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Cultivating a New Relationship with the Mind: Insights on Learning and Applying Mindfulness for Health and Wellbeing

Betül Tatar (BSc, MSc)

Submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

August 2022

School of Psychology and Neuroscience University of Glasgow 62 Hillhead Street Glasgow G12 8QB



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Abstract

The human mind has a profound capacity to re-experience past events. These reexperiences, termed 'simulations' within the grounded cognition theory, are a common mechanism in both reward and aversion-related domains. For example, simulations can lead to unhealthy food desires and anxiety. Mindfulness practices have grown in popularity in the secular West to address issues of health and wellbeing, which may partly arise from simulations. Mindfulnessbased interventions typically span over several months and train individuals to cultivate non-judgmental present-moment awareness. While these interventions are effective, their time and attentional demands may not be realistic for many individuals. As such, brief interventions as short as several minutes have gained empirical and popular interest in the last few decades. Brief interventions often focus on a single component of mindfulness such as 'decentering' - the metacognitive insight that the events of the mind are transient. Previous research demonstrates the effectiveness of decentering in regulating both reward-related processes (e.g., eating behaviour) and negative affect (e.g., anxiety). The grounded cognition account identifies simulations as a clear target for intervention, where decentering may reduce the effect of simulations on motivational/affective states like food desires and anxiety. However, there is very limited research on whether and how decentering targets the simulationstate link, and how decentering can be best taught. Further, studies of decentering predominantly rely on quantitative methods, which cannot illustrate specifically how people experience decentering. To address these gaps, this thesis investigates how individuals learn and apply single-session brief decentering strategies in the domains of food cravings and pandemic-related anxiety. Specifically, it assesses the potential effects of decentering on the relationship between simulations and motivational/affective states (Chapters 2 and 5). It also addresses methodological gaps in research through two gualitative studies (Chapters 3 and 4) and a mixed-methods experiment (Chapter 5).

Chapter 1 introduces grounded cognition theory as the central theoretical framework of this thesis (Papies et al., 2022), illustrating the shared cognitive mechanisms underlying the domains of food cravings and anxiety. Further, this chapter justifies the rationale for selecting food cravings and anxiety as domains of investigation for this thesis. Briefly, both domains present costly real-world

problems of health and wellbeing. Both are multidimensional phenomena that have various biopsychosocial correlates. Importantly, according to grounded cognition theory, vivid mental simulations play a central role in both domains and are clear targets for decentering intervention.

Chapter 2 presents two experiments in the domain of food cravings that examine whether decentering is best learned in a domain-specific way or more generally, and assess the effect of decentering on the relationship between consumption simulations and food cravings. Salivation to foods is used as the main outcome variable, serving as a physiological measure of desire. Findings provide insufficient evidence on the need for domain specificity, and mixed evidence on whether decentering decouples the association between consumption simulations and desire for attractive food.

Chapter 3 presents the first qualitative interview study that explores how individuals learn and apply a brief decentering strategy in the domain of food cravings. Findings suggest that participants experience decentering as a change in their relationship to attractive food stimuli, where thoughts and feelings about foods are perceived as more transient. Various factors facilitate the learning and application of decentering, such as the use of metaphors. Chapter 4 builds on these findings with a focus group study in the domain of pandemic anxiety. This study shows that while participants perceive their anxietyprovoking experiences as transient mental events, some misunderstand the metacognitive concept of decentering. The final empirical chapter (Chapter 5) takes the qualitative findings as the basis for a well-powered mixed-methods experiment. This chapter investigates whether a brief decentering strategy curbs anxiety related to the pandemic, assessing the effect of decentering on the relationship between negative mental imagery (i.e., simulations) and anxiety. The quantitative results demonstrate that decentering can reduce both levels of anxiety, and decouple the link between imagery and anxiety. Qualitative findings provide a more nuanced understanding of these findings, revealing that again, a substantial number of participants misunderstand decentering.

In the final chapter of this thesis (Chapter 6), I discuss the key theoretical and applied conclusions of this work, evaluate its overall strengths and limitations, and propose avenues for future research. Overall, this work contributes a

grounded cognition account of learning, (mis)understanding, and applying brief decentering, highlighting the importance of qualitative and mixed-methods inquiry in mindfulness research.

Table of Contents

Abstract 4
Table of Contents
List of Tables
List of Figures
Acknowledgements
Research Output
Contributorship Statement
Abbreviations
Chapter 1 General introduction
1.1Food (over)consumption: Background and a grounded cognition perspective201.2Food (over)consumption: A multidimensional phenomenon231.3Food overconsumption: One problem, many solutions251.3.1Dietary restriction261.3.2Cueing interventions261.3.3Training interventions281.4Anxiety: Background and a grounded cognition perspective311.5Anxiety: A multidimensional phenomenon331.6Anxiety: One problem, many solutions351.7Food cravings and anxiety: Common processes and interventions381.8Mindfulness-based interventions for health and wellbeing: An empowered approach.391.9Decentering as an active component of mindfulness and (brief) mindfulness-based421.10The current thesis451.11Note to readers49
Chapter 2 A brief decentering mindfulness induction to modulate the link between eating simulations and desire for attractive food - Does domain specificity matter?
2. Abstract. 51 2.1 Introduction 52 2.2 Experiment 1 57 2.2.1 Method 57 2.2.2 Results 64 2.3 Discussion 70 2.3 Experiment 2 71 2.3.1 Method 72 2.3.2 Results 81 2.3.3 Discussion 70 2.4 General discussion 92 2.4.1 The effect of decentering on salivation to food cues 92 2.4.2 The relationship between consumption simulations and salivation 93 2.4.3 The effect of decentering on the relationship between consumption simulations and salivation 94 2.4.4 The role of domain specificity in reactivity to food cues 96 2.4.5 Study limitations 97 2.4.6 Salivation as a physiological, potentially implicit measure of desire 100 2.4.7 Conclusion 101 2.5 Declarations 102 2.5.1 Funding 102 2.5.2 Ethical approval 102
Chapter 3 "The thought is gonna come and the thought is gonna go": A qualitative study on how non-meditators learn and apply brief mindfulness-based instructions for food cravings103

8

3.2.1	Study design	110
3.2.2	Participants	111
3.2.3	Interview schedule	112
3.2.4	Materials	113
3.2.5	Procedure	115
3.2.6	Analysis	117
3.3 F	indings	117
3 3 1	Theme 1. Learning and applying decentering instructions	119
227	Theme 7: Detential daily application of decentering instructions	172
3.3.Z	Theme 2. Consumption and reward simulations	122
3.3.3	Theme 3: Consumption and reward simulations	123
3.3.4	Food Thoughts Overlap Measure (FTOM) as a tool for exploring decentering effect	S
	125	
3.4 D	iscussion	125
3.5 A	cknowledgements	131
3.6 D	eclarations	131
3.6.1	Funding	131
3.6.2	Ethical approval	131
		-
Chapter 4	"It's still there, but it doesn't have as big of an effect on me": Qualitative finding	S
on experien	ces of applying brief decentering mindfulness in the context of COVID-19 anxiety .	132
4 41.1		
4. ADSt	ract	133
4.1 Ir	itroduction	134
4.2 M	ethodŕ	137
4.2.1	Study design	138
4.2.2	Participants	138
4.2.3	Focus group guide	140
4.7.4	Focus group moderators	140
425	Materials	1/1
4.2.5	Drocoduro	1/2
4.2.0	Procedure	142
4.2.7	Data analysis	142
4.3 F	indings	144
4.3.1	Anxiety-provoking aspects of the COVID-19 pandemic	144
4.3.2	Themes	147
4.4 D	iscussion	159
4.5 A	cknowledgements	166
4.6 D	eclarations	166
4.6.1	Funding	166
462	Fthical approval	166
1.0.2		
Chapter 5	A brief decentering-based mindfulness strategy reduces pandemic-related anxiety	y:
A mixed-me	thods experiment	167
5. Abst	ract	168
5.1 lr	itroduction	169
5.2 M	ethodŕ	174
5.2.1	Design	174
5.2.2	Participants	174
5.2.3	Materials	175
5.2.4	Measures	176
5 2 5	Qualitative survey	177
526	Drocedure	178
5.2.0		170
5.2.7	Dala dilalysis	1/7
5.3 K	esults	180
5.3.1	Quantitative results	180
5.3.2	Confirmatory analyses	182
5.3.3	Exploratory analyses	185
5.3.4	Manipulation checks	189
5.3.5	Qualitative findings on pandemic-related worries	189
5.3.6	Qualitative survey findings	197
5.4 D	iscussion	211
5/1	Study summary	211
5 1 2	Quantitative findings	217
J.4.Z	Qualitative findings on pandomic related warries	<u>∟</u> ।∠)1∡
5.4.5 F 4 4	Qualitative minumes on panuemic-related wornes	214 24 F
5.4.4	Qualitative survey findings	215

5.4.5 Evaluation of the decentering manipulation	218
5.4.6 Study strengths and limitations	218
5.4.7 Implications	220
5.4.8 Conclusion	221
5.5 Declarations	221
5.5.1 Funding	
Chapter 6 General discussion	223
6.1 Grounded cognition theory: A summary	223
6.2 Summary of findings	224
6.3 Thesis contributions and implications	227
6.4 Strengths and limitations	230
6.5 Implications for application of mindfulness	234
6.6 Future research directions	237
6.7 Conclusion	239
Appendix A Supplementary materials for Chapter 2	240
Supplementary material 1: Decentering and relaxation control instructions (Experiment 1)	.240
Supplementary material 2: Decentering and 'normal viewing' control instructions (Experin	nent
2)	245
Supplementary material 3: Model comparison tables for Bayesian regression analyses	250
Appendix B Supplementary materials for Chapter 3	252
Supplementary material 1: Further participant demographic information	252
Supplementary material 2: Interview schedule	253
Supplementary material 3: Normal viewing (control) and decentering instructions	259
Supplementary material 4: Reflexivity	262
Supplementary material 5: Trustworthiness	270
Appendix C Supplementary materials for Chapter 4	271
Supplementary material 1: Further participant demographic information	271
Supplementary material 2: Focus group guide	272
Supplementary material 3: Reflexivity	276
Supplementary material 4: Decentering instructions	284
Supplementary material 5: Summary findings from the analysis of interactional data	286
Supplementary material 6: Trustworthiness	289
Appendix D Supplementary materials for Chapter 5	291
Supplementary material 1: Additional quantitative analyses informed by qualitative survey	,
findings	291
Supplementary material 2: Control and decentering instructions	297
References	300

List of Tables

Table 1 - Descriptive statistics and bivariate correlations between main study
variables
Table 2 - Summary of the multiple regression model comparing the effect of
consumption simulations on salivation to crisps between conditions
Table 3 - Descriptive statistics and comparison of the attractiveness and
healthiness ratings between foods70
Table 4 - Descriptive statistics for the main study variables per condition82
Table 5 - Correlations between main study variables 84
Table 6 - Summary of the hypothesis-testing multiple regression model85
Table 7 - Summary of the exploratory multiple regression model, with outliers
removed from the dataset
Table 8 - Overview of themes and sub-themes118
Table 9 - Anxiety-provoking aspects of the COVID-19 pandemic that participants
have identified
Table 10 - Overview of themes and sub-themes
Table 11 - Supporting quotes for Theme 1150
Table 12 - Supporting quotes for Theme 2151
Table 13 - Supporting quotes for Theme 3154
Table 14 - Supporting quotes for Theme 4 157
Table 15 - Supporting quotes for Theme 5 159
Table 16 - Descriptive statistics and comparison of the decentering and control
conditions per study variable
Table 17 - Bivariate correlations between study variables in each condition 182
Table 18 - Summary of the multiple regression model testing Hypotheses 2 and 3
Table 19 - Summary of the exploratory multiple regression models testing
Hypothesis 1
Table 20 - Summary of the multiple regression model testing Hypotheses 2 and 3
using pre-task imagery as a predictor 186
Table 21 - Summary of the multiple regression model testing Hypotheses 2 and 3
using post-task imagery as a predictor
Table 22 - Descriptive statistics and comparison of the decentering and control
conditions for perceived effort and success in applying the instructions 188
Table 23 - Overview of themes and sub-themes for the worry data 190
Table 24 - Additional demographic information191
Table 25 - Supporting quotes for qualitative findings on pandemic-related
worries 194
Table 26 - Qualitative survey questions197
Table 27 - Overview of qualitative survey themes and sub-themes
Table 28 - Supporting quotes for Theme 1200
Table 29 - Supporting quotes for Sub-theme 2.1204
Table 30 - Supporting quotes for Sub-themes 2.2 and 2.3 205
Table 31 - Supporting quotes for Sub-theme 3.1209
Table 32 - Supporting quotes for Sub-themes 3.2, 3.3, 3.4, and 3.5 210
Table 33 - Supporting quotes for Sub-themes 3.6 and 3.7211

List of Figures

Figure 1 - Conceptual map illustrating how decentering may target both the simulation-motivational state link and the motivational state-behaviour link Figure 2 - Overview of study procedure for Experiment 1 Figure 3 - Violin-boxplots showing the distribution of salivation for the neutral food and the attractive food in each condition Figure 4 - Scatterplot with regression lines and 95% confidence intervals showing the effect of consumption simulations on salivation to crisps per condition	55 63 67 ng
(standardised scores)	69
Figure 5 - Food Thoughts Overlap Measure	77
Figure 6 - Overview of study procedure for Experiment 2	80
Figure 7 - Violin boxplots showing the distribution of salivation to crisps per	
condition	82
Figure 8 - Added variable plots illustrating the effect of consumption simulatio on salivation to crisps in each condition, controlling for baseline salivation	ns
(standardised scores)	88
Figure 9 - Added variable plots illustrating the effect of consumption simulatio	ns
on salivation to crisps in each condition, controlling for baseline salivation, and	d
with influential data points removed (standardised scores)	88
Figure 10 - Food Thoughts Overlap Measure (FTOM) 1	15
Figure 11 - Overview of study procedure1	16
Figure 12 - Overview of study procedure 1	.79
Figure 13 - Violin boxplots showing the data points and distribution of post-tas	K
anxiety for each condition1	83
Figure 14 - Scatterplots with regression lines and 95% confidence intervals	
snowing the effect of pre-task imagery (panel A), post-task imagery (panel B),	
and combined imagery (panel C) on post-task state anxiety per condition	
(standardised scores) 1	84

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Contributorship Statement

Below are contribution statements for each chapter of this thesis. Contributions are listed following the Contributor Roles Taxonomy (CRediT) format for chapters marked with an asterisk.

Key

BT: Betül Tatar; **EKP:** Esther K. Papies; **HG:** Hanna Glandorf; **LB:** Lawrence Barsalou; **RP:** Rebeka Pázmányová

Chapter 1

BT conceptualised and wrote the first draft of the chapter. EKP reviewed and edited it. BT revised it with further input from EKP and LB.

Chapter 2*

BT: Conceptualisation, Methodology, Formal analysis, Investigation, Resources, Data curation, Writing - Original draft, Writing - Review & Editing, Visualisation, Supervision, Project administration. **HG:** Conceptualisation, Methodology, Investigation, Resources, Data curation. **EKP:** Conceptualisation, Methodology, Resources, Writing - Review & Editing, Supervision. **LB:** Writing - Review & Editing.

Chapter 3

All authors contributed to the study conception and design. Material preparation was performed by BT and RP, with feedback from EKP. RP collected the data. BT and RP analysed the data, with input from EKP. BT wrote the first draft of the manuscript, and EKP revised it. BT revised the manuscript further with input from RP, drafted the final manuscript, and revised it with input from EKP.

Chapter 4*

BT: Conceptualisation, Methodology, Formal analysis, Investigation, Resources, Data curation, Writing - Original draft, Writing - Review & Editing, Supervision, Project administration. **RP:** Conceptualisation, Methodology, Formal analysis, Investigation, Resources, Writing - Review & Editing. **EKP:** Conceptualisation, Methodology, Resources, Writing - Review & Editing, Supervision.

Chapter 5*

BT: Conceptualisation, Methodology, Formal analysis, Investigation, Resources,
Data curation, Writing - Original draft, Writing - Review & Editing, Visualisation.
EKP: Conceptualisation, Methodology, Resources, Writing - Review & Editing,
Supervision. LB: Writing - Reviewing & Editing.

Chapter 6

BT conceptualised and wrote the first draft of the chapter. EKP reviewed and edited it. BT revised it with further input from EKP and LB.

Abbreviations

ACT	Acceptance and Commitment Therapy
BF	Bayes Factor
СВТ	Cognitive Behavioural Therapy
COREQ	Consolidated Criteria for Reporting Qualitative Research
DBT	Dialectical Behaviour Therapy
EMDR	Eye Movement Desensitisation and Reprocessing
F-SET	False Safety Behaviour Elimination Treatment
FTOM	Food Thoughts Overlap Measure
GAD	Generalised Anxiety Disorder
HPA	Hypothalamic-Pituitary-Adrenal
IOS	Inclusion of Other in Self
LPP	Late Positive Potential
МВСТ	Mindfulness-Based Cognitive Therapy
MB-EAT	Mindfulness-Based Eating Awareness Training
MBSR	Mindfulness-Based Stress Reduction
OSIO	Overlap of Self, Ingroup and Outgroup
РВСТ	Person-Based Cognitive Therapy
PMR	Progressive Muscle Relaxation
ТА	Thematic Analysis
TFEQ	Three-Factor Eating Questionnaire
TMS	Toronto Mindfulness Scale
VAS	Visual Analogue Scale

Chapter 1 General introduction

Many of the qualities that make us human also have the potential to cause suffering. For instance, the human mind easily wanders off. This 'mental time travel' (Brown et al., 2007) to past memories or future plans may inspire one to reflect and grow, plan the milestones of a fulfilling career, compose a captivating piece of music, write an exquisite novel, or contribute to scientific advancements. While the wandering mind may have an adaptive self-enhancing function (Sheldon & Vansteenkiste, 2005), the mind may also wander off in unhelpful ways, for example to escape the present moment, ruminate about the past, or catastrophise about the future.

One way in which mind wandering manifests is through the experience of cravings. Although cravings serve a vital function in motivating behaviour to fulfil essential biological needs, one may also crave unhealthy, and even dangerous substances. Therefore, the wandering and craving mind has the potential to negatively impact physical and mental health. Many cultures, faiths, and spiritual traditions have developed practices to understand and cultivate qualities of the mind, and to address them when they become unhelpful or harmful to the individual. Mindfulness is one such practice, defined in the West as, "the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment" (Kabat-Zinn 2003). This thesis focuses on mindfulness in the context of food cravings and anxiety related to the COVID-19 pandemic. Specifically, I investigated various aspects of how individuals learn and apply brief mindfulness strategies that are based on an active component of mindfulness called 'decentering'.

Mindfulness can be studied in the context of various life domains. I focused on food cravings and anxiety, as these are highly prevalent phenomena that may negatively impact health and wellbeing. The current food environment is laden with attractive, ultra-processed foods that are high in sugar, fat, and salt (de Ridder et al., 2017). The availability of these foods facilitates consumption that is driven by pleasure and reward (i.e., hedonic hunger) rather than physical hunger (Appelhans, 2009; Lowe & Butryn, 2007). Further, the accessibility of these foods is reinforced by product marketing and advertisement strategies

(Schwartz & Ustjanauskas, 2012). Examples include the Dunkin' Donuts slogan, "America runs on Dunkin'" (availability), and McDonald's slogan, "look for the golden arches" (accessibility). Attractive foods are also available in larger portion sizes compared to a few decades ago (Steenhuis & Poelman, 2017). The overall food environment that is characterised by the ubiquity of attractive foods and the promotion of consumption of such foods is termed the "obesogenic environment" (Swinburn et al., 1999; Swinburn et al., 2011). This term signals that the current food environment is indeed problematic, as it promotes food cravings and overconsumption, and leads to negative health outcomes such as weight gain (Ledikwe et al., 2006).

The World Health Organisation (2016) estimates that approximately 2 billion adults are affected by excess weight, of which 650 million suffer from obesity. If these trends continue, 2.7 billion adults will be affected by excess weight by 2025, with over 1 billion suffering from obesity. In turn, excess weight and obesity are linked to a range of noncommunicable diseases such as type 2 diabetes, coronary heart disease, and cancer (Kopelman, 2007), reduced quality of life (Kolotkin et al., 2001), increased mortality (Whitlock et al., 2009), as well as mood problems (for a review, see de Ridder et al., 2017). As such, excess weight and obesity are associated with a high cost and burden of disease (Hecker et al., 2022). However, even for those who do maintain a healthy weight status, cravings and overconsumption of foods may be problematic. It is therefore essential to develop evidence-based, effective, simple, and accessible interventions that promote health by helping people navigate a problematic food environment.

Mental ill health is another domain of concern. According to population-based surveys from various countries, the lifetime prevalence of anxiety disorders is up to 33.7% (Bandelow & Michaelis, 2015). In the United Kingdom alone, 19.7% of those over the age of 16 show symptoms of anxiety or depression (Evans et al., 2016). According to the 2014 Adult Psychiatric Morbidity Survey (McManus et al., 2016), one in six adults in England has a common mental disorder at any given time, which includes anxiety disorders. As such, anxiety is associated with a high cost and burden of disease, where access to evidence-based treatment is improving but still limited (Dormon, 2015). In addition, the COVID-19 pandemic that started in December 2019 was and continues to be an anxiety-provoking

time for many people. In particular, the initial stages of the pandemic were characterised by elevated levels of psychological distress and anxiety (da Silva et al., 2021; O'Connor et al., 2020). As with food cravings, it is essential to develop effective, simple, and accessible interventions that help people navigate anxiety-provoking situations.

The rest of this chapter presents an integrated grounded cognition account of food cravings and anxiety, including key interventions in each domain. The empirical chapters of this thesis are based predominantly on the grounded cognition theory of desire and motivated behaviour (Papies et al., 2020; Papies & Barsalou, 2015). To mirror this, I depict the domains of food cravings and anxiety as the multidimensional phenomena that they are, still through a grounded cognition perspective. Although at first the reward-related process of food cravings may seem antagonistic to the negative affective processes that underlie anxiety, I draw parallels between the two domains to argue that they have many commonalities. Namely, they are both extremely important and costly issues of health and wellbeing that have multiple biopsychosocial correlates. Grounded cognition theory identifies mental simulations as an underlying cognitive and neural mechanism in both domains, and therefore as a clear target for intervention. I end this chapter by situating mindfulness in the context of both domains, and summarising the programme of research that comprise this thesis.

1.1 Food (over)consumption: Background and a grounded cognition perspective

Various physiological, psychological, and social factors interact to bring about food consumption or overconsumption behaviour. Specifically, from a psychological perspective, various interrelated processes give rise to desire and cravings to consume attractive food, which in turn influence eating behaviour and predict weight gain (Boswell & Kober, 2016; Delahanty et al., 2002; Hetherington & Macdiarmid, 1995). Desire and cravings are defined respectively as the motivation and strong urge to consume a certain substance, with an anticipation based on previous experiences that consuming this substance will be rewarding (Kavanagh et al., 2005; Papies et al., 2020; Papies & Barsalou, 2015). People frequently experience desire to consume foods and beverages in daily life (Hofmann, Vohs, et al., 2012; Hofmann, Baumeister, et al., 2012). According to the goal-conflict theory, the frequent experiencing of desire places people in a state of conflict between short-term rewards of consuming tempting yet unhealthy foods and long-term goals related to health and weight (Stroebe et al., 2008, 2013). Such goal conflict often favours the attainment of short-term rewards (Hofmann et al., 2008; Riet et al., 2011; Verhoeven et al., 2012). This relates to the 'intention-behaviour gap' (Webb & Sheeran, 2006). Specifically, the intentions to eat healthily and in line with one's weight loss/maintenance goals does not strongly predict behaviour (Shaikh et al., 2008).

The grounded cognition theory of desire and motivated behaviour provides a comprehensive account of the psychology of cravings (for a detailed overview, see Papies et al., 2020; Papies & Barsalou, 2015). According to this theory, cognitive and memory processes play a fundamental role in how desire and related motivated behaviour arise upon encountering relevant internal or external cues. Specifically, past experiences of the world are represented in memory as 'situated conceptualisations' (Barsalou, 2008, 2009, 2016). These representations are 'situated' in that they capture experiences multi-modally. For example, crisps may be represented through visual and sensory properties (e.g., taste, texture; "salty", "crunchy"), hedonic properties (e.g., "scrumptious"), the external context associated with consumption (e.g., place, time; "movie", "at night"), the internal context associated with consumption (e.g., body states, emotions; "hungry", "sad"), and other relevant information (Barsalou, 2009; Papies, 2013). The repeated experiencing of similar situations (e.g., consuming crisps when watching a movie) strengthens the association between the various features of the situated conceptualisation (Barsalou, 2008).

As an individual goes about their day, the situated conceptualisations that best match any given situation become activated. Revisiting the example of crisps, when someone experiences a relevant cue (e.g., hunger, a TV advertisement), the stored situated conceptualisation becomes partially re-enacted as 'consumption and reward simulations' (Papies et al., 2020). In other words, encounters with a subset of the appetitive cues that make up a stored memory representation may spontaneously activate other features of that representation (Papies et al., 2020; for a review of relevant brain-imaging studies, see Chen, 2016). In the case of crisps, viewing a TV advertisement may lead to mental simulations of how crunchy crisps are and how rewarding it would be to eat some now. Importantly, consumption and reward simulations are assumed to occur primarily as automatic and unconscious mental events, but may reach conscious awareness as 'mental imagery' (May et al., 2015; Papies & Barsalou, 2015). Consumption and reward simulations reach conscious awareness when one pays goal-directed attention to simulation content in the working memory (Papies et al., 2022). In other words, simulations in working memory become accessible to an individual when they pay attention to it. According to the elaborated intrusion theory of desire, simulations would reach conscious awareness when they evoke a strong affective response or sense of deficit, leading to further cognitive elaboration (Kavanagh et al, 2005; May et al, 2015; Tapper, 2018).

Most relevant to this thesis, both consumption and reward simulations that reach conscious awareness and those that remain unconscious lead to desire and motivated behaviour (e.g., consuming food; Keesman et al., 2016; Papies et al., 2020). So, upon viewing the TV advertisement for crisps, a person might simulate eating and enjoying the crisps, which may motivate them to walk to the kitchen, grab a pack of crisps, and eat it in front of the TV. Further, this consumption episode will also be encoded as part of the situated conceptualisation, suggesting that increased intake of specific foods may lead to a vicious and potentially harmful cycle of stronger consumption simulations and resulting overconsumption. Importantly, the relationship between situated conceptualisations, simulations and motivated behaviour is equally relevant for instances of 'emotional eating'; the consumption of food in response to negative or positive emotions, arousal, and distress (Adam & Epel, 2007; Evers et al., 2010; Sultson et al., 2022; for a meta-analysis, see Cardi et al., 2015). Emotions may be encoded as part of a situated conceptualisation (e.g., sadness for chocolate). Feeling an emotion may therefore become a cue that triggers simulations, leading to consumption of food. The grounded cognition theory of desire and motivated behaviour not only explains appetitive processes, but also identifies specific targets for intervention. One clear target is individuals' consumption and reward simulations. Disrupting simulations either by reducing their strength or reducing their downstream impact may curb desire (Papies et

al., 2020). Chapter 2 of this thesis explores the latter in the context of a brief decentering strategy.

Another target for intervention would be the problematic food environment itself. Changing the environment to reduce the availability and accessibility of attractive yet unhealthy foods would arguably be the most effective approach to addressing problematic aspects of the food environment. From a grounded cognition perspective, this would reduce the number of situations that can activate situated conceptualisations that would lead to cravings. Environmental change can be achieved through law and policy interventions such as pricing strategies, financial incentives, and changes to legislation (e.g., Sarlio-Lähteenkorva & Winkler, 2015; Scarborough et al., 2020). Although such systemic interventions are beyond the scope of this thesis, the possibility of targeting the environment highlights that the onus for change is not solely on the individual. Where systemic change is slow, however, interventions focused on the individual may be empowering, including mindfulness-based strategies. Critically, the environment is still extremely relevant when targeting individuals, as environmental cues trigger simulations, which in turn may lead to desire and cravings.

1.2 Food (over)consumption: A multidimensional phenomenon

The grounded cognition perspective introduced above also relates to the physiological and social correlates of food overconsumption. Physiologically, humans are genetically programmed to consume tasty and attractive foods, which include the ultra-processed foods of the current food environment. Any excess energy from these foods is stored as body fat due to its evolutionarily protective advantage against food scarcity and starvation (Bellisari, 2008). Reward signals in the form of simulations may further regulate consumption to be in line with evolutionarily adaptive physiological needs. In other words, consumption and reward simulations may support the extant physiological drive to prioritise intake of attractive and high-energy foods.

Further, various hormones regulate appetite and satiety signals of the body, therefore regulating food intake and energy expenditure. For instance, the hormone ghrelin stimulates appetite and food intake, whereas the hormone leptin suppresses appetite and food intake (Klok et al., 2007). Consuming a diet high in sugar and fat may reduce the body's responsiveness to leptin's suppressive effects. This process, termed 'leptin resistance', is associated with overconsumption of food and obesity (de Git & Adan, 2015). Such hormonal imbalances may enhance the effect of consumption and reward simulations on motivated behaviour. Where appetite suppression does not occur effectively due to leptin resistance, simulations of eating and enjoying food may persist for a longer duration and increase in vividness (i.e., strengthen), and may lead to actual consumption more readily. This may cause further hormonal imbalance in a cyclical fashion.

Lastly, various psychological and bodily states influence eating behaviour. Stress is a particularly important state to consider, as it has far-reaching psychological and physiological effects (McEwen, 2004). Chronic life stress in particular is associated with greater intake of energy-dense and ultra-processed foods, and weight gain (Adam & Epel, 2007; Dallman, 2010). Previous studies illustrated the underlying physiological correlates of this process, including a dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis and elevated levels of cortisol (Chao et al., 2017; Raspopow et al., 2010, 2014; Torres & Nowson, 2007). From a grounded cognition perspective, past experience of eating in response to stress may be stored as part of a memory representation (i.e., a situated conceptualisation). Future experiences of stressful situations may lead to partial re-enactments of the situated conceptualisation (i.e., simulations), thereby leading to desire and motivated behaviour. A dysregulated HPA axis and/or cortisol imbalances may enable or strengthen the effect of stress-related simulations on food consumption.

The social environment is another key determinant of eating behaviour. The behaviours of others signal what, how, and how much is appropriate to eat. In other words, other people's eating behaviours indicate social norms through the processes of social modelling, social facilitation, and self-presentation (Fletcher et al., 2011; Herman, 2015; Herman et al., 2003; Herman et al., 2019; Robinson et al., 2014; Vartanian et al., 2015). Social norm signals may activate situated

conceptualisations related to appropriate and desirable eating behaviours, which may have high reward value due to implied social approval of others (Papies, 2017b). Interestingly, the daily eating context is rapidly changing as well. While people continue to engage in communal eating (Dunbar, 2017), more and more occasions of eating take place in the presence of distractors such as television and computers. These distractors have been shown to impair memory of food intake, therefore increasing current and later consumption (Ghobadi et al., 2018; Higgs, 2015; Higgs & Woodward, 2009; Mittal et al., 2011). Higgs et al. (2012) offer a decision-making account of this phenomenon, where decisions about consumption are partly based on information about the satiating effects of previous food intake. For instance, when deciding on whether to eat a snack, one may draw on memories of a satiating lunch earlier in the day. Conversely, if information about lunch was not encoded in memory due to distractors, it would not be possible to base one's decision on previous intake, which may lead to increased consumption.

Overall, this section demonstrates the multidimensional and complex nature of food overconsumption. It seems that many aspects of food overconsumption can be explained naturally through a grounded cognition account (Papies et al., 2020, 2022). Specifically, the grounded cognition theory explains the cognitive and motivational processes underlying (over)eating and weight gain across specific contexts and situations. The problematic food environment provides ample opportunities to learn that attractive yet unhealthy foods are rewarding. This learning is further influenced by an evolutionary drive against starvation and rewarding social normative signals. It is further supported by hormonal responses of the body. As such, the grounded cognition theory can explain the effects of various factors such as social norms and habits/impulses on behaviour (for a detailed discussion, see Papies et al., 2022). This thesis specifically focuses on the link between simulations and desire.

1.3 Food overconsumption: One problem, many solutions

Numerous interventions with varying levels of effectiveness have been developed to tackle the problem of food overconsumption. They include 'cueing

interventions' that target environmental cues and 'training interventions' that target people's responses to the cues in their environment (Papies, 2017b). Further, some interventions are best viewed in relation to dietary restriction, as they are designed to support and facilitate dieting goals. This section reviews dietary restriction and a non-exhaustive selection of interventions, with an emphasis on how they relate to the grounded cognition perspective.

1.3.1 Dietary restriction

Restricting food intake, colloquially called 'dieting', appears as a logical and simple solution at first. Indeed, restriction of energy intake may lead to varying degrees of short-term weight loss success (Franz et al., 2007). However, it often backfires as a long-term strategy. The human body responds to dietary restriction through various hormonal and metabolic adaptations that facilitate weight gain (Fothergill et al., 2016). As a result, dieters often fail to sustainably resist food temptation, regaining the initial weight lost (Jeffery et al., 2000; Mann et al., 2007).

In addition to this physiological explanation, the psychological false assumption that "people act rationally" underlies dieting failures (Kelly & Barker, 2016). According to the Theory of Planned Behaviour, behaviours are enacted in a reasoned and planned way (Ajzen, 1991). From here, it would follow that being knowledgeable about the components of a healthy diet and appropriate levels of energy intake would lead to healthy dietary choices and weight loss maintenance. However, simply *knowing* what and how much to eat may not be sufficient on its own to engage with sustainable dietary restriction (Marteau et al., 2012).

1.3.2 Cueing interventions

Various interventions aim to change aspects of the environment to make ultraprocessed food consumption less likely, while promoting healthy food choices. For instance, changing the price of products may reduce consumption (e.g., UK's tax on sugar sweetened beverages; Sarlio-Lähteenkorva & Winkler, 2015; Scarborough et al., 2020). Another approach is to manipulate the features of an environment that are implicated in people's choices, termed 'choice architecture' (Hollands et al., 2013). Within the choice architecture, a 'nudge' may be implemented to make a healthy (vs. unhealthy) food choice more likely (Marchiori et al., 2017), for example by placing fruit (vs. chocolate cake) at the front of a dessert buffet. 'Nudges' may also be in the form of smaller food portion sizes or units (Geier et al., 2006; Spanos et al., 2015). The grounded cognition theory would suggest that cues in the form of 'nudges' would activate situated conceptualisations of consuming healthy foods or food in smaller amounts, increasing the likelihood that such behaviour will be enacted again (Papies, 2017b).

Goal priming is another cueing strategy where specific environmental cues are associated with certain goals. The subsequent perception of the environmental cue activates the associated goal and relevant behaviours that will enable goal achievement (Custers & Aarts, 2005; Papies & Aarts, 2016; Papies & Hamstra, 2010). Goal priming therefore enhances existing dieting goals, rather than functioning as an independent intervention. Goal primes may activate goalrelevant situated conceptualisations rather than hedonic consumption-related situated conceptualisations, which may get activated more readily otherwise (Papies, 2017b; Papies et al., 2022). Previous work suggests that goal priming may be a useful intervention for eating behaviour ('diet primes'; Papies et al., 2014; Versluis & Papies, 2016). Lastly, social norms have been developed into social norm messaging interventions, where individuals are provided with information on the type and amount of food others consume in a specific context (Mollen et al., 2013; Robinson, Fleming, et al., 2014). However, social norm messaging interventions may not have large enough effects to be practically meaningful in daily life (Foxcroft et al., 2015).

A key critique of interventions such as 'nudging' and goal priming is that it is near impossible to ensure a fool-proof, temptation-free environment solely through them, even if their implementation becomes commonplace. As Boswell et al., (2018) state, "there will always be nudge-resistant food courts filled with cheap, delicious, unhealthy options". That said, there are effective "upstream interventions" such as changes to availability, policy (e.g., changing taxes and subsidies), and legislation on food access and marketing (see Papies, 2017b). For example, research in the domain of cigarette smoking demonstrates the effectiveness of laws banning public and workplace smoking (Fichtenberg & Glantz, 2002; Sargent et al., 2004). These changes alter the situational cues that individuals are exposed to, therefore manipulating the situated conceptualisations that get activated. However, given the political, organisational and industry resistance to implement law and policy interventions, any change in the environment will likely be slow (Marteau et al., 2011; Sarlio-Lähteenkorva & Winkler, 2015; Swinburn et al., 2011). Importantly, all interventions mentioned in this section, including 'upstream' interventions, are oriented toward reducing the cognitive effort required for individuals to make better food decisions.

1.3.3 Training interventions

Various interventions aim to modify individuals' responses to cues in their environment, rather than the environment itself. Therefore, a shared goal of these interventions is to support healthier eating goals by promoting an alternative response to environmental cues. Computerised high repetition training is a family of computer-based paradigms that target the link between an attractive stimulus (e.g., attractive food) and the cognitive, affective or motor impulses to approach that stimulus (for a summary, see Papies, 2017b). For example, in *response inhibition training*, individuals are repeatedly exposed to a target product. Their task is to withhold (i.e., 'inhibit') their default motor response to reach for and grab the product (for a review, see Stice et al., 2016). From a grounded cognition perspective, repeated practice of response inhibition may modify the underlying situated conceptualisations such that they are less likely to activate consumption and reward simulations (Papies, 2017b). Similarly, in *approach/avoidance retraining*, individuals repeatedly move toward or away from both target and control stimuli (Wiers et al., 2010), again altering existing situated conceptualisations. While these approaches show variable effectiveness in reducing unhealthy food impulses in short-term lab experiments, there is limited evidence on their longer-term effectiveness in daily life (Allom et al., 2016; Becker et al., 2015; Veling et al., 2017).

Implementation intentions is another training intervention, where an individual develops an 'if-then' plan, connecting a specific situation to a specific behaviour (e.g., *"If* I crave a snack while watching TV, *then* I will eat an apple"; Gollwitzer & Sheeran, 2006; Hagger & Luszczynska, 2014). Planning behaviour change

involves the formation of novel situated conceptualisations. When the situation that is relevant to the implementation intention is re-encountered (e.g., cravings while watching TV), the new situated conceptualisation may be partially re-enacted to bring about the planned behaviour (e.g., eat an apple), especially when the behaviour is anticipated to be rewarding (Martiny-Huenger et al., 2017; Rodger et al., 2022; for a detailed account, see Papies et al., 2022). Importantly, developing plans in the form of implementation intentions involves vivid mental imagery of planned situations and actions (Papies, 2017b). Indeed, research suggests that the effect of implementation intentions is enhanced by mental imagery (Knäuper et al., 2009). This is perhaps because the new situated conceptualisations include more specific and vivid cues, which activate the planned behaviour more readily in the future. Although implementation intentions may be effective in *increasing* healthy eating behaviours (e.g., introducing the behaviour of snacking on fruit in the afternoon), they are less effective in *decreasing* unhealthy eating behaviours (e.g., not purchasing cake when passing by one's favourite bakery; for a metaanalysis, see Adriaanse et al., 2011). This also aligns with the grounded cognition perspective, as performing mental imagery or forming a situated conceptualisation of *not* enacting a behaviour is challenging, and may ironically strengthen the original representation of enacting the behaviour (Papies et al., 2022).

Further, specific skills from various therapeutic traditions may be considered standalone training interventions. For instance, *cognitive restructuring* is a cognitive reappraisal strategy from Cognitive Behavioural Therapy (CBT; Beck, 1970; Ellis, 1957). In this technique, individuals are taught to identify unhelpful thoughts, understand that these thoughts perpetuate unwanted behaviour, and work toward replacing unhelpful thoughts with more accurate thinking (Hofmann & Asmundson, 2008). For example, if someone has the thought, "If I don't give in to this craving for chocolate, it will never go away" (Moffitt et al., 2012, p. 80), the cognitive restructuring process would involve challenging and ultimately changing these thoughts (e.g., considering whether there has been a time/situation when the craving for chocolate went away without having to act on it). While there is evidence to suggest that cognitive restructuring is an effective strategy for reducing eating pathology (Juarascio et al., 2010), it may

be less effective than 'cognitive defusion' in resisting cravings (Karekla et al., 2020; Moffitt et al., 2012). Cognitive defusion will be discussed later in the context of the decentering component of mindfulness. What stands out the most from cognitive reappraisal strategies is their emphasis on changing the contents of the mind - unconscious consumption and reward simulations and their conscious manifestations as thoughts and mental imagery.

The emphasis on altering thoughts and experiences is in stark contrast with other strategies that are orientated toward changing one's *relationship* to experiences. Cultivating a new relationship to experience is the main premise of mindfulness-based interventions, and will be introduced in detail later. Another example is 'distanced self-talk', where an individual refers to and reflects on themselves using their name and non-first-person-singular pronouns, rather than first-person pronouns (e.g., "What does Betül want?", rather than "What do I want?"; Kross et al., 2014; Kross & Ayduk, 2011). Research suggests that distanced self-talk reduces dieters' unhealthy food choices and increases nondieters' healthy food choices (Furman et al., 2020). From a grounded cognition perspective, a new relationship to experience is characterised as change in the individual's relation to the content of their situated conceptualisations, and their re-enactments as consumption and reward simulations (Papies et al., 2022). Specifically, even when simulations are active in the mind, their impact on one's motivational states (e.g., desire, cravings) and/or behaviour (e.g., unhealthy food consumption) are reduced (Keesman et al., 2020; also see Chapters 2 and 3). Over time and repeated practice, the situated conceptualisations themselves may also be updated, therefore engendering structural change in memory representation (Hölzel et al., 2011).

Compared to dietary restriction and cueing interventions, training interventions reviewed in this section are unique in that they recognise individuals' agency and potential for navigating problematic food environments by training their existing personal resources. In other words, they are designed to empower individuals in managing food cravings and related eating behaviours. However, these strategies also have several limitations. First, participating in computerised high repetition training (e.g., response inhibition training) or acquiring a therapeutic skill (e.g., cognitive restructuring) requires instruction from an experienced trainer or clinician, where access to these practitioners

may not be feasible for everyone. Second, strategies such as response inhibition training and implementation intentions need to be "strongly situated" for optimal effectiveness (Papies, 2017b). In other words, any training completed for a specific food or implementation intention formed for a specific eating situation may not translate into benefits when dealing with other foods or situations. Third and finally, changing internal experience, such as when engaging in cognitive restructuring, is effortful and challenging for most people (Ellis, 2009; Hofmann & Asmundson, 2008).

This thesis investigates how individuals learn and apply single-session brief decentering strategies, including in the domain of food cravings. The brief decentering strategies address many limitations of the interventions described above. Namely, they may require minimal, if any, level of instruction by a trainer/clinician, meaning having access to a trained practitioner may be less of an issue when learning these strategies. Further, decentering strategies are not as "strongly situated" as some other interventions (e.g., implementation intentions), and can be applied within a wide range of situations and contexts. Finally, decentering strategies invite individuals to change their relationship to internal experience, rather than changing the internal experience itself, where the latter may not always be possible.

1.4 Anxiety: Background and a grounded cognition perspective

This thesis also focuses on the domain of anxiety, with a particular focus on anxiety related to the COVID-19 pandemic. The American Psychological Association (2015) defines anxiety as "an emotion characterised by feelings of tension, worried thoughts and physical changes like increased blood pressure". Various anxiety disorders are recognised in disease classification manuals such as the Diagnostic and Statistical Manual of Mental Disorders (e.g., generalised anxiety disorder, social anxiety disorder, panic disorder; American Psychiatric Association, 2013). This thesis focuses on subclinical anxiety, which is characterised by experiences of anxiety (e.g., worry thoughts) that remain below the threshold for a formal diagnosis. Subclinical anxiety is an important avenue for research for several reasons: The specific context of the COVID-19 pandemic has been particularly anxiety-provoking for many people, without necessarily manifesting at clinical levels (da Silva et al., 2021; O'Connor et al., 2020). It is therefore important to investigate subclinical manifestations of pandemic anxiety. Further, in general, chronically elevated levels of anxiety is a risk factor for physical and psychological health problems such as pain (Beesdo et al., 2009) and comorbid depressive symptoms (Brown et al., 2001; Hirschfeld, 2001). Lastly, if left unattended, subclinical anxiety may develop into an anxiety disorder (Bosman et al., 2019). The evidence therefore highlights the need for developing interventions to address subclinical anxiety.

The grounded cognitive processes of learning, updating, and partially reenacting situated conceptualisations may underlie emotion processing as well (Lebois et al., 2020; see also Papies et al., 2022). Specifically, from this perspective, negative mental imagery emerges as a central yet understudied component of anxiety, defined as vivid, intrusive, and distressing experiences of imagined events in the absence of any corresponding visuosensory input (Kosslyn et al., 2001; MacNamara, 2018). Experiencing negative imagery is a symptom of various anxiety and mood disorders (Holmes & Mathews, 2010). As well, it occurs commonly in non-clinical populations, leading to impaired daily functioning and heightened levels of anxiety (Brewin, 1996; Bywaters et al., 2004).

Within the grounded cognition framework, experiences of negative imagery can be conceptualised as simulations. Specifically, past affective experiences that were encoded as situated conceptualisations may get activated when exposed to similar cues and events, leading to simulations of past experiences (i.e., mental imagery). Such simulations may lead to affective and physiological experiences (e.g., worried thoughts, increased blood pressure), and can be experienced as anxiety (for a discussion of this process in the related domain of perceived stress, see Lebois et al., 2016). Indeed, studies of the relationship between negative mental imagery and emotional responding have shown that negative imagery representations elicit emotions such as anxiety, where the imagery takes on an "as-if-real" quality (Kosslyn et al., 2001; Lang, 1979; for a recent review, see Ji et al., 2016). In an EEG study, for instance, healthy participants displayed an increase Late Positive Potential (LPP) when they vividly imagined negative scenes, where LPP is an electrophysiological indicator of emotional processing (MacNamara, 2018). Further indirect evidence comes from studies of Prolonged Exposure Therapy, which is the gold-standard treatment for post-traumatic stress disorder (Foa et al., 2007; Rauch et al., 2012). Prolonged Exposure Therapy consists of exercises to confront distressing situations (i.e., "in vivo exposure") and trauma memories (i.e., "imaginal exposure"; Rauch et al., 2012). The process of recalling and recounting trauma memories is especially pertinent to understanding the link between mental imagery and anxiety. In a study by Rauch and colleagues (2004), participants received 9-12 sessions of Prolonged Exposure Therapy. The finding most relevant to this thesis is that imagery vividness of trauma memories and anxiety were moderate-to-highly correlated in the initial sessions of therapy (i.e., prior to treatment effects).

Together, the evidence suggests that negative mental imagery plays a key role in experiences of anxiety. In both MacNamara's (2018) EEG study and Rauch et al.'s (2004) investigation of Prolonged Exposure Therapy, participants were instructed to vividly imagine negative scenes or trauma memories. From a grounded cognition perspective, this induction would deliberately activate situated conceptualisations, leading to conscious simulations in the form of mental imagery, which in turn would lead to emotional states such as anxiety. Imagery may therefore be an appropriate target for interventions, where learning to manage or even disrupting the imagery may reduce anxiety. The disruption of mental imagery has been demonstrated by Andrade et al. (1997), where loading visuospatial working memory with an eye movement task (i.e., disrupting imagery) reduced the vividness of imagery and emotional responding. Chapter 5 of this thesis focuses on the management of imagery, where I studied the effect of a brief decentering mindfulness strategy on the relationship between imagery and pandemic-related anxiety.

1.5 Anxiety: A multidimensional phenomenon

As with the desire toward and overconsumption of food, anxiety has various biological, environmental, and psychological correlates. Previous work outlines the genetic and neurobiological underpinnings of anxiety (e.g., Holmes, 2001; Millan, 2003). From an evolutionary perspective, acute anxiety may grant adaptive advantage by alerting an individual to the existence of potential danger in the environment (Bishop, 2007). This aligns with the grounded cognition

perspective, where learning (i.e., forming and/or updating situated conceptualisations) about anxiety-provoking aspects of the environment may get prioritised due to its importance. Activation of these situated conceptualisations may facilitate faster and more efficient identification of danger, thereby granting adaptive advantage. Although acute primal environmental threats such as a predator's attack are unlikely today, the current environment in many Western societies is laden with chronic threats and stressors that demand alertness, evoking worry and tension. Daily stressors such as work and relationships become sources of chronic anxiety for many people. On top of such 'routine' stressors, humanity is currently enduring a uniquely anxiety-provoking time with wars, economic and political crises, the climate and biodiversity crises, and the COVID-19 pandemic. The current environment therefore highlights not only the urgency of resolving the stressors themselves, but also empowering individuals to bear the anxiety caused by this environment.

From a psychological perspective, personality factors such as neuroticism and anxiety sensitivity are risk factors for the development of anxiety disorders (Brown et al., 2001; Reiss et al., 1986). Further, various clinical theories have been put forth to explain the development and maintenance of anxiety disorders (e.g., for a review on generalised anxiety disorder, see Behar et al., 2009). Although psychological explanations for subclinical anxiety are sparse relative to clinical accounts, the field of cognitive science provides some insights (for an integrative review, see Bishop, 2007; see also Papies et al., 2022). For example, the cognitive bias of paying increased selective attention toward threat signals is linked with increased subclinical anxiety (MacLeod et al., 2002; Mathews & MacLeod, 2002; Mathews & Mackintosh, 1998). Similarly, individuals who interpret emotionally ambiguous stimuli as dangerous, perhaps due to activation of negatively valenced situated conceptualisations of past events, experience elevated levels of anxiety. In other words, when judging the valence of emotionally ambiguous future situations and events, some individuals readily interpret these stimuli as negative rather than neutral or positive, which is associated with anxiety (Hirsch & Mathews, 1997; Mathews & MacLeod, 1994; Richards et al., 2002).

Experiential avoidance is another psychological factor that generates anxiety. Defined as the persistent attempt to control, suppress, or avoid one's mental

experiences, experiential avoidance often occurs as an initial reaction to anxiety-provoking situations (Forsyth et al., 2006; Hayes et al., 2004; Sloan, 2004). From the grounded cognition perspective, an individual may have encoded past experiences of experiential avoidance as rewarding, since it may provide short-term respite from more intense experiences of discomfort. However, experiential avoidance fails to provide long-term relief from anxiety (Hayes et al., 2004). Importantly, experiential avoidance may be a suitable target for mindfulness-based interventions (Antoine et al., 2018; McCluskey et al., 2020). This makes sense, given that mindfulness promotes approach-related qualities such as present-moment awareness, acceptance, and decentering, rather than avoidance.

Lastly, cognitive research in the domain of perceived stress may provide indirect but relevant insights for understanding anxiety. For instance, Lebois et al. (2016) studied situated features of perceived stress based on the grounded cognition framework, identifying eight core features that predict stressful situations (e.g., self-threat, coping efficacy). A situated account of stress is relevant to the domain of anxiety, as stressful situations may elicit various forms of negative emotion, including but not limited to anxiety.

1.6 Anxiety: One problem, many solutions

Many treatments and interventions have been developed to manage anxiety. For diagnosed anxiety disorders, antidepressants such as selective serotonin reuptake inhibitors (SSRIs; National Institute for Health and Care Excellence, 2011), Eye Movement Desensitisation and Reprocessing (EMDR) therapy (Chen et al., 2014; van den Hout & Engelhard, 2012), and Cognitive Behavioural Therapy (Hofmann & Smits, 2008) have demonstrated efficacy.

A wide range of approaches are available to reduce levels of subclinical anxiety. Cognitive-behavioural interventions have been effective in subclinical populations as well, for example to manage social anxiety (Aune & Stiles, 2009) and reduce occurrence of panic attacks (Gardenswartz & Craske, 2001). As discussed previously in the context of food cravings, specific skills from Cognitive Behavioural Therapy such as cognitive reappraisal and progressive
muscle relaxation (PMR) may also effectively reduce anxiety (Borkovec et al., 2002; Ochsner et al., 2004).

Again, as mentioned in the context of food cravings, the effectiveness of distanced self-talk has been demonstrated in reducing anxiety (Kross et al., 2014; Nook et al., 2017). On the other hand, implementation intentions demonstrate variable effectiveness depending on the anxiety context and type of implementation intention used. For instance, Łakuta's study (2020) suggests that only some forms of implementation intentions are effective in reducing social anxiety (e.g., "*If* I feel threatened or anxious, *then* I will remember things that I have succeeded in / think about people who are important to me").

Further, novel interventions continue to be developed, including the False Safety Behaviour Elimination Treatment (F-SET; Riccardi et al., 2017). The F-SET programme targets safety behaviours associated with anxiety. Safety behaviours (also called 'safety aids') are cognitive and behavioural strategies employed by an individual to avoid perceived threat and associated anxiety (Kamphuis & Telch, 1998). Examples include over-preparing for catastrophic events that may never occur or avoiding physical exercise to avoid physical sensations that resemble a heart attack/panic attack. Although F-SET was initially developed for identifying and eliminating safety behaviours in clinical populations, research demonstrates its potential effectiveness in subclinical anxiety as well (Korte & Schmidt, 2020). Perhaps F-SET is partly effective because it updates one's situated conceptualisations about anxiety-inducing and threatening situations. Updating one's situated conceptualisation on perceived threat may reduce the need to avoid situations by enacting safety behaviours.

Specifically in the context of pandemic anxiety, various interventions have been developed and examined. Cognitive-behavioural interventions and techniques seem to be the most popular (e.g., Egan et al., 2021; Graziano et al., 2021; Kong et al., 2020; Shabahang et al., 2021; Sharrock et al., 2021). For example, Egan et al. (2021) examined the effect of an unguided (i.e., self-help) low intensity Cognitive Behavioural Therapy intervention on levels of anxiety and depression during the pandemic. The intervention consisted of components such as behavioural experiments to challenge negative thinking, psychoeducation about anxiety, progressive muscle relaxation, and mindfulness. Findings suggest

that compared to the waitlist control condition, the Cognitive Behavioural Therapy intervention significantly reduced levels of anxiety and depression. Similarly, Sharrock et al. (2021) studied an internet-based Cognitive Behavioural Therapy intervention in the context of pandemic-related health anxiety symptoms, reporting large significant reductions in levels of health anxiety and distress. In a rapid review of meta-analyses on interventions that were used and tested in the pandemic context, Fischer et al. (2020) reported that self-help interventions demonstrated effectiveness in reducing anxiety, depression and stress, and enhanced subjective well-being with a small-to-medium effect size. Fischer and colleagues (2020) identified interventions based on therapeutic techniques (e.g., Cognitive Behavioural Therapy), positive psychology interventions (e.g., gratitude, loving-kindness), and activity-based interventions (e.g., physical exercise) as most effective in the context of pandemic anxiety and distress.

Different than the carefully designed interventions described above, some avoidance-based coping strategies are intuitively and spontaneously employed by individuals to manage anxiety, including suppression and distraction. These strategies are based on the activation of situated conceptualisations that are not directly relevant to the current affective experience, therefore competing for limited cognitive resources (Papies et al., 2022). Suppression of anxious thoughts may seem effective at first, but it ironically leads to more anxious thoughts in the long run due to behavioural rebound effects (Erskine et al., 2010; Shipherd & Beck, 2005; Wang et al., 2020). Distraction is a similar strategy that seems conditionally effective. Specifically, distraction becomes an adaptive coping strategy when combined with acceptance (Wolgast & Lundh, 2017), but acceptance is a challenging skill to learn and practice, especially when already in a distressed state.

Overall, each of the interventions described here have strengths and limitations. For instance, while F-SET and cognitive-behavioural interventions developed in the context of the pandemic seem effective, their basic premise is to change mental content specific, which may not be easy or possible. Further, the issue of healthcare access comes up again in relation interventions like F-SET and Cognitive Behavioural Therapy. Namely, access to clinicians who deliver such interventions may not be feasible for many individuals. Mindfulness-based interventions, including decentering strategies, can address these limitations. Unlike the F-SET and cognitive-behavioural interventions, decentering strategies aim to change individuals' *relationship* to mental content, rather than changing the mental content itself. Further, learning and applying decentering requires minimal, if any, access to a clinician or teacher, meaning it may be a more accessible strategy. The self-help pandemic interventions described above share this advantage with mindfulness-based interventions in that individuals can engage with these interventions without clinician or teacher input. It is also promising that some of the pandemic interventions include components of mindfulness (e.g., Egan et al., 2021; Shabahang et al., 2021; for a review, see Fischer et al., 2020). This once again highlights the importance and relevance of studying decentering as a standalone strategy in the context of the pandemic.

Lastly, and most importantly, it would be misleading to conclude that given the effectiveness of the interventions above, novel strategies are no longer needed. Although interventions display group-level effectiveness, not every intervention is effective for every individual or suitable across various contexts. For example, Cognitive Behavioural Therapy is generally effective, but not everyone responds well to treatment (Yonkers et al., 2003). There is therefore both space and need for other interventions, including those that are based on mindfulness.

1.7 Food cravings and anxiety: Common processes and interventions

Food cravings and anxiety are evidently different in that one is an approachbased and reward-related phenomenon, whereas the other is avoidance-based and concerned with negative affect. Despite that, and as demonstrated through a unified grounded cognition account in this chapter, they have key similarities in their context, underlying processes, and associated interventions. Both food cravings and anxiety are multidimensional phenomena with multiple biopsychosocial correlates. Therefore, there are factors that influence the development of both food cravings and anxiety that are outside of one's control (e.g., the obesogenic environment, distressing and anxiety-provoking events such as the pandemic). As such, predicting or changing the environment is not feasible in either domain. Further, simulations play a central role in both domains. Consumption and reward simulations for food cravings and negative mental imagery for anxiety are both vivid and intrusive, they rely on the same cognitive and neural mechanisms, arise spontaneously, and may automatically lead to experiences of food cravings and anxiety (Ji et al., 2016; Papies et al., 2020). Simulations are precursors to cravings/anxiety, therefore possibly easier to manage than a fullblown episode of cravings/anxiety. As such, simulations may be a promising target for intervention in both domains.

More broadly, both food cravings and anxiety are costly real-world problems that are in need of simple and effective solutions. Some strategies that are common to both domains have been described above (i.e., cognitive reappraisal, distanced self-talk, implementation intentions). This thesis focuses on mindfulness as a potentially effective strategy in both domains. In doing so, it not only establishes general effects of mindfulness across two different domains, but also provides an account of the parallel processes between these domains.

1.8 Mindfulness-based interventions for health and wellbeing: An empowered approach

Mindfulness and mindfulness-based interventions differ from most of the approaches showcased above in a fundamental way. Interventions such as computerised high repetition training and implementation intentions aim to change underlying situated conceptualisations that lead to affective responses (e.g., anxiety) or behaviour (e.g., overeating). Likewise, cognitive structuring aims to replace unhelpful thoughts. In other words, these interventions aim to change mind contents. In contrast, mindfulness-based interventions are concerned with observing the *nature* of the mind, to ultimately change one's relationship to mind contents (Kabat-Zinn, 1994). Being mindful entails the awareness of mental experiences, and the adoption of a different perspective toward these experiences, characterised by non-judgment, openness, and curiosity (Kabat-Zinn, 1994). Practicing this perspective creates the space to deliberately *respond* to stimuli, rather than *reacting* to them in the usual way. Mindfulness, meditation, and other contemplative practices (e.g., visualisation, prayer) have been around for thousands of years, as a central tenet of world's religions and philosophies (Burckhardt & Chittick, 2008; Eifring, 2015; Gethin,

1998). The Western secular concept of mindfulness has Buddhist origins (for a discussion, see Williams & Zinn, 2013), and has grown exponentially in popularity over the past decades (Masci & Hackett, 2018; Van Dam et al., 2018).

Mindfulness was first introduced into Western psychology by Jon Kabat-Zinn in 1979, in the form of Mindfulness-Based Stress Reduction (MBSR) - an intervention for chronic pain (Kabat-Zinn, 1982). MBSR is an eight-week, group-based, and multicomponent programme that consists of 'specific' elements such as sitting meditation, attention regulation exercises, body scan, psychoeducation, and yoga stretches, as well as 'non-specific' elements like social support through interaction with other participants of the programme (Kabat-Zinn, 1982). In addition to the eight weekly meetings each lasting two-and-a-half hours, the programme requires 45 minutes of daily personal meditation practice (Mindfulness Center at Brown, 2020). Following the growing popular interest for MBSR, many other mindfulness-based and mindfulness-informed interventions have been developed. Examples include Mindfulness-Based Cognitive Therapy (MBCT; Segal et al., 2002), Mindfulness-Based Eating Awareness Training (MB-EAT; Kristeller et al., 2014), Dialectical Behaviour Therapy (DBT; Linehan, 1993), and Acceptance and Commitment Therapy (ACT; Hayes & Wilson, 1994).

Mindfulness-based interventions have shown potential to improve health and wellbeing across a wide spectrum of domains, including but not limited to chronic pain (Chiesa & Serretti, 2011), sleep (Shallcross et al., 2019), cigarette smoking (Brewer et al., 2011), alcohol dependence (Garland et al., 2010), psychological experiences of physical chronic disease (Greeson & Chin, 2019), stress (Pbert et al., 2012), depressive relapse (Fjorback et al., 2011), romantic relationships (Karremans et al., 2017), and emotion regulation (Chambers et al., 2009). In the context of food cravings and eating behaviour, the evidence is mixed. Some research suggests that mindfulness-based interventions are effective in lowering levels of food cravings (Alberts et al., 2010, 2012), facilitating weight loss (Carrière et al., 2018), and reducing unhelpful eating behaviours such as emotional eating and external eating (O'Reilly et al., 2014; Rogers et al., 2014).

40

A similarly mixed picture emerges for the effectiveness of mindfulness-based interventions in the domain of anxiety. Some meta-analyses have shown that mindfulness-based interventions such as MBSR and MBCT effectively reduce anxiety with moderate-to-high effect sizes (Goyal et al., 2014; Hofmann et al., 2010; Khoury et al., 2013, 2015). However, when compared specifically to other active treatment or control conditions (e.g., psychotherapy, physical exercise), mindfulness-based interventions show no superiority (Fumero et al., 2020; Goyal et al., 2014; Toneatto & Nguyen, 2007). In other words, mindfulness-based interventions may be similarly effective as other evidence-based approaches.

The mixed evidence in the domains of food cravings and anxiety can be attributed to some of the issues in mindfulness research more generally. There are many definitions and operationalisations of "mindfulness" and "mindfulness-based interventions" in the literature (Grossman & Van Dam, 2011). The lack of a shared understanding and operationalisation has downstream effects on measurement. Unsurprisingly, different definitions generate different approaches to measuring mindfulness, often overly relying on self-report measures (Bergomi et al., 2013; Hadash et al., 2017). This is all compounded by limitations in study reporting. Specifically, most published studies do not provide detailed descriptions of the mindfulness, and the ambiguity in the interventions used, combined with the varying rigour of research design and control conditions may explain the mixed findings observed in the literature, including in the domains of food cravings and anxiety (Goyal et al., 2014; Howarth et al., 2019).

Overall, and despite the mixed evidence, mindfulness-based interventions have great potential to promote human flourishing by training individuals to observe mental experiences in the present-moment, and with an attitude of nonjudgment, openness, and curiosity. As such, mindfulness has the potential to empower individuals in their choices and responses. These interventions also naturally address limitations of other strategies. Unlike approaches such as cognitive restructuring, Cognitive Behavioural Therapy, and False Safety Behaviour Elimination Treatment, mindfulness does not involve the challenging task of changing mind contents, but instead cultivates a different relationship with internal experiences. Further, unlike cueing interventions for food cravings, mindfulness does not rely on the construction of a temptation-free environment. Instead, the open, non-judgmental way of observing the mind can be practiced in any environment.

Despite some evidence of their effectiveness and their strength as empowered tools of health and wellbeing, much remains to be understood about mindfulness-based interventions. Since these interventions comprise multiple specific (e.g., sitting meditation) and non-specific (e.g., social support) factors, it is unclear which of these components engenders the effects observed. In other words, is mindfulness an active and necessary component of mindfulness-based interventions? And more specifically in the context of this thesis, is decentering an active component of the construct of mindfulness?

1.9 Decentering as an active component of mindfulness and (brief) mindfulness-based interventions

The various operational definitions of mindfulness propose a slightly different conceptualisation of it by placing a different emphasis on components such as intention, present-moment awareness, regulation of attention, decentering, and acceptance (Bishop et al., 2004; Creswell, 2017; Lindsay & Creswell, 2017). These components interact with and complement each other to bring about mindfulness effects (Papies, 2017a). Importantly, studying the individual components of mindfulness is not only meaningful in the context of better understanding longer mindfulness-based interventions, but also for the development of standalone strategies that are based on one active component.

Many of the standalone strategies that feature a single active component of mindfulness are brief in duration. The term, 'brief mindfulness' has not been operationalised in the literature. However, Howarth et al., (2019) conceptualise it as an intervention with "a duration of 30 minutes or less on any one occasion". It has been pointed out that for novices and other groups of individuals such as caregivers, the time and attentional demands of traditional mindfulness-based interventions are often not realistic (Carmody & Baer, 2009; Minor et al., 2006). It is therefore promising that the effectiveness of brief mindfulness-based interventions in domains of health and wellbeing such as food cravings and emotional responding is comparable to that of longer interventions, especially

for novices (Howarth et al., 2019; Ribeiro et al., 2018; Schumer et al., 2018; Strohmaier et al., 2021). These findings suggest that brief mindfulness is not only as empowered as longer interventions, but also potentially simpler and more accessible.

'Decentering' is the metacognitive insight that the internal experiences of the mind are transient, rather than accurate and objective representations of reality (Bishop et al., 2004; Safran & Segal, 1990; Teasdale et al., 1995). In other words, mental experiences are impermanent and only *subjectively* real. Decentering is an integral element of both Buddhist accounts (Bodhi, 2011; Dreyfus, 2011; Grabovac et al., 2011) and secular mindfulness-based interventions (e.g., MBCT; Segal & Williams, 2002). Yet, relatively less empirical work has been conducted on it compared to other components of mindfulness. The evidence available suggests that decentering is effective in reducing and regulating both negative affect (Fresco et al., 2007; for a review, see Bernstein et al., 2015) and reward-related processes such as eating behaviours (Moffitt et al., 2012; Papies et al., 2015; Tapper & Turner, 2018; for a review, see Tapper, 2017).

Decentering may work through similar processes in the domains of food cravings and anxiety. First, it may enhance one's self-control over their responses (Tapper, 2017). Applying decentering may disrupt habitual reactions, therefore leading to conscious control and a deliberate response (e.g., eating an apple instead of chocolate; acknowledging that a thought will pass instead of ruminating on it). Second, decentering may directly reduce cravings/negative affect or inhibit their development (Keesman et al., 2017, 2020; Tapper, 2017). According to grounded cognition theory, decentering makes simulations less vivid and compelling, therefore less believable (Papies et al, 2022). Where simulations are less believable, they may lead to fewer or weaker cravings/negative affect. According to the elaborated intrusion theory, decentering may load working memory to disrupt the elaborative processes that would lead to cravings and negative affect if left uninterrupted (Kavanagh et al., 2005, May et al., 2012). Other models have been proposed for explaining the key processes underlying decentering effects. One example is Bernstein et al.'s (2015) Metacognitive Processes Model of Decentering. This model identifies three metacognitive processes that underlie decentering: meta-awareness, disidentification from

internal experience, and reduced reactivity to thought content. Importantly, Bernstein and colleagues (2015) propose that meta-awareness of experience (e.g., "I am having craving/worried thoughts") may be the key process that leads to disidentification and reduced reactivity, altogether leading to a decentered perspective.

A key, yet understudied process underlying decentering is the decoupling of assumed unconscious and automatic processes from the response that they typically elicit (Bowen & Marlatt, 2009; Feldman et al., 2010; Ostafin et al., 2012; for a review, see Levin et al., 2015). Levin et al. (2015) describe decoupling as the process by which the "normative relationship" between an internal experience and another internal experience (e.g., thought, feeling) or an internal experience and a behaviour is "reduced, eliminated, or altered" (Levin et al., 2015, p. 871). In other words, decoupling is an alteration of the "function of inner experience" (p. 871). The grounded cognition account described above most closely relates to decoupling (Papies et al., 2022). When simulations become less believable, their function changes in that they may lead to fewer or weaker cravings/negative affect. In more concrete terms, while the level of individual variables (e.g., consumption and reward simulations, negative mental imagery, food cravings, anxiety) may remain the same, the strength of the relation between these variables may be altered (e.g., a reduced association between negative mental imagery and anxiety). The deeper and more precise mechanisms underlying decoupling have not been studied yet. Indeed, in their review, Levin et al. (2015) acknowledge the lack of research on specific decoupling processes, especially as it relates to decentering.

This thesis focuses on two cases of decoupling; between consumption and reward simulations and food cravings, and negative mental imagery and anxiety. In other words, this work investigates whether and how decentering targets simulations that are common to the domains of food cravings and anxiety, to reduce their effect on motivational states (i.e., food cravings) or affective states (i.e., anxiety).

1.10 The current thesis

In recognition of the need to better understand the decentering component of mindfulness, I conducted a programme of research where I investigated singlesession brief decentering strategies in the domain of food cravings (Chapters 2 and 3) and anxiety related to the COVID-19 pandemic (Chapter 4 and 5). The strategies are between three and five minutes in duration (i.e., 'brief'). Further, they introduce decentering as a way of dealing with experiences, with clear instructions on how to apply this way of thinking to one's experiences (i.e., 'brief decentering strategy'). Together, the empirical work presented here addresses the question of how brief decentering is learned and applied, with a unique focus on the potential decoupling effects of decentering (see especially Chapters 2 and 5). I adopted a range of data collection approaches, including physiological (i.e., salivation; Chapter 2), qualitative (Chapters 3 and 4), and mixed methodologies (Chapter 5). Further, and in line with current open science practices, all studies were preregistered (except Chapter 2, Experiment 1).

It is worth emphasising the unique contributions of the qualitative approach to this thesis (Chapters 3, 4, and 5). Studying how individuals learn and apply decentering through qualitative methods allows for a deeper understanding of participant experiences than quantitative methods alone would allow (Gough & Deatrick, 2015; Harper & Thompson, 2011). Said differently, qualitative research methods allow for a more sophisticated investigation of complex human experiencing (Gough & Lyons, 2016), where learning and applying decentering are such complex phenomena. Further, the qualitative approach celebrates and gives space to subjective experience, instead of trying to control or eliminate it (Gough & Madill, 2012). As decentering is a highly subjective metacognitive experience, adopting a qualitative approach to capture this subjectivity is not only appropriate, but also necessary.

Chapter 2 investigates the question of domain specificity across two experiments, and in the domain of food cravings. This work was inspired by the finding that mindfulness-based interventions are effective in the domain that they are intended to target (e.g., MBCT for depressive symptoms), but not as effective in the domains that they do not directly target (e.g., MBSR for weight loss; Hebert et al., 2001). Specifically, I assessed whether brief decentering instructions are more effective in curbing food cravings when they are taught with reference to the domain, or when taught more generally. Phrased in grounded cognition terms, I assessed whether domain general decentering instructions are sufficient in effectively targeting consumption and reward simulations and reducing their effect on cravings, or whether domain-specific instructions are needed. In Experiment 1 (N = 91), participants listened to general decentering, domain-specific decentering, or progressive muscle relaxation (i.e., active control condition) instructions. Then, they viewed a bowl of crisps (attractive food) or a rice cake (neutral food). The main outcome measure was salivation to food, as a physiological measure of desire. Findings demonstrated that participants had more desire (i.e., salivation) for crisps than the rice cake. Although salivation to crisps was comparable across the three conditions, general decentering reduced the association between consumption simulations and salivation to crisps compared to the control condition, suggesting a decoupling effect.

Experiment 2 (*N* = 118) was conducted to replicate Experiment 1 with a different active control condition (i.e., 'normal viewing'), larger sample, and the attractive food stimulus only. Contrary to Experiment 1, the decoupling of consumption simulations from salivation was not observed in Experiment 2 for neither the general nor the domain-specific decentering strategy. Overall, this chapter presents mixed evidence on whether decentering alters the relationship between individuals' vivid re-experiences of eating and enjoying crisps (i.e., consumption simulations) and desire (i.e., salivation). It also presents insufficient evidence to conclude whether domain specificity matters when learning decentering. Nevertheless, the experiments reported here serve as an interesting and useful starting point for further investigations of the question of domain specificity.

Chapter 3 presents a qualitative exploration of how non-meditators learn and apply brief decentering instructions in the domain of food cravings. Several considerations prompted this study. Single-session brief mindfulness-based interventions have been studied primarily through quantitative research. Although quantitative findings are highly informative for determining generalised group effects, the underlying and often overlooked assumption is that participants understand and apply mindfulness instructions with relative ease and exactly in the way that they were intended. Further, the need for conducting more qualitative research has been highlighted both specifically within mindfulness research (Alberts, 2017; Frank & Marken, 2022; Grossman & Dam, 2011) and generally in social science (Grigoropoulou & Small, 2022). To my knowledge, the study reported in Chapter 3 is the first gualitative investigation of a decentering-based strategy. In this study, 10 non-meditators viewed a video of attractive foods in the way that they normally would and were interviewed about this experience. They then listened to decentering instructions and viewed another food video while applying decentering. Participants were interviewed again about their experiences of learning and applying decentering. Results of reflexive thematic analysis illustrated that applying decentering changed participants' relationship to the food stimuli. Although all participants experienced consumption and reward simulations, they started perceiving their thoughts and feelings about foods as transient. This links to the grounded cognition idea that decentering may reduce the effect of active simulations on motivational states. Factors such as the use of metaphors in the decentering instructions facilitated this change. Although participants felt confident in their ability to use the strategy in their daily lives, they anticipated challenges such as remembering to apply it. Overall, this study provides a rich, first-person account of learning and applying a brief decentering strategy, which complements knowledge gained through quantitative investigation.

Chapter 4 presents another qualitative study on how non-meditators learn and apply brief decentering instructions, this time with a sample of non-meditator first and second-year undergraduate students, and in the domain of pandemic anxiety. I decided to focus on this sample, as students are susceptible to mental health challenges even in the absence of the COVID-19 pandemic (Auerbach et al., 2016), and they seem to benefit from mindfulness-based interventions (Chiodelli et al., 2020). Data was collected through five focus groups (total N = 16). First, participants identified an aspect of the pandemic that makes them feel anxious. They then learned a brief decentering strategy, applied this strategy to their anxiety-provoking aspect, and engaged in a moderated discussion. Five themes were identified through reflexive thematic analysis. Notably, participants perceived learning the decentering strategy to be effortless, although some misunderstood the concept of decentering. Similar to

findings of Chapter 3, participants experienced an altered relationship to their anxiety-provoking aspect, perceiving it as transient. Participants experienced the strategy while immersed in the collective context of the focus group, which reinforced the idea that they are not alone in their struggles. As with Chapter 3, participants reported confidence in their ability to use the strategy in their daily lives, especially for purposes of short-term relief. Overall, this study provides another rich, first-person account, which may be relevant for understanding how decentering is learned and applied across a wide array of distressing life situations beyond the pandemic.

Chapter 5 is the final empirical chapter of this thesis, which presents a mixedmethods experiment in the domain of pandemic anxiety. Specifically, it examines whether a brief decentering strategy curbs anxiety related to COVID-19, while also assessing whether decentering targets negative mental imagery (i.e., simulations) to reduce its effect on anxiety. In an online experiment, nonmeditator participants (N = 316) identified a pandemic-related worry (e.g., job insecurity, loneliness). They then listened to decentering or control instructions and applied the instructions to their worry. The main measures were state anxiety and vividness of worry imagery, which were measured both before and after applying the instructions. In addition, participants completed a qualitative survey on their experiences of applying the decentering or control instructions. Quantitative results suggested that decentering reduced both the levels of anxiety, and the link between worry imagery and anxiety experienced while applying the instructions. Qualitative findings further illustrated that applying decentering led to a wide range of outcomes such as a changed relationship to experience, relaxation, and reduced negative affect. Qualitative analyses also revealed that a substantial number of participants misunderstood the decentering instructions. Overall, this study suggests that a brief decentering strategy can effectively regulate anxiety, also demonstrating the importance of conducting mixed-methods research to gain a nuanced understanding of decentering effects.

In sum, the empirical chapters each tackle an important aspect of the question of how brief decentering is learned and applied. Chapter 2 provides preliminary answers to whether decentering is best learned in a general or domain-specific way, while also exploring the relationship between consumption simulations and food cravings. Chapter 3 challenges a fundamental assumption of quantitative research by exploring how individuals *actually* learn and apply brief decentering in the domain of food cravings. Chapter 4 builds on the qualitative exploration in Chapter 3 specifically with a sample of undergraduate students and in the different domain of pandemic anxiety. Finally, Chapter 5 builds on the qualitative findings of Chapter 4 through a mixed-methods study of brief decentering for pandemic anxiety. In the final chapter of this thesis (Chapter 6), I discuss the overall theoretical and applied conclusions of this work, relating them to exciting potential avenues for future research.

1.11 Note to readers

The empirical chapters of this thesis (i.e., Chapters 2-5) were written as separate journal articles that are either already published (Chapter 3), under review (Chapter 4), or available as pre-prints that will soon be submitted to peer-reviewed journals (Chapters 2 and 5). Since they were written as independent (but thematically connected) pieces of work, these chapters may contain overlapping materials. This may be especially true for the literature reviewed in the Introduction sections of the chapters.

Chapter 2 A brief decentering mindfulness induction to modulate the link between eating simulations and desire for attractive food – Does domain specificity matter?

This chapter is an exact copy of the following preprint manuscript:

Tatar, B., Glandorf, H. L., & Papies, E. K. (2022, July 27). A brief decentering mindfulness induction to modulate the link between eating simulations and desire for attractive food - Does domain specificity matter?. https://doi.org/10.31234/osf.io/5j32x

2. Abstract

We investigated the question of domain specificity in brief decentering across two experiments. Specifically, we assessed the effect of brief decentering-based mindfulness instructions on reactivity to food cues, and whether these instructions are most effective when they specifically refer to experiences in a specific domain (e.g., food cravings), or when taught more generally. In Experiment 1, participants (N = 91, female = 71, predominantly without prior meditation experience) listened to general decentering, domain-specific decentering or relaxation (control) instructions. They then viewed a bowl of crisps (attractive food) and a rice cake (neutral food), in counterbalanced order. The main outcome measure was the amount of salivation to foods as a physiological measure of desire to eat. We also assessed self-reported desire, consumption simulations, and subjective decentering experiences. Results showed that participants salivated more to the attractive food compared to the neutral food. Salivation to the attractive food was comparable across the three study conditions. Exploratory analyses suggested a decoupling effect, where general decentering, but not domain-specific decentering reduced the association between consumption simulations and salivation to crisps compared to relaxation. We conducted Experiment 2 to replicate findings of Experiment 1 with a different active control condition. Participants (N = 118, female 88, predominantly without prior meditation experience) followed the same procedure as Experiment 1, except a 'normal viewing' control condition was used, and only crisps were shown as food stimulus. As with Experiment 1, salivation to the attractive food was comparable across the three conditions. However, the decoupling effect found in Experiment 1 was not replicated. Overall, these experiments provide preliminary yet insufficient evidence on how decentering affects the link between consumption simulations and desire, and whether domain specificity modulates this relationship. These questions are worth continued investigation for their relevance to theory and to the development of cost-effective interventions that are optimised for use in daily life.

Keywords: mindfulness, decentering, food cravings, grounded cognition, eating behaviour

2.1 Introduction

Brief mindfulness-based interventions have gained immense interest in the Western context, both empirically and in everyday lives. These interventions are much shorter than traditional programmes that involve an extensive daily practice over the span of weeks and months (e.g., the 8-week Mindfulness-Based Stress Reduction (MBSR) course; Kabat-Zinn, 1982). The interest in brief interventions may speak to the need for simple strategies that improve health and wellbeing, while also fitting in with fast-paced everyday lives. Research evidence illustrates the effectiveness of brief interventions in a wide range of domains including cigarette smoking, emotional responding, stressful events, and food cravings (Bowen & Marlatt, 2009; Erisman & Roemer, 2010; Lebois et al., 2015; Papies et al., 2015; for a systematic review, see Howarth et al., 2019). An unaddressed empirical question about these interventions is the need for domain specificity. In other words, should brief mindfulness-based interventions explicitly refer to the domain of interest (i.e., food cravings) to be most effective, or are more general inductions sufficient or even preferable? Here, we present two experiments where we examined the question of domain specificity with a brief decentering-based mindfulness strategy and in the domain of food cravings.

In the Western context, Jon Kabat-Zinn defined mindfulness as, "the awareness that arises by paying attention on purpose, in the present moment, and nonjudgmentally" (Kabat-Zinn, 1994). The effectiveness of mindfulness-based interventions has been demonstrated in various domains of health and wellbeing, including anxiety, depression, stress, reactivity to food cues, and nicotine and alcohol dependence (Brewer et al., 2013; Ostafin et al., 2012; Papies et al., 2015; for meta-analyses, see Goyal et al., 2014; Hofmann et al., 2010; Khoury et al., 2013). A key component of mindfulness training is decentering (also referred to as urge surfing, cognitive defusion, de-reification, and mindful attention; Bowen & Marlatt, 2009; Hayes et al., 2004; Lutz et al., 2015; Papies et al., 2012). Decentering is defined as, "a process through which one is able to step outside one's immediate experience, thereby changing the very nature of that experience" (Safran & Segal, 1990, p. 117). More specifically, decentering is a metacognitive insight into one's internal experiences as "passing events in the mind rather than as inherent aspects of the self or valid reflections on reality" (Bishop et al., 2004, p. 234; also see Teasdale et al., 1995). When a person adopts a decentered perspective by viewing thoughts and emotions as mental events that come up and go away on their own, they change the way in which they relate to the contents of their consciousness (Keesman et al., 2017; Shapiro et al., 2006).

Studies focusing on decentering suggest that this component of mindfulness effectively targets both negative affect (e.g., anxiety and depression; Bieling et al., 2012; Fresco et al., 2007; Teasdale et al., 2002; for a review, see Bernstein et al., 2015), and reward-related processes such as the prevention and management of food cravings (Alberts et al., 2012; Papies et al., 2016; Tapper, 2017), and reduction in the actual consumption of attractive yet calorific foods (Jenkins & Tapper, 2014; Moffitt et al., 2012; Papies et al., 2015). For example, Jenkins and Tapper (2014) assigned a sample of university students who wanted to reduce their chocolate consumption to one of three conditions: decentering, acceptance, or relaxation control. Participants were instructed to apply their assigned strategy any time they craved chocolate, and to carry a bag of chocolates with them over a five-day period. Results suggested that, compared to the control condition, those in the decentering condition consumed significantly less chocolate both from the bag and as recorded on a food diary. Further, Papies and colleagues (2015) trained participants both in the lab (Experiment 2) and a cafeteria setting (Experiment 3) to view a set of healthy and unhealthy yet attractive food pictures by adopting a decentered perspective. Although higher levels of hunger were associated with preferences for unhealthy foods in the control condition, decentering curbed the effect of hunger on both the perceived attractiveness of unhealthy foods (Experiment 2) and unhealthy food choices (Experiment 3).

Decentering may bring about these effects by decoupling motivational states (e.g., hunger, cravings, desire) from behaviour (e.g., unhealthy food consumption; Papies et al., 2015). Indeed, studies in various health domains show that when cravings and desire do arise, decentering changes the response to these urges. For instance, decentering may lead to reduced cigarette smoking (Bowen & Marlatt, 2009), decoupling of the relation between the motivation to drink alcohol and actual drinking behaviour (Ostafin et al., 2012), and reduced number of cookies consumed (Fisher et al., 2016).

Decentering may also have an influence even earlier on, by decoupling "consumption and reward simulations" from motivational states (e.g., cravings, desire; Keesman et al., 2017). The grounded cognition theory of desire and motivated behaviour proposes that encountering food cues such as specific eating contexts spontaneously triggers vivid and compelling re-experiences of eating and enjoying foods (Papies et al., 2020; Papies & Barsalou, 2015). These re-experiences are called "consumption and reward simulations", and can lead to cravings and desire (Papies et al., 2020; Papies & Barsalou, 2015), which in turn may lead to motivated behaviour such as obtaining and consuming food. When targeted at these simulations, decentering may be able to reduce their effect on motivated behaviour.

Previous research suggests that the decentering component of mindfulness may effectively regulate reactivity to food cues both in relation to the simulationmotivational state link, and the motivational state-behaviour link (Jenkins & Tapper, 2014; Keesman et al., 2020; Lacaille et al., 2014; Wilson et al., 2021). In other words, decentering may have a role in both the prevention of craving development (by targeting the simulations that lead to cravings), and the management of cravings that may have already developed (by diffusing the strength of the cravings; Wilson et al., 2021). See Figure 1 for a conceptual map of the proposed dual role of decentering. The simulation-motivational state link (i.e., prevention of craving development) is most relevant to the present study. Viewing vivid and seemingly real simulations as mental events that come up and go away on their own is a fundamental shift in perspective. In their review, Keesman and colleagues (2017) propose that this shift would mean that even when consumption and reward simulations are present, decentering may reduce cravings and associated physiological responses that prepare one to eat food, including salivation.

54



Figure 1 - Conceptual map illustrating how decentering may target both the simulationmotivational state link and the motivational state-behaviour link.

The map is based primarily on the grounded cognition theory of desire and motivated behaviour, as the theory accounts for both the simulation-motivational state and the motivational state-behaviour link (Papies et al., 2020; Papies & Barsalou, 2015). The grounded cognition theory places less emphasis on the process by which simulations may reach conscious awareness. Therefore, this part of the map (i.e., "May develop into conscious *imagery*") draws on the elaborated intrusion theory of desire (Kavanagh et al., 2005; May et al., 2012).

A currently unanswered question regarding decentering is whether instructions work best when they specifically refer to experiences in a particular domain (e.g., food cravings), or when they are taught more generally, independent of specific domains. Some evidence on the role of domain specificity comes from studies of general mindfulness interventions such as Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1982), demonstrating the limited effects of these interventions on behaviours outside their intended domains. For instance, Goyal et al.'s (2014) meta-analysis illustrates that interventions such as MBSR (Kabat-Zinn, 1982) and Mindfulness-Based Cognitive Therapy (MBCT; Teasdale et al., 1995) are moderately effective in improving pain, anxiety, and depression (i.e., the domains that these interventions directly target), but have no effects on domains such as sleep and body weight (i.e., domains that these interventions do not directly target). In other words, the intervention effects do not seem to generalise across domains. Similarly, weight loss is observed with mindfulness interventions that explicitly identify weight loss as a goal (Dalen et al., 2010; Miller et al., 2012), but not observed with interventions that focus on other outcomes such as binge eating (Kristeller et al., 2014). On the other hand, some studies have found that without any modified content specific to eating or weight loss, MBSR led to a significant reduction in emotional eating (Levoy et al., 2017). The latter can be viewed as 'transfer of learning', which is the process of applying knowledge and skills acquired in one context within a new context (Salomon & Perkins, 1989; Thorndike & Woodworth, 1901). In other words, mindfulness knowledge and skills learned in the context of stress (i.e., MBSR) may lead to improvements in the different context of emotional eating.

The indirect evidence from general mindfulness interventions should be interpreted with caution, since these interventions typically combine decentering with other components such as attention regulation, acceptance, self-compassion, and even physical components such as yoga stretches. Less is known about the role of domain specificity in instructions that focus solely on the decentering component. A review of previous studies of brief decentering suggests that both domain-specific inductions (e.g., Baquedano et al., 2017; Lacaille et al., 2014; Lebois et al., 2015; Tincher et al., 2016) and general inductions (e.g., Jenkins & Tapper, 2014; Tapper & Turner, 2018; Wade et al., 2009) have been used. This further highlights the relevance of systematically examining the question of domain specificity. Determining the need for domain specificity is especially relevant in the context of the link between consumption simulations and motivational states. If decentering indeed plays a role in the prevention of craving development by targeting consumption simulations (Keesman et al., 2017), it would be important to determine whether general decentering instructions are sufficient to decouple simulations from cravings or domain-specific instructions are needed to be able to target specific simulations effectively.

We conducted two experiments to assess the effect of decentering domain specificity on desire for food. In both experiments, we used salivation to food as the main outcome measure. Previous research has shown that consumption simulations induce salivation to attractive food cues, and salivation correlates with subjective ratings of desire (Keesman et al., 2016; Papies et al., 2022). Ultimately, salivation is a physiological response that prepares the body for eating (Kaplan & Baum, 1993), and perhaps more readily so for attractive foods that evoke higher desire (Keesman et al., 2016).

56

2.2 Experiment 1

Experiment 1 was designed to test the hypotheses that participants will salivate more in response to the attractive food compared to the neutral food, and that applying the domain-specific decentering instructions will reduce salivation to the attractive food compared to the general decentering and relaxation control instructions. We developed relaxation instructions as an active control condition to account for the potentially relaxing effects of the decentering instructions. In the context of decentering, relaxation may be a by-product of the key process of gaining metacognitive insight (Papies, 2017a; Papies et al., 2015).

2.2.1 Method

2.2.1.1 Design

Experiment 1 had a 3 (condition: general decentering, domain-specific decentering, relaxation control; between participants, random assignment) x 2 (food type: attractive vs. neutral; within participants, counterbalanced) factorial design with salivation as the dependent variable. This study received ethical approval from the University of Glasgow Ethics Committee.

2.2.1.2 Participants

We recruited 95 members of the University of Glasgow Psychology Subject Pool who consume an omnivorous, pescatarian or vegetarian diet (i.e., not vegan), have normal or corrected-to-normal vision, have no current eating disorder or history of eating disorders, are not on a weight loss or other restrictive diet, did not have a cold at the time of study participation, and like crisps. In addition, individuals who smoke cigarettes were not recruited, as long-term smoking significantly reduces salivary flow rate (Rad et al., 2010). After excluding three participants who did not comply with study instructions, and one participant who reported finding the non-food stimulus more attractive than the food stimuli, 91 participants (71 female; 77 students; age M = 23.65, SD = 8.36, range: 18-67; BMI M = 22.26, SD = 4.04, range: 16.83-41.65; general decentering N = 31, domain-specific decentering N = 29, control N = 31) were included in the analyses. Participants were instructed to refrain from eating and drinking except water, black tea, or coffee without sugar during the hour preceding their participation in the study so that they were not fully satiated. Participants verbally confirmed that they followed these instructions before beginning the experiment.

We determined our planned sample size through a Bayesian sequential sampling approach, following Schönbrodt and colleagues' guidelines (Schönbrodt et al., 2017; see also Best et al., 2018). We selected a minimum sample size of 114 (38 per condition to avoid false-positives associated with early stopping; Schönbrodt et al., 2017). The maximum sample size was determined as 156 (52 per condition) due to resource limitations.

We planned to compute Bayes Factors (BF) once the minimum sample size was reached, looking for substantial evidence for the null hypothesis (i.e., no difference in salivation to the attractive food between general and domainspecific decentering; BF_{10} smaller than 1/6) or for the alternative hypothesis (i.e., difference in salivation to the attractive food between general and domain-specific decentering; BF_{10} greater than 6). If the results were inconclusive, we would then continue data collection by adding six participants per iteration (two participants per instruction condition) until the BF provided substantial support for either the null or alternative hypothesis, or the maximum sample size (156) was reached (Schönbrodt & Wagenmakers, 2017). However, we stopped data collection before reaching the minimum sample size due to our concerns with relaxation as an adequate and/or sufficient control condition (see Discussion for details). These concerns came up during data collection. Our decision to end data collection was further informed by resource considerations (i.e., the cost of continuing data collection vs. the benefit of designing Experiment 2 with the necessary modifications).

2.2.1.3 Materials

As stimuli, we used a small bag of crisps (attractive food; Walkers brand "ready salted", 25 g) a slice of rice cake (neutral food; supermarket brand, e.g., "Tesco lightly salted rice cakes"), and a small block of wood (non-food control object; for use of wood as an adequate control stimulus, see Keesman et al., 2016). The experimenter opened a new bag of crisps for each participant, poured it into a

58

bowl, and placed it in front of the participant. Likewise, the experimenter placed a new rice cake on a plate for each participant. Participants were instructed to refrain from consuming the foods during the experiment, but were told that they are allowed to eat them after the study.

2.2.1.4 Decentering and relaxation control instructions

The decentering instructions were adapted from Keesman et al. (2020) and asked participants to observe their thoughts as transient mental events that arise and dissipate. We explained this perspective with the metaphor of a waterfall, which drew parallels between the stream of water in a waterfall and one's constant stream of thoughts. Participants were told not to resist this stream, and not to pretend that it does not exist, or get carried away in the water, but instead to observe the stream of thoughts as they pass by.

The key difference between the general and specific decentering instructions was the way in which participants were instructed to observe their thoughts and apply this perspective. In the general decentering condition, participants were asked to, "Observe the thoughts that you have, and look at them come up and go away" and apply this to any thoughts that they have. Conversely, in the domain-specific decentering condition, participants were asked to, "Observe the thoughts that you have, any foods, cravings you have about these foods or any thoughts about eating them, and look at them come up and go away", and apply this to any cravings or thoughts of eating that they have.

The relaxation instructions described a progressive muscle relaxation technique. Participants were instructed to breathe in and out deeply and then to tense and relax their feet muscles.

Participants listened to an audio recording of their assigned instructions, which lasted approximately four minutes. To check comprehension, participants were asked to summarise the instructions. The words "mindfulness" and "meditation" were not used to minimise demand effects. See Appendix A (supplementary material 1) for the full script of all three instructions.

2.2.1.5 Measures

Participants completed all self-report measures on Visual Analogue Scales (VAS).

2.2.1.5.1 Saliva

Small opaque paper cups that were pre-weighed with a 0.01-gram precision scale were used for saliva collection. Participants looked at each stimulus for one minute while letting the saliva accumulate in their mouth. Afterwards, they spat their saliva into a cup (for full instructions, see Keesman et al., 2016), which was again weighed to determine the amount of saliva in grams. For our analyses, we computed difference scores for the attractive food and the neutral food by subtracting baseline trial salivation from food trial salivation.

2.2.1.5.2 Consumption simulations

Participants were asked to rate their agreement with the following statements for each stimulus, with the anchors "not at all" to "very much" (100-point scale): "While I was viewing [the object], (1) ... I imagined that I was eating [the object], (2) ... It was as if I could really taste [the object], and (3) ... I imagined how it would be to eat [the object], (based on Keesman et al., 2016), all Cronbach's a > .69 (food stimuli Cronbach's a > .84). We computed composite scores of simulations using the scores of the three items.

2.2.1.5.3 Desire

Participants rated the following statement for each stimulus: "I would have liked to eat [the object]", with the anchors "not at all" to "very much" (100-point scale).

2.2.1.5.4 Decentering

The 8-item "decentering from food-related thoughts" scale (Papies et al., 2016) was adapted to refer to the foods presented in the study. An example item is, "I considered my thoughts about [crisps/rice cake] as transient events in my mind". Participants rated all statements once for the attractive food and once for the neutral food, with the anchors "not at all" to "very much" (100-point

scale), both Cronbach's $\alpha > .80$. We computed composite scores of decentering using the scores of the eight items.

2.2.1.5.5 Food attractiveness, healthiness, and consumption frequency

For both foods, participants rated perceived attractiveness ("How much do you like crisps/rice cakes?"), healthiness ("How healthy do you think crisps/rice cakes are?"), and frequency of consumption ("How often do you usually consume crisps/rice cakes?"), with the anchors "not at all/not healthy at all/never" to "very much/very healthy/very often", respectively (100-point scale).

2.2.1.5.6 Subjective salivation

Participants rated the following question, with anchors "not at all" to "very much" (100-point scale): "To what extent did you salivate while you were viewing the crisps/rice cake?"

2.2.1.5.7 Additional questions

Participants rated their perceived effort and success in applying their assigned instructions ("To what extent did you try to apply [the instructions] introduced to you while viewing the [crisps/rice cake]?" and "To what extent were you successful in applying [the instructions] introduced to you while viewing the [crisps/rice cake]?"; from "not at all" to "very much", 100-point scale). To assess their current meditation frequency, participants answered the question, "How often do you currently meditate?", with the anchors "never" to "very often" (100-point scale). Participants rated the six-item cognitive restraint subscale of the Three-Factor Eating Questionnaire (TFEQ; de Lauzon et al., 2004) to assess concern for dieting. Lastly, participants provided demographic information (e.g., height, weight), and answered open-ended questions about the study (e.g., "What do you think this study is about? What do you think we are expecting to find in this experiment?").

The ratings for the perceived effort and success in applying instructions, current meditation frequency, concern for dieting, and the open-ended responses were not included in the formal analyses.

2.2.1.6 Procedure

For an overview of the experimental procedure, see Figure 2. Participants were invited to take part in a study investigating "responses to consumer products" between 12 noon and 5 pm. All study instructions were delivered through Qualtrics software (Qualtrics, Provo, UT). After providing informed consent, participants were first asked to rinse their mouth with a cup of water. Then, they indicated their current levels of hunger (M = 45.15, SD = 25.83; no differences between conditions) and thirst (M = 42.54, SD = 24.03; no differences between conditions) on a 100-point VAS from "not at all" to "extremely". Participants received instructions on the saliva collection procedure and provided a baseline saliva sample with the non-food control object (block of wood).

Participants then listened to their assigned instructions. None of the stimulus objects (i.e., block of wood, crisps, rice cake) were in the vicinity while they listened to the instructions. Participants were also given specific guidance on how to apply the instructions. In the general decentering condition, they were asked to apply decentering to *any* thoughts that they have. In the domain-specific decentering condition, they were asked to apply decentering to any thoughts that they have any thoughts that they have the food. Finally, in the relaxation control condition, they were reminded that they can apply relaxation during *any* experience that they have.

Next, participants provided saliva samples for the neutral food (rice cake) and the attractive food (crisps) in counterbalanced order, while applying the instructions of their respective condition. As a break between the two food stimuli, participants read a passage from the book, *Lord of the Rings* (Tolkien, 1954), for three minutes. Finally, participants completed self-reported measures of consumption simulations, desire, decentering, food attractiveness, food healthiness, and current meditation frequency (M = 25.10, SD = 28.51; no differences between conditions), provided demographic information, and were thanked, paid, and debriefed.



Figure 2 - Overview of study procedure for Experiment 1

2.2.1.7 Data screening, outlier removal, and analyses

Unless otherwise specified, we conducted statistical analyses using R and R Studio (version 1.4.1717; R Core Team, 2019). We checked the salivation data for outliers (both absolute salivation and difference scores), where a data point was considered an outlier if it differed more than three standard deviations from the mean of all participants for a given stimulus (see also Keesman et al., 2016). There was one outlier for absolute salivation to wood, two outliers each for absolute salivation to the attractive food and the neutral food, and one outlier for rice cake difference scores. Outlier removal did not influence our confirmatory or exploratory findings, so outliers were included in the analyses.

To test the hypothesis that participants would salivate more in response to the attractive food compared to the neutral food, we conducted a frequentist paired samples t-test. To test the hypothesis that applying domain-specific decentering instructions would reduce salivation to the attractive food compared to the general decentering and relaxation control instructions, we conducted an ANOVA with condition as the independent variable and salivation as the dependent variable. In line with our original Bayesian sequential sampling stopping rule, we also conducted three Bayesian independent samples t-tests for each instruction pair (general decentering vs. relaxation control, etc). We computed Bayes Factors using JASP with a default prior of .707.

In an exploratory way, we tested whether consumption simulations predict salivation less strongly in the general and specific decentering instructions compared to the relaxation instructions, by constructing a multiple linear regression model with condition, consumption simulations and the interaction term as predictors, and salivation as the outcome variable. All continuous predictors were standardised, and the categorical variable (condition) was dummy coded.

2.2.2 Results

2.2.2.1 Associations between main study variables

See Table 1 for descriptive statistics and bivariate correlations between main study variables. There were positive associations between consumption simulations, salivation, and desire for both foods. Decentering from the attractive food was negatively correlated with consumption simulations, salivation, and desire for the attractive food. Likewise, decentering from the neutral food was negatively correlated with consumption simulations and desire for the neutral food. In other words, adopting a decentered perspective was associated with reduced cognitive re-enactments of earlier eating experiences, and a reduced motivation to eat the foods.

64

	М	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Salivation (RC)	0.10	0.20	-											
2. Salivation (C)	0.19	0.25	.60**	-										
3. Simulations (RC)	53.95	25.86	.25*	.23*	-									
4. Simulations (C)	69.62	25.15	.27**	.34**	.71**	-								
5. Desire (RC)	54.35	30.38	.25*	.18 [†]	.48**	.25*	-							
6. Desire (C)	83.41	23.03	.12	.35**	.32**	.53**	.37**	-						
7. Attractiveness (RC)	52.16	27.51	.19 †	.10	.30**	.02	.62**	.02	-					
8. Attractiveness (C)	87.42	14.81	.14	.25*	.36**	.36**	.06	.29**	.15	-				
9. Healthiness (RC)	57.69	23.10	.11	.19 †	01	06	05	01	.03	.21*	-			
10. Healthiness (C)	13.14	14.08	04	06	.03	.02	.19 [†]	.11	.16	.10	.14	-		
11. Decentering (RC)	65.40	15.45	13	.05	34**	12	39**	05	34**	.03	02	04	-	
12. Decentering (C)	51.57	18.76	.03	27*	31**	49**	12	42**	.13	14	02	.07	.34**	-

Table 1 - Descriptive statistics and bivariate correlations between main study variables

Note: RC = Rice cake, C = Crisps; 'Salivation' refers to difference scores of salivation from baseline in grams; $^{\dagger}p < .10$, $^{*}p < .05$, $^{**}p < .01$ (two-tailed); *p*-values <.05 appear in bold.

2.2.2.2 Confirmatory analyses

2.2.2.1 Comparing salivation toward the attractive food and the neutral food

In line with our first hypothesis, participants salivated more toward the attractive food (M = 0.19, SD = 0.25) compared to the neutral food (M = 0.10, SD = 0.21), t(90) = 4.48, p < .001, d = 0.43, CI 95% for the difference in means [-0.14, -0.05].

2.2.2.2 The effect of decentering instruction specificity on salivation for the attractive food and the neutral food

In contrast to our second hypothesis, there was no main effect of condition on salivation, F(2,88) = 0.53, p = .590, $\eta_p^2 = .009$, and no interaction with food type, F(2,88) = 0.22, p = .800, $\eta_p^2 = .005$. Specifically for the attractive food, participants salivated similarly in the general decentering (M = 0.21, SD = 0.23), domain-specific decentering (M = 0.15, SD = 0.25), and relaxation control instructions (M = 0.21, SD = 0.26); BF₁₀ (general decentering vs. control) = 0.24, BF₁₀ (domain-specific decentering vs. control) = 0.52, BF₁₀ (general vs. domain-specific decentering) = 0.61, (see Figure 3). This does not support our hypothesis that applying the domain-specific decentering instructions would reduce salivation to the attractive food compared to the general decentering and relaxation control instructions.

To assess whether using absolute scores of salivation instead of difference scores changed our findings, we constructed multiple regression models with baseline salivation to wood as a covariate, condition (dummy coded) as a predictor, and absolute salivation to crisps/rice cake as the outcome variable. The results were the same such that there was no main effect of condition (all p's > .343).



Figure 3 - Violin-boxplots showing the distribution of salivation for the neutral food and the attractive food in each condition.

Diamonds display means, and horizontal lines display medians.

2.2.2.3 Exploratory analyses

2.2.2.3.1 The effect of condition on the relationship between consumption simulations and salivation

To assess a potential decoupling effect of decentering, we tested whether consumption simulations predict salivation less strongly in the general and specific decentering instructions compared to the relaxation instructions, by constructing a multiple linear regression model with condition, consumption simulations and the interaction term as predictors, and salivation as the outcome variable.

For the attractive food, and as can be seen in Table 2, consumption simulations predicted salivation, and this was qualified by an interaction with the general decentering condition. Specifically, in the general decentering instructions, consumption simulations no longer predicted salivation. In contrast, the interaction of simulations and domain-specific decentering was not significant. This suggests that compared to relaxation, general decentering, but not specific

decentering, reduced the link between simulations and salivation (see Figure 4 for scatterplot with regression lines).

We also assessed the relationship between consumption simulations and salivation using absolute scores of salivation in a multiple regression model with baseline salivation as a covariate, condition (dummy coded) and consumption simulations as predictors, and absolute salivation to crisps as the outcome variable. The results were the same such that consumption simulations predicted salivation ($\beta = 0.34$, p = .001), which was qualified by an interaction with the general decentering condition ($\beta = -0.31$, p = .028).

For the neutral food, only consumption simulations significantly predicted salivation, $\beta = 0.49$, 95% CI [0.12, 0.87], p = .010, and the interaction terms with condition were not significant (all p's > .074). The overall model significantly predicted salivation to rice cake, F(5,85) = 2.34, p = .049, adjusted R² = 0.07).

Variable	Standardized beta (ß)	Standard error	95% CI	t	р
Intercept	0.07	0.17	-0.26, 0.40	0.45	.654
Simulations	0.58	0.16	0.26, 0.89	3.67	<.001**
Condition:					
Control	Reference				
General decentering	0.03	0.24	-0.44, 0.49	0.11	.916
Domain-specific decentering	-0.34	0.24	-0.83, 0.14	-1.41	.161
Simulations x General decentering	-0.48	0.22	-0.91, -0.04	-2.18	.032*
Simulations x Specific decentering	-0.04	0.28	-0.59, 0.51	-0.14	.890

Table 2 - Summary of the multiple regression model comparing the effect of consumption

Table 2 - Summary Of	the multiple regression model comparing the effect of consum
simulations on saliva	tion to crisps between conditions
(colivation to origns	andition * annumption cimulations)

(salivation to crisps ~ condition * consumption simulations	5)
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 $p^* < .05$, $p^* < .01$. p-values <.05 appear in bold. All continuous predictors were standardized, and condition was dummy coded. Model statistics: F(5, 85) = 4.12, p =.002, adjusted $R^2 = 0.15$.



Figure 4 - Scatterplot with regression lines and 95% confidence intervals showing the effect of consumption simulations on salivation to crisps per condition (standardised scores).

2.2.2.3.2 The effect of decentering specificity on desire and consumption simulations

Participants experienced more desire for the attractive food than the neutral food, F(1,88) = 80.21, p < .001, $\eta_p^2 = .480$, and desire ratings did not differ between conditions p = .910. Similarly, participants reported stronger consumption simulations for the attractive food compared to the neutral food, F(1,88) = 58.63, p < .001, $\eta_p^2 = .400$, which also did not differ between conditions, p = .170.

2.2.2.4 Manipulation checks

We analysed decentering scores to examine whether the decentering manipulation increased self-reported decentering compared to the control condition. Since the results were the same across food types, we computed a composite score of decentering per participant, across the two foods. Participants in the general decentering condition (M = 67.12, SD = 12.10) reported higher levels of decentering compared to domain-specific decentering (M = 57.25, SD = 9.55), t(56.44) = 3.52, p < .001, d = 0.91. Participants in the general decentering condition also reported higher levels of decentering compared to the relaxation control condition (M = 51.00, SD = 14.86), t(57.62) =4.68, p < .001, d = 1.19. However, decentering scores did not differ between domain-specific decentering and relaxation instructions, t(51.57) = 1.95, p =.057, d = 0.50. In other words, these scores suggest that the decentering manipulation was successful in the general decentering, but not specific decentering condition.

See Table 3 for descriptive statistics and a comparison of attractiveness and healthiness ratings for the neutral and the attractive food with paired t-tests. In summary, participants rated the crisps as more attractive than the rice cake, and the rice cake as healthier than crisps.

 Table 3 - Descriptive statistics and comparison of the attractiveness and healthiness ratings

 between foods

	Rice cake		Cri	Crisps					
Variable	М	SD	М	SD	t	df	p	d	95% CI for difference in means
Attractiveness	52.16	27.51	87.42	14.81	11.52	90	<.001**	1.60	29.17, 41.33
Healthiness	57.69	23.10	13.14	14.08	16.80	90	<.001**	2.33	39.29, 49.82

p < .01. p-values <.05 appear in bold.

Finally, participants rated their perceived effort in applying the instructions to be less for the relaxation control condition (M = 45.41, SD = 30.07), compared to the general (M = 74.97, SD = 18.85) and domain-specific (M = 79.25, SD = 14.82) decentering conditions, F(2,88) = 20.88, p < .001, $\eta_p^2 = .322$. Participants also felt less successful in applying the relaxation control instructions (M = 43.50, SD = 27.54), compared to both general decentering (M = 64.84, SD = 25.02) and domain-specific decentering (M = 67.84, SD = 15.38), F(2,88) = 9.83, p < .001, $\eta_p^2 = .183$.

2.2.3 Discussion

The findings of Experiment 1 suggest that as predicted, participants showed more desire (i.e., salivation) toward the attractive food compared to the neutral food. In contrast to our hypothesis, however, salivation to the attractive food

did not differ between the three conditions. A possible explanation for this finding might lie in the control instructions used. Our control condition was carefully designed to equal the decentering instructions in length, level of engagement, and possible expectancies around how it could affect food responses (Van Dam et al., 2018). As a result, the control condition might have resembled the decentering instructions a lot (Luberto et al., 2020) and helped participants to reduce their desire for the attractive food, even when they experienced lower levels of perceived effort and success in applying these instructions. Further, relaxation may be an easier concept to understand and apply compared to decentering, especially for a predominantly meditation-naïve sample. If relaxation is an element and/or by-product of decentering instructions, participants may pay more attention to the relaxing properties of decentering rather than its key metacognitive message. This points to a potential problem with task understanding and adherence in the decentering condition. If participants understood and applied the decentering instructions as relaxation, this may partly explain the finding that desire did not differ between the two decentering conditions and the relaxation control condition.

Exploratory analyses suggested that compared to a relaxation control, general decentering instructions reduced the link between consumption simulations and salivation to crisps. This suggests that while decentering may not directly reduce salivation or desire, it might change how participants relate to their consumption and reward simulations, and therefore reduce the degree to which such simulations lead to desire. Experiment 2 was designed to address this possibility.

2.3 Experiment 2

Experiment 2 was designed to replicate findings from Experiment 1 with a different control condition. Specifically, we designed a normal viewing control condition in which participants were simply asked to view objects in a normal way, and follow up on any thoughts that come up. This way, we compared the decentering instructions to a control condition that addressed possible expectancy effects.
Because salivation differences between attractive and neutral food have now been well established (Experiment 1, see also Keesman et al., 2016; Keesman et al., 2020, Power & Schulkin, 2008), we included only the attractive food here. Based on the findings of Experiment 1, we hypothesised that consumption simulations would predict salivation less strongly in the general decentering condition compared to the normal viewing control condition. We did not formulate a directional hypothesis with regard to the domain-specific decentering condition but planned to explore the association of simulation with salivation also in this condition, and to compare it with the general decentering and normal viewing conditions.

2.3.1 Method

2.3.1.1 Design

Experiment 2 had a between-subjects design with condition (general decentering, domain-specific decentering, normal viewing control; random assignment) and consumption simulations (continuous predictor) as independent variables. The main dependent variable is salivation to the attractive food (i.e., crisps). This study received ethical approval from the University of Glasgow Ethics Committee. Study preregistration, data and materials are available on the Open Science Framework (OSF; <u>https://osf.io/jgcwy/</u>).

2.3.1.2 Participants

We recruited 124 participants from the University of Glasgow Psychology Subject Pool, with the same inclusion criteria as Experiment 1. In addition, upon observing that non-native speakers of English experienced challenges with understanding and following the study instructions, we added self-assessed English language proficiency as an inclusion criterion, from Participant 58 onward. Four participants reported having a cold at the time of study participation, one participant reported not complying with the saliva collection instructions, and one participant experienced severe language comprehension issues. After exclusion of these six participants, 118 participants were included in the analyses (88 female; 116 students; age M = 22.92, SD = 3.51, range: 18-36; BMI M = 22.34, SD = 4.36, range: 16.73-45.63; general decentering N = 47, domain-specific decentering N = 49, control N = 22). As with Experiment 1, participants refrained from eating and drinking except water, black tea, or coffee without sugar one hour before their participation in the experiment.

The planned sample size was determined through a Bayesian sequential sampling approach similar to Experiment 1 (see also, Best et al., 2018; Schönbrodt et al., 2017). We based our minimum sample size on a large effect of consumption simulations on salivation to crisps in the normal viewing control condition (f^2 = 0.46; based on Experiment 1 findings) with alpha level = 0.05 and 80% power in a simple linear regression. Calculations were made using R version 3.6.1 (R Core Team, 2019). This gave a minimum sample of 20 for the normal viewing control condition. However, since we are also interested in the effect of consumption simulations on salivation to crisps in the two decentering conditions, the minimum sample size was determined as 60 (i.e., 20 x 3). For the general and specific decentering conditions, the maximum sample size was determined as 50 per condition, taking resource and time limitations into consideration. For the normal viewing control condition, we initially planned to stop data collection when we reached 20 participants. However, we then deviated from this preregistered plan and decided to have equal sample sizes per cell (i.e., 50 participants in the control condition as well). This decision was made prior to conducting any confirmatory or exploratory analyses (i.e., no peeking).

Once the minimum sample size was reached, we started computing Bayes Factors (BF; Bayesian multiple regression model for the general decentering condition, with salivation to crisps as the outcome variable, consumption simulations as a predictor, and baseline salivation as a covariate), looking for substantial evidence for the null hypothesis (i.e., consumption simulations do not predict salivation to crisps; BF₁₀ smaller than 1/6) or the alternative hypothesis (i.e., consumption simulations predict salivation to crisps; BF₁₀ greater than 6). As the results were inconclusive, we continued data collection by adding six participants per iteration (i.e., two participants per cell). BF calculations were made using JASP version 0.11.1, with a default prior of .707 (JASP Team, 2019). While the preregistered plan was to continue doing so until the BF provided substantial support for the null or alternative hypothesis, or we reached the maximum sample size (total N = 120), data collection was stopped before either condition was satisfied due to the start of the COVID-19 pandemic and suspension of face-to-face data collection. As a result, the final sample consisted of 118 participants (general decentering N = 47, domain-specific decentering N = 49, control N = 22).

2.3.1.3 Materials

As with Experiment 1, we used a small bag of crisps as the attractive food (Walkers brand "ready salted", 25 g; not consumed during the experiment), and a small block of wood as baseline stimulus.

2.3.1.4 Decentering and 'normal viewing' control instructions

The decentering instructions used in Experiment 1 (Appendix A, supplementary material 1) were modified slightly to improve the clarity of contents and style of communication. While doing so, the meaning of the instructions, the difference between the general and domain-specific versions of the instructions, and the metaphor of the waterfall were preserved. The domain-specific instructions were further modified to remove any content that may have been perceived as suggestive of specific food-related experiences. For instance, the original script instructed participants to "Observe the thoughts that you have in response to any foods, cravings you have about these foods or any thoughts about eating them, and look at them come up and go away". The modified script instructed participants to simply, "Observe the thoughts that you have in response to the food, and look at them come up and go away". Both the general and domain-specific decentering instructions were approximately four-and-a-half minutes in duration.

We developed the 'normal viewing' control instructions for this study. Participants were asked to view objects as they normally would, and to follow up on any thoughts, emotions, and responses that may come up. The metaphor of a river was used to emphasise that it is fine for their minds to flow freely and get carried away with whatever comes up - like a river. The instructions were approximately two-and-a-half minutes in duration.

All participants listened to an audio recording of their assigned instructions. To check comprehension, participants summarised the instructions to the experimenter. None of the instructions mentioned "mindfulness" or

"meditation" to prevent demand effects. See Appendix A (supplementary material 2) for the full script of all three instructions.

2.3.1.5 Measures

Participants completed all self-report measures on Visual Analogue Scales (VAS).

2.3.1.5.1 Saliva

The same saliva collection protocol was used as Experiment 1. However, we used an absolute measure of salivation for our analyses (i.e., post-trial cup weight pre-trial cup weight), rather than a difference score of salivation (i.e., salivation in crisps trial - salivation in the baseline (wood) trial). The decision to use absolute scores was based on the literature suggesting that when assignment to condition is randomised, as is the case in this experiment, using either the difference score or the absolute score would lead to unbiased results, but the absolute score (i.e., covariate) approach has more power (van Breukelen, 2013).

2.3.1.5.2 Consumption simulations

Participants rated their agreement with the following statements for the block of wood and crisps, with the anchors "not at all" to "very much" (100-point scale): While I was viewing [the object], (1) ... I imagined eating it, (2) ... I thought about what it would taste like, and (3) ... I imagined how it would feel to eat it. The wording of these items is slightly different than in Experiment 1. Since Cronbach's *a* were both > .70 (wood *a* = 0.92, crisps *a* = .86), we computed composite scores of simulations using all three items.

2.3.1.5.3 Desire

The same measure was used as Experiment 1. There was no difference in desire ratings between conditions (p = .409, $\eta_p^2 = .015$).

2.3.1.5.4 Decentering

Participants rated their experiences of viewing the crisps and applying the instructions with the Toronto Mindfulness Scale decentering subscale (TMS; Lau

et al., 2006). An example item is, "[While viewing the crisps,] I was aware of my thoughts and feelings without overidentifying them with" (anchors "not at all" to "very much"). Since the Cronbach's *a* for all seven items was .60, we removed item 1 (i.e., "I experienced myself as separate from my changing thoughts and feelings") to improve internal consistency (Cronbach's *a* = .61). We then removed item 3 as well to further improve internal consistency (i.e., "I experienced my thoughts more as events in my mind than as a necessarily accurate reflection of the way things 'really' are"). We constructed the final composite score from five items that correlated most strongly, (i.e., items 2, 4, 5, 6, and 7; Cronbach's *a* = .67).

2.3.1.5.5 Food Thoughts Overlap Measure (FTOM)

We adapted the Overlap of Self, Ingroup and Outgroup measure (OSIO; Schubert & Otten, 2002) to serve as a single-item graphical measure of one's perceived distance to one's food thoughts (also see the original Inclusion of Other in the Self scale; IOS; Aron et al., 1992). Similar to the "assessment of self-group overlap" item of OSIO, the FTOM consists of seven pictures with circles labelled 'me' and 'food thoughts' that overlap increasingly (see Figure 5). Participants were asked to "pick the picture that best shows how [they] currently relate to [their] food thoughts".



Figure 5 - Food Thoughts Overlap Measure

2.3.1.5.6 Crisps attractiveness, healthiness, and consumption frequency

The same 100-point scales as Experiment 1 were used to assess perceived attractiveness (M = 78.28, SD = 18.77), healthiness (M = 16.61, SD = 16.83) and frequency of consumption (M = 48.72, SD = 22.15). There were no differences between conditions for any of these measures (all p's > .217).

2.3.1.5.7 Subjective salivation

Participants rated the following question for both the block of wood and crisps, with anchors "not much" to "a lot" (100-point scale): "What do you think, how much saliva did you produce while viewing [the object]?". There were no differences between conditions for subjective salivation to the block of wood (M = 18.20, SD = 19.58, p = .742) and to crisps (M = 54.11, SD = 23.12, p = .326).

2.3.1.5.8 Instruction-induced changes in food thoughts

To assess whether the instructions made the participants think about food more than they normally would (i.e., triggered higher levels of consumption simulations than would normally occur), participants were asked whether they "felt forced to think about food beyond what [they] would naturally think about" (100-point scale). There were no differences between general decentering (M = 54.34, SD = 29.03), domain-specific decentering (M = 57.05, SD= 29.14), and the control conditions (M = 63.30, SD = 26.27) in instructioninduced changes in food thoughts (p = .481), although there was a trend for those in the 'normal viewing' control condition to think about food beyond what they would naturally think.

2.3.1.5.9 Perceived effort and success in applying the instructions

Participants rated their perceived effort (M = 73.40, SD = 21.18; no difference between conditions, p = .776) and success in applying their assigned instructions with the same items as Experiment 1. Although there were no differences between conditions (p = 058), there was a trend toward participants in the control condition applying the instructions more successfully compared to the domain-specific decentering condition (control: M = 74.12, SD = 19.37; domainspecific decentering: M = 61.35, SD = 22.16; general decentering: M = 63.25, SD = 20.70).

2.3.1.5.10 Meditation frequency

Participants reported their current meditation frequency on a 100-point scale (M = 18.15, SD = 23.95; no difference between conditions, p = .947).

2.3.1.5.11 Additional questions

Participants provided demographic information and responded to open-ended questions about their study experiences.

The ratings for the attractiveness, healthiness and consumption frequency of crisps, subjective salivation, instruction-induced changes in food thoughts, perceived effort and success in applying the instructions, current meditation frequency, and the open-ended responses were not included in the formal analyses.

2.3.1.6 Procedure

For an overview of the experimental procedure, see Figure 6. Participants were invited to take part in a study investigating "experiences with consumer products" between 12 noon and 5 pm. The study lasted approximately 30 minutes. Data collection took place between November 2019 and March 2020, and was stopped a few days before the first COVID-19 national lockdown in the United Kingdom.

As with Experiment 1, participants provided informed consent, rinsed their mouth, and indicated on a 100-point VAS their current levels of hunger (M =43.66, SD = 26.75; no difference between conditions, p = .983) and thirst (participants in the control condition (M = 37.93, SD = 26.21) reported lower levels of thirst than general decentering (M = 53.50, SD = 16.69) and domainspecific decentering (M = 42.26, SD = 21.11; p = .005). Participants provided a baseline saliva sample while viewing the block of wood. They then listened to their randomly assigned instructions (general decentering, domain-specific decentering, control), and provided a saliva sample while viewing the crisps and applying the instructions. As with Experiment 1, none of the stimulus objects (i.e., block of wood, crisps) were in the vicinity while participants listened to their assigned instructions, and participants were given specific guidance on how to apply the instructions. Guidance for the general and domain-specific decentering conditions was the same as in Experiment 1. In the 'normal viewing' control condition, participants were asked to apply the specific way of looking at objects throughout the study. Finally, participants completed all self-reported measures, provided demographic information, and were thanked, paid, and debriefed.



Figure 6 - Overview of study procedure for Experiment 2

2.3.1.7 Data screening, outlier removal, and analyses

We conducted statistical analyses using R and R Studio (version 1.4.1717; R Core Team, 2019). As preregistered, we checked the salivation data for outliers (i.e., three standard deviations above or below the mean). We identified two outliers for baseline salivation to wood and one outlier for salivation to crisps (all 3SD above the mean). Since outlier removal did not influence the confirmatory findings, outliers were included in the dataset. However, outlier removal did influence exploratory analyses. Therefore, exploratory findings both with and without outliers are reported.

To test the hypothesis that consumption simulations would predict salivation less strongly in the general decentering condition compared to the normal viewing condition, we constructed a frequentist multiple regression model with consumption simulations and condition as predictors, baseline salivation as a covariate, and salivation to crisps as the outcome variable. All continuous predictors, including the covariate, were standardised, and the categorical variable (condition) was dummy coded.

In an exploratory way, we assessed how the association between consumption simulations and simulations in the domain-specific decentering condition compared to the other two conditions, by adding all three conditions to the same multiple regression model as above. We constructed an additional multiple regression model using self-reported desire scores as the outcome variable, with condition and consumption simulations as predictors. In addition to frequentist null hypothesis significance testing, we computed three separate simple Bayesian linear regressions per condition, with consumption simulations as the predictor, baseline salivation as the covariate, and salivation to crisps as the outcome variable. We used JASP for the Bayesian analyses (version 0.16.1; JASP Team, 2022), with an uninformed uniform prior (i.e., P(M) of 0.25 for each possible model). When reporting these findings, we used the Bayes Factor classification and interpretation scheme outlined by Lee and Wagenmakers (2013).

Further, we explored whether there are differences between participants' perceived distance to their thoughts. We conducted a one-way between participants ANOVA with the FTOM scores as the dependent variable.

As a manipulation check, we assessed whether participants in the general and domain-specific decentering conditions self-reported higher levels of decentering than in the control condition. We conducted a one-way between participants ANOVA with TMS scores as the dependent variable. One outlier was identified in the TMS scores, three standard deviations below the mean. We kept the outlier data point, as outlier removal did not influence the findings.

All of these confirmatory and exploratory analyses, and the manipulation check were preregistered.

2.3.2 Results

2.3.2.1 Descriptive statistics and comparison of baseline salivation across conditions

Table 4 summarises descriptive statistics for the main study variables per condition. Also see Figure 7 for the distribution of salivation to crisps per condition.

There was no difference in baseline salivation between conditions, F(2, 115) = 0.46, p = .634, $n_p^2 = .008$.

Table 4 - Descriptive statistics for the main stur	dy variables per condition
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		Normal viewing control		General decentering		Domain-specific decentering	
Variable	Scale	М	SD	М	SD	М	SD
Baseline salivation (wood)	grams	0.38	0.31	0.37	0.25	0.33	0.24
Crisps salivation	grams	0.63	0.29	0.56	0.30	0.50	0.33
Consumption simulations	0-100	65.17	26.11	64.56	27.98	63.91	23.31
Desire	0-100	78.91	21.11	69.48	32.58	73.53	24.54

Note. Descriptive statistics for absolute measures of salivation are reported here (i.e., post-trial cup weight - pre-trial cup weight).





2.3.2.2 Associations between main study variables

See Table 5 for correlations between main study variables. For associations between salivation to crisps and all other variables, we performed partial correlations controlling for baseline salivation. Salivation was positively correlated with consumption, desire, and attractiveness of crisps. In other words, the more an individual liked crisps, expressed desire for eating them, and imagined eating and enjoying them, the more they salivated when they viewed the crisps. We performed Bonferroni corrected bivariate correlations for associations between consumption simulations, desire, decentering, FTOM, and attractiveness and healthiness of crisps. Consumption simulations positively correlated with desire and attractiveness. Further, FTOM correlated negatively with both consumption simulations and desire. Put differently, the more an individual imagined and desired eating crisps, the less perceived distance they experienced to their food thoughts (i.e., they felt more fused with these thoughts).

	М	SD	1	2	3	4	5	6	7
1. Salivation (Crisps)	0.10	0.20	-						
2. Simulations	0.19	0.25	.22*	-					
3. Desire	53.95	25.86	.25**	.64**	-				
4. Attractiveness	69.62	25.15	.19*	.46**	.53**	-			
5. Healthiness	54.35	30.38	.07	.11	.02	.01	-		
6. Decentering subscale of the TMS	83.41	23.03	.01	.20	.22	.17	.06	-	
7. FTOM	52.16	27.51	04	29*	34**	17	16	08	-

Table 5 - Correlations between main study variables

Note: Correlations that involve salivation to crisps (i.e., column marked with '1') are *partial* correlations that control for baseline salivation. All others are Bonferroni corrected bivariate correlations; p < .05, p < .01 (two-tailed); *p*-values <.05 appear in bold.

2.3.2.3 Confirmatory analyses

In contrast to our predictions, and as can be seen in Table 6, the association between consumption simulations and salivation was the same across conditions. In other words, applying the general decentering instructions to crisps did not reduce the association between consumption simulations and salivation compared to the control condition. Also notably, the main effect of consumption simulations on salivation was not significant, despite a significant positive partial correlation between the two variables (see Table 5). The discrepancy may be because the correlation analysis is based on an aggregate of all three conditions, whereas the confirmatory regression model compares conditions against each other. Specifically, there seems to be no association between simulations and salivation in the control condition, which may be bringing about the observed effects (see Exploratory Analyses below for a further assessment). See Table 6 for a summary of the multiple regression model and Figure 8 for added variable plots illustrating the relationship between consumption simulations and salivation (note that this figure includes the domain-specific decentering condition as well).

Conducting the same analysis using difference scores of salivation revealed the same patterns (i.e., main effect of simulations: $\beta = 0.14$, p = .545; interaction effect of condition and simulations: $\beta = 0.07$, p = .803).

Variable	Standardized beta (ß)	Standard 95% CI error		t	p
Intercept	0.15	0.15 0.14 -0.13, 0.44		1.06	.291
Baseline salivation	0.72	0.08	0.56, 0.89	8.72	< .001**
Consumption simulations	0.06	0.15	0.15 -0.25, 0.37		.712
Condition:					
Control	Reference				
General decentering	-0.22	0.17	-0.57, 0.12	-1.29	.203
Consumption simulations x General decentering	0.11	0.18	-0.26, 0.47	0.58	.567

 Table 6 - Summary of the hypothesis-testing multiple regression model

 (crisps salivation ~ baseline salivation + condition * consumption simulations)

Note: ^{**}p < .01; p-values <.05 appear in bold. All continuous predictors were standardized, and condition was dummy coded. Model statistics: F(4, 64) = 21.16, p < .001, adjusted R² = 0.54.

2.3.2.4 Exploratory analyses

2.3.2.4.1 Comparison of the association between consumption simulations and salivation across all conditions

There were no significant differences in the association between consumption simulations and salivation across conditions (general vs. control: $\beta = 0.07$, p = .669; specific vs. control: $\beta = 0.12$, p = .486). See Figure 8 again for added variable plots. Conducting the same analysis using difference scores of salivation revealed the same patterns in the interaction effect of condition and simulations (general vs. control: $\beta = 0.06$, p = .801; specific vs. control: $\beta = 0.14$, p = .595).

However, since the main effect of consumption simulations on salivation was not significant, we identified influential data points by computing Cook's distances. Using the conventional threshold of 4/n (i.e., 0.033), we identified eight influential data points (control: five; general decentering: two; domain-specific decentering: two). Although conducting a multiple regression by removing the influential data points revealed the same results (i.e., no main or interaction effect of consumption simulations and salivation), the relationship between the two variables was now qualitatively in the predicted direction. In other words, there was a positive relationship between simulations and salivation in the

control condition, and visually weaker associations between the two variables in the two decentering conditions (see Figure 9, compared to Figure 8).

When the outliers for baseline salivation (one control, one general decentering) and salivation to crisps (one domain-specific decentering) were removed, salivation to crisps was reduced in the domain-specific decentering condition compared to the control condition (i.e., a main effect). Outlier removal did not affect findings on the simulation-salivation interactions. See Table 7 for a summary of this multiple regression model. However, as with above, we conducted the multiple regression model with both the outliers and influential data points removed. In this case, the main effect of domain-specific decentering on salivation was no longer significant ($\beta = -0.24$, p = .115).

Table 7 - Summary of the exploratory multiple regression model, with outliers removed from the dataset

Variable	Standardized beta (B)	Standard error	95% CI	t	р
Intercept	0.25	0.13	-0.004, 0.51	1.95	.054
Baseline salivation	0.75	0.06	0.62, 0.87	11.61	< .001**
Consumption simulations	0.08	0.13	-0.18, 0.33	0.61	.543
Condition:					
Control	Reference				
General decentering	-0.25	0.16	-0.56, 0.06	-1.61	.111
Domain-specific decentering	-0.39	0.16	-0.70, -0.08	-2.49	.014*
Consumption simulations x General decentering	0.08	0.15	-0.23, 0.38	0.50	.619
Consumption simulations x Domain- specific decentering	0.01	0.16	-0.31, 0.33	0.05	.959

(crisps salivation ~ baseline salivation + condition * consumption simulations)

Note: ${}^{*}p < .05$, ${}^{**}p < .01$; *p*-values <.05 appear in bold. All continuous predictors were standardized, and condition was dummy coded. Model statistics: *F*(6, 108) = 25.01, *p* < .001, adjusted R² = 0.56.



Figure 8 - Added variable plots illustrating the effect of consumption simulations on salivation to crisps in each condition, controlling for baseline salivation (standardised scores).

First, consumption simulations and salivation to crisps were each regressed onto baseline salivation separately. Then, the residuals for those models were plotted against each other.



Figure 9 - Added variable plots illustrating the effect of consumption simulations on salivation to crisps in each condition, controlling for baseline salivation, and with influential data points removed (standardised scores).

First, consumption simulations and salivation to crisps were each regressed onto baseline salivation separately. Then, the residuals for those models were plotted against each other.

2.3.2.4.2 Bayesian analyses of the association between consumption simulations and salivation per condition

In all three simple Bayesian regression analyses, the data were most likely under the model with only baseline salivation as a predictor, compared against the null model (i.e., H_0 = neither baseline salivation nor consumption simulations will predict salivation to crisps).

In the normal viewing control condition, there was extreme evidence for the alternative model (H₁) with baseline salivation, compared to the null model (BF₁₀ = 115.57; R² = 0.51). The change from prior to posterior inclusion odds (i.e., BF_{inclusion}) suggested extreme evidence for the inclusion of baseline salivation in the model (H₁; BF_{inclusion} = 105.64). Further, there was very strong evidence for the alternative model (H₁) with both baseline salivation and consumption simulations as predictors, compared to the null model (BF₁₀ = 33.41; R² = 0.51). However, there was anecdotal evidence for the *exclusion* of consumption simulations from the model (H₀; BF_{inclusion} = 0.29). Similar trends were observed after outlier removal, however with strong (vs. extreme) evidence for the alternative model (H₁) with baseline salivation (BF₁₀ = 23.05; BF_{inclusion} = 21.83).

Similar to the control condition, there was extreme evidence for the alternative model (H₁) with baseline salivation compared to the null model, both in the general decentering condition ($BF_{10} > 1000$; $R^2 = 0.58$) and the domain-specific decentering condition ($BF_{10} > 1000$; $R^2 = 0.60$). Again, the change from prior to posterior inclusion odds (i.e., $BF_{inclusion}$) suggested extreme evidence for the inclusion of baseline salivation in both the model for general decentering (H₁; $BF_{inclusion} > 1000$) and domain-specific decentering (H₁; $BF_{inclusion} > 1000$) and domain-specific decentering (H₁; $BF_{inclusion} > 1000$). There was anecdotal evidence for the *exclusion* of consumption simulations (H₀; general decentering: $BF_{inclusion} = 0.53$; domain-specific decentering: $BF_{inclusion} = 0.54$). Similar trends were observed after outlier removal.

In sum, and similar to the frequentist findings, consumption simulations did not have an effect on salivation to crisps in all three conditions, as evidenced through anecdotal evidence to exclude simulations from all models. See Appendix A (supplementary material 3) for individual model comparison tables for all three models.

2.3.2.4.3 Comparison of the association between consumption simulations and self-reported desire across all conditions

There were no significant differences in the association between consumption simulations and desire across conditions (general vs. control: $\beta = 0.19$, p = .327; specific vs. control: $\beta = 0.004$, p = .985). Further, in this model, consumption simulations significantly and positively predicted desire ($\beta = 0.55$, p = .001).

There was a trend toward a main effect of reduced desire in the general decentering condition compared to the control condition ($\beta = -0.33$, p = .098), but not in the domain-specific decentering condition ($\beta = -0.17$, p = .395; model statistics: F(5, 112) = 17.21, p < .001, adjusted $R^2 = 0.41$).

2.3.2.4.4 Comparison of participants' perceived distance to their food thoughts

There was a significant difference between conditions in participants' perceived distance to food thoughts as measured by the FTOM, F(2, 115) = 3.99, p = .021, $n_p^2 = .065$. Pairwise comparisons corrected for multiple comparisons demonstrated that the only significant difference was between general decentering (M = 3.38, SD = 1.61) and domain-specific decentering (M = 4.20, SD = 1.49), t(115) = 2.69, p = .024). This suggests that those who applied the domain-specific decentering instructions perceived a greater distance between themselves and their food thoughts compared to those in the general decentering condition. There were no significant differences between the control condition (M = 3.50, SD = 1.22) and both decentering conditions (p's > .206).

2.3.2.5 Manipulation checks

We conducted a one-way between participants ANOVA, using the Toronto Mindfulness Scale scores as the dependent variable. Participants reported comparable levels of decentering in the general decentering (M = 63.01, SD =16.05), domain-specific decentering (M = 64.51, SD = 14.45), and control conditions (M = 60.52, SD = 13.19), F(2, 115) = 0.55, p = .580, $\eta_p^2 = .009$. This suggests that the decentering manipulation was not successful in inducing a decentered perspective toward one's thoughts. However, see General Discussion for a further interpretation of this finding.

2.3.3 Discussion

Findings of Experiment 2 suggest that contrary to our predictions, neither general nor domain-specific decentering reduced the link between consumption simulations and salivation for crisps compared to a 'normal viewing' control condition. In other words, there was no evidence that decentering altered the way that participants' vivid re-experiences of eating and enjoying crisps affected their salivation, as a physiological measure of desire to eat. However, additional analysis illustrated that the regression model, and especially the association between consumption simulations and salivation, might be strongly affected by influential data points.

As with Experiment 1, these findings may also be related to our choice of the active control condition. The instructions to view objects as one normally would and to follow up on any experiences may have been perceived metacognitively, and even as a mindfulness exercise. Further, there was some evidence to suggest that participants applied the control instructions more successfully than the two decentering instructions. Lastly, using the metaphor of the river in the control condition may have loaded visual working memory. From an elaborated intrusion theory of desire perspective, this is considered a possible mechanism of mindfulness effects (Kavanagh et al., 2005; May et al., 2012; Tapper, 2018). As such, the control instructions may have been as effective as mindfulness due to visual working memory load. We do not have data from the present study to test this possibility. Overall, it remains a challenge to design a carefully matched active control condition for brief mindfulness research (Davidson & Kaszniak, 2015). That said, it is also important to consider these findings at face value, where brief decentering may simply not be effective above and beyond an active control condition. Importantly, these explanations (i.e., influential data points, limitations of the control condition, true ineffectiveness of decentering) are not mutually exclusive. More data is needed to parse out which of these explanations are plausible.

Next, we discuss additional considerations in relation to both experiments.

2.4 General discussion

We conducted two experiments to assess the effect of decentering domain specificity on reactivity to food cues. In both experiments, we used salivation as a physiological measure of desire. While Experiment 1 used relaxation as an active control condition and included both neutral and attractive food stimuli, Experiment 2 replicated Experiment 1 with a 'normal viewing' control condition and using only the attractive food stimulus.

2.4.1 The effect of decentering on salivation to food cues

In both experiments, amount of salivation to the attractive food was comparable across the general decentering, domain-specific decentering, and active control conditions. These findings are in line with Tapper's (2018) review of 30 experimental studies that assessed the effects of different types of mindfulness practice - including decentering - on cravings for food, cigarettes, and alcohol. This review concluded that there is a lack of compelling evidence for the immediate effects of mindfulness on craving reduction. Further, Tapper and Turner (2018) compared decentering to both a guided imagery and a mind wandering condition during a chocolate craving induction. Although results showed a reduction in cravings compared to baseline across all conditions, there were no significant differences between conditions. In other words, and in line with the findings of the present studies, decentering was not effective in reducing cravings above and beyond visualisation and an active control condition.

However, there are other studies that did report a reduction in the frequency or intensity of cravings following a decentering induction. For instance, in a study by Lacaille et al. (2014), participants practiced mindfulness skills that included decentering, or distraction (active control). Following a craving induction task, those in the mindfulness condition reported a reduced intensity of cravings compared to those in the control condition. Similarly, Baquedano et al. (2017) recruited a mixed sample of meditators and non-meditators, comparing the effect of decentering and self-immersion instructions on appetitive reactivity toward food cues. They implemented an approach-avoidance task as a behavioural measure of automatic approach bias toward attractive food. They

also assessed saliva volumes as a physiological measure. Compared to the immersion condition, decentering reduced both the automatic approach bias toward attractive food and saliva volumes. For both studies described here, the difference with our findings can be interpreted through differences in methodological choices. In the Lacaille et al. (2014) study, participants applied their respective strategies for two weeks, compared to single-session application in our experiments. In the Baquedano et al. (2017) study, the sample had mixed levels of previous meditation experience, compared to the predominantly nonmeditator samples here. In other words, it is possible that applying brief mindfulness instructions is more effective for reducing responses to foods among participants with previous meditation experience.

2.4.2 The relationship between consumption simulations and salivation

Although consumption simulations predicted salivation in Experiment 1, this relationship was absent in Experiment 2. The findings of Experiment 1 can be explained through the grounded cognition theory of desire and motivated behaviour (Papies et al., 2020; Papies & Barsalou, 2015). Namely, the more salient participants' re-experiences of eating and enjoying crisps were, the more they salivated as a physiological preparation to consume crisps. Findings of Experiment 2 conflict with both those of Experiment 1, and previous work that established a relationship between consumption simulations and salivation (Keesman et al., 2016).

There may be various explanations for the lack of a relationship between simulations and salivation in Experiment 2. A compelling explanation relates to the smaller cell size of the control condition in Experiment 2 (N = 22) compared to Experiment 1 (N = 31). Combined with the five influential data points (i.e., almost a quarter of the cell), the absence of a simulation-salivation relationship may be due to the shortcomings of the control condition.

Another explanation may be the time context of this experiment, as data collection took place between November 2019 and March 2020. This timeframe directly coincides with the first known outbreak of COVID-19 in November 2019 and the first cases of COVID-19 in the UK in January 2020. The presence of a

highly contagious and novel pathogen in the environment may have led to participants regulating or suppressing bodily preparations to consume food, despite experiencing consumption simulations. This may have a direct impact on salivation.

A final explanation is the potential role of the neutral food (rice cake). Half of the participants in Experiment 1 applied their respective instructions to the rice cake first, followed by the bowl of crisps (the other half of the participants viewed crisps first due to counterbalancing). For participants who viewed the rice cake first, salivation and desire may have been more salient for crisps due to their exposure to another clearly less tempting food item first. Being exposed to the rice cake in this way may have amplified the relationship between consumption simulations and salivation. Therefore, the absence of a significant relationship between simulations and salivation in Experiment 2 may be related to the lack of exposure to the rice cake.

The difference in findings *cannot* be explained through the slightly different analytical approach chosen in Experiments 1 and 2. We conducted the main analyses using difference scores of salivation in Experiment 1, and absolute scores of salivation with baseline salivation as a covariate in Experiment 2. However, to ensure that the outcome of our analysis of the salivation data is not susceptible to this subtle change in analytic approach, we also conducted Experiment 1 analyses with absolute scores, and Experiment 2 analyses with difference scores. The results were the same, meaning consumption simulations predicted salivation in Experiment 1, but not in Experiment 2. This suggests that the discrepant findings cannot be ascribed to how we processed and analysed the salivation data.

2.4.3 The effect of decentering on the relationship between consumption simulations and salivation

The two experiments demonstrated weak and contradictory findings on the effect of the decentering instructions on the relationship between consumption simulations and salivation. In Experiment 1, general decentering, but not domain-specific decentering reduced the link between consumption simulations and salivation compared to relaxation. This suggests a decoupling effect, where

even when simulations are active, they predict salivation less strongly when general decentering is applied. Decoupling effects have been reported previously in the mindfulness literature (e.g., Bowen & Marlatt, 2009; Elwafi et al., 2013; Hulbert-Williams et al., 2019; Keesman et al., 2020; for a review, see Levin et al., 2015). However, except for Keesman et al.'s (2020) study, this work focused predominantly on the decoupling of motivational states (e.g., nicotine craving) from behaviour (e.g., cigarette smoking). For instance, Hulbert-Williams et al. (2019) instructed participants to carry a bag of chocolates with them for a week, while applying brief defusion, acceptance or distraction (control) instructions. Although the frequency of cravings was the same across conditions, participants in both the defusion and acceptance conditions consumed less chocolate during the study period, suggesting a decoupling effect and reduced reactivity to cravings. In addition to investigating the motivational state-behaviour link, Experiment 1 and Keesman et al.'s (2020) study highlight potential merits in paying empirical attention to decoupling effects in the simulation-motivational state link as well. It is unclear why this decoupling effect was observed in Experiment 1 when applying general decentering, but not domain-specific decentering. The decentering induction may have been more successful in the domain general condition, compared to the domain-specific condition. This is discussed later in the context of study limitations. Alternatively, the repetitive, suggestible contents of the domain-specific instructions which were later removed in Experiment 2 may have caused frustration or annoyance for some participants, leading them to stop learning about or applying the instructions altogether. This is challenging to assess, especially in the absence of accompanying qualitative data (for examples of qualitative studies, see Tatar et al., 2021; Tatar et al., 2022).

The decoupling effect observed in Experiment 1 was also absent in Experiment 2. Again, this may be related to the strong effect of influential data points, especially in the control condition. It may also be related to the different control conditions used in these experiments. Compared to the relaxation instructions in Experiment 1, the 'normal viewing' instructions that used the river metaphor better matched and controlled for the visual aspects of the decentering instructions in Experiment 2. This change in design is in line with calls for better research practices that manipulate decentering while controlling

for visual working memory load (Tapper, 2018). Once these recommendations are implemented, however, there is evidence to suggest that decentering is as equally effective as visualisation, both in the lab and with naturally occurring cravings in the field (Schumacher et al., 2017, 2018; Tapper & Turner, 2018; Wilson et al., 2021). As such, the absence of a significant effect in Experiment 2 here may be because 'normal viewing' generated a visuospatial working memory load comparable to decentering. Likewise, the significant effects observed in Experiment 1 may be due to a non-specific, waterfall-related visuospatial working memory load, rather than attributable to the metacognitive concept of decentering. Future research should continue to test decentering against active control conditions designed to control for working memory load.

2.4.4 The role of domain specificity in reactivity to food cues

These experiments provide insufficient evidence to draw conclusions on whether decentering instructions work best when they specifically refer to food thoughts and cravings or are taught more generally, independent of domain-specific references. Although findings of Experiment 1 suggest that general decentering is more effective than domain-specific decentering, we failed to replicate this effect or establish any clear decentering effects in Experiment 2. Since our preregistered confirmatory hypotheses were contingent upon consumption simulations significantly and positively predicting salivation in the control condition, we are cautious to draw conclusions on domain specificity.

These findings should be considered in relation to the concept of pragmatics from the field of psycholinguistics (i.e., "the study of... context-dependent aspects of meaning"; Noveck & Sperber, 2004; see also Gibbs, 2019; Gibbs & Colston, 2020). The general decentering instructions lacked domain-specific references and were therefore general from a *literal* linguistics perspective. However, the instructions may have been perceived as specific, since participants were asked to apply the instructions to *any* thoughts that they have, while also being presented with foods. Therefore, from a *pragmatic* linguistic perspective, the study context may have provided the relevant food-specific meaning, increasing the similarity between the domain-general and domain-specific instructions. Although still cautious to draw conclusions on domain specificity, this may partly explain the lack of difference in findings between the

two conditions. Future research should investigate domain specificity longitudinally within multi-contextual daily life situations.

These findings should also be considered in relation to several limitations regarding sample size and characteristics, the unsuccessful decentering manipulation check on self-reported decentering experiences (however, see discussion of findings with the FTOM), and the modified control condition from Experiment 1 to Experiment 2. These issues are discussed next.

2.4.5 Study limitations

A main limitation of the experiments was sample size and characteristics. In Experiment 1, we intentionally stopped data collection before reaching the minimum sample size that was determined through Bayesian sequential sampling. As previously discussed, this was due to concerns raised regarding the adequacy of relaxation as a control condition, and to conserve resources to conduct a better-informed replication study (i.e., Experiment 2). Data collection for Experiment 2 was stopped outside of our control due to the start of the COVID-19 pandemic. This resulted in unequal sample sizes per condition, with fewer participants in the control condition than the two decentering conditions. Although equality of cell sizes is not an assumption of the analyses conducted, and all assumption checks were met, the small cell size of the control condition clearly had a strong effect on the study through influential data points.

In addition, four features of the sample characteristics are worth highlighting. First, both samples predominantly consisted of students (84.62% and 98.31% in Experiments 1 and 2, respectively). Overreliance on student participants in psychological research is a pervasive issue that raises questions of sample representativeness (Arnett, 2008; Henrich et al., 2010), and it may negatively impact the generalisability of our findings. Second, participants in both studies had a healthy weight, on average. As noted previously in the literature, absence of effect in a sample of normal weight individuals does not preclude the possibility of a different pattern emerging among those affected by excess weight and/or suffering from obesity (Seguias & Tapper, 2022; Tapper, 2017). Third, and related, we did not gauge participants' motivation to change their relationship to their food cravings generally, or to cravings for crisps specifically.

Although we recruited participants who like crisps, liking is different from having a problematic relationship with crisps and wanting to reduce consumption, which might enable a stronger effect of decentering strategies. Indeed, a review of studies on mindfulness and eating behaviours related to weight management suggests that participant motivation to reduce consumption of target foods may be a moderator of significant (vs. non-significant) effects (Tapper, 2017). Fourth and finally, we did not assess participants' levels of dispositional mindfulness. Previous studies suggested that those with high levels of pre-intervention mindfulness benefit more from brief mindfulness interventions (Creswell, 2017), and dispositional mindfulness is associated with healthy eating behaviours such as less impulsive eating and healthier food choices (Jordan et al., 2014). Future, well-powered studies should be designed by taking all these factors into consideration; namely, by recruiting individuals from different weight categories and occupational/educational backgrounds, recruiting those who are motivated to change their relationships to cravings, and assessing potential moderation effects of dispositional mindfulness.

A final limitation is the partially and fully unsuccessful decentering manipulations in Experiments 1 and 2, at least as measured through self-report questionnaires. In Experiment 1, participants reported experiences of decentering using a scale developed by Papies et al. (2016). The decentering manipulation was successful in the general decentering, but not in the domainspecific decentering condition. This aligns with the findings that general, but not domain-specific decentering modulated the relationship between consumption simulations and salivation to crisps. In other words, the success of the decentering induction may partly account for the effects found. In Experiment 2, participants reported experiences of decentering with the Toronto Mindfulness Scale (TMS; Lau et al., 2006). On this measure, the decentering manipulation was unsuccessful in both the general and domain-specific decentering conditions. Again, this aligns with the findings that neither general nor domainspecific decentering modulated the relationship between consumption simulations and salivation to crisps. Although these findings can be taken at face value, meaning the decentering induction was indeed as unsuccessful as these measures suggested, we consider them more cautiously within the wider context of criticism toward self-report measures (Bergomi et al., 2013; Grossman & Dam,

2011; Hadash et al., 2017; Hadash & Bernstein, 2019; Van Dam et al., 2018). Since understanding and completing self-report measures of mindfulness itself requires great levels of introspection, awareness, and metacognitive capacity, they may be perceived in ways other than intended by those without mindfulness experience. As such, these findings alone do not automatically rule out the possibility that participants in some or all decentering conditions experienced thoughts, feelings and sensations as mere mental events.

There is preliminary and partial evidence to suggest that the FTOM has the potential to be developed into a visual measure of distance between an individual and their food thoughts. FTOM was used in Experiment 2 for the first time, where those who applied domain-specific decentering perceived a greater distance between themselves and food thoughts compared to those in the general decentering condition. The differences between the control condition and the two decentering conditions were not significant. Although distance to food thoughts is a relatively straightforward construct, the instructions surrounding the FTOM may be interpreted more easily once someone is exposed to the language of the decentering instructions. Specifically, participants in the decentering conditions were introduced to a "specific way of dealing with thoughts", whereas participants in the control condition were introduced to a "specific way of looking at *objects*". Since the FTOM instructed participants to "pick the picture that best shows how [they] currently relate to [their] food thoughts", those in the two decentering conditions may have interpreted the measure more easily in relation to their study experiences. The exposure to relevant, mindfulness-specific language is an issue with text-based self-report measures such as the TMS as well (Grossman & Dam, 2011), suggesting that any efforts to validate the FTOM may involve modifications to the measure (or instructions surrounding the measure) so that it is equally interpretable by participants in the decentering and control conditions.

Another critical consideration should be whether 'perceived distance' as measured by the FTOM is an accurate measure of decentering as a construct. Said differently, does 'distance' in the FTOM capture true levels of metacognitive distance? The FTOM did not significantly correlate with the TMS here. This suggests that, if the TMS data from this study are considered a meaningful comparison, the FTOM may be measuring a different construct. Overall, more research is needed to determine whether FTOM can become an alternative measure of decentering, in domains other than food cravings as well.

2.4.6 Salivation as a physiological, potentially implicit measure of desire

A key strength and unique feature of our work is the use of salivation as an outcome measure. Factors influencing salivary flow, including cognitive factors, have been studied extensively (for a review, see Spence, 2011). As well, salivation has been used as a proxy for desire in previous research (e.g., Keesman et al., 2016, 2020; Nederkoorn & Jansen, 2002; Van Gucht et al., 2008). Recently, Hanley and Garland (2020) used salivation in the domain of opioid cue-reactivity, where chronic pain patients on long-term opioid therapy salivated more when exposed to the opioid they were prescribed compared to a neutral cue, and participating in the 8-week Mindfulness-Oriented Recovery Enhancement programme led to reduced salivation compared to a supportive group psychotherapy active control condition. Using salivation as a measure in this way is a strength, as it offers a cost-effective alternative to self-report measures of desire that is less susceptible to demand effects. However, much remains unknown about its properties as a measure.

First, we assume in this work that salivation is a physiological measure of desire. Although many other studies have been conducted under the same assumption (e.g., Hanley & Garland, 2020; Keesman et al., 2016, 2020; Nederkoorn & Jansen, 2002; Van Gucht et al., 2008), the incentive salience theory offers an alternative view (Stevenson et al., 2017). Namely, the incentive salience theory dissociates the process of 'wanting' (i.e., desire to eat, in anticipation of consumption) from 'liking' (i.e., the reward process, following consumption). Stevenson et al.'s (2017) work suggests that 'liking' is associated with salivation, rather than, and independent of 'wanting'. This opens the possibility that we may have measured 'liking' rather than 'wanting'/desire in the present work. However, Stevenson et al.'s (2017) findings are correlational. Therefore, the accuracy of the assumption that salivation is a physiological measure of 'wanting'/desire (vs. 'liking') needs to be examined more directly and causally in future research. Second, it is unknown whether it is realistic to expect change in levels of salivation following a brief, single session of mindfulness. Salivation is an appetitive reflex enacted in preparation to consume food, and it is associated with cravings (Nederkoorn et al., 2000; Power & Schulkin, 2008). Future research should assess whether it is realistic to reliably detect changes in this reflexive behaviour within the timescale of single-session lab studies, and in response to a specific type and dose of mindfulness induction (Rosenkranz et al., 2019). While previous studies reported changes in salivation (e.g., Baquedano et al., 2017; Keesman et al., 2020), the consistency with which effects can be detected is unknown.

Finally, it is undetermined whether salivation is actually an implicit measure. It would be possible to determine implicitness by comparing salivation to the normative criteria of an ideal implicit measure that were outlined by (De Houwer et al., 2009). Here, the *implicitness* criterion refers to whether the process in question is automatic (i.e., unintentional, unconscious, efficient, and/or uncontrollable; De Houwer et al., 2009; Moors & De Houwer, 2006). Overall, a continued, systematic study of salivation as an implicit measure would be best informed by its comparison against these normative criteria. However, as emphasised by De Houwer et al. (2009), lack of knowledge on implicitness should not stop researchers from using salivation as a measure in their studies. While doing so, it is important to remain cognizant of the multifaceted nature of mindfulness and the risk of being reductive during such measurement efforts (Davidson & Kaszniak, 2015).

2.4.7 Conclusion

There is much more to learn about brief mindfulness-based interventions. Here, we studied the question of domain specificity in relation to the decentering component of mindfulness. Although this study provides inconclusive evidence about both the role of decentering in the relationship between consumption simulations and salivation, and the effect of domain specificity on this relationship, it is nevertheless a first attempt at understanding how these constructs relate to one another.

It is worthwhile pursuing the question of domain specificity, as it has numerous implications for intervention development. For instance, if domain general decentering is as effective as domain-specific instructions, teaching decentering to individuals in a general way would allow them to apply it effectively to multiple domains of health and wellbeing. Conversely, if instructions must be domain-specific for optimal effectiveness, targeted interventions can be developed. Addressing the question of domain specificity would therefore facilitate the development of optimally useful intervention programmes in relation to eating behaviour and beyond.

2.5 Declarations

2.5.1 Funding

No funding was received for conducting this study.

2.5.2 Ethical approval

The study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the University of Glasgow College of Science & Engineering Ethics Committee (Experiment 1 - date: 1 February 2018, no: 300170083; Experiment 2 - date: 11 November 2019, no: 300190042).

Chapter 3 "The thought is gonna come and the thought is gonna go": A qualitative study on how non-meditators learn and apply brief mindfulness-based instructions for food cravings

This chapter is an exact copy of the following published manuscript:

Tatar, B., Pázmányová, R., & Papies, E. K. (2021). "The thought is gonna come and the thought is gonna go": A qualitative study on how non-meditators learn and apply brief mindfulness-based instructions for food cravings. *Appetite*, 166, 105482. https://doi.org/10.1016/j.appet.2021.105482

3. Abstract

While brief mindfulness-based interventions have emerged as tools to modulate automatic responding in various domains of health and wellbeing, findings are primarily based on quantitative experimental research. However, these grouplevel findings do not capture the rich subjective experiences of individuals learning mindfulness. In the following qualitative study, we explored how nonmeditators learn and apply brief mindfulness instructions in the domain of food cravings. Ten non-meditators listened to 'normal viewing' instructions, which asked them to view foods in the way that they normally would. They then viewed a video of attractive foods, and were interviewed about their experiences of learning and applying the instructions. Next, participants listened to a five-minute recording of mindfulness instructions, viewed another food video while applying the mindfulness instructions, and were interviewed again. The data were analysed using thematic analysis. When participants applied brief mindfulness, their relationship to the food stimuli changed such that they started perceiving their experiences as transient. Certain factors (e.g., use of visual metaphors) and processes (e.g., listening to the 'normal viewing' instructions first) facilitated this change. The ease of applying the instructions fluctuated with food preferences and perceived strength of cravings. Participants reported that they would apply the instructions in daily life if they felt a need for this, including in domains other than food. However, they anticipated challenges such as remembering and finding time to apply. Our findings highlight the specific aspects that influence how brief mindfulness instructions are learned and applied. These insights may change how brief mindfulness is studied empirically, and may inform the development of simple and empowering techniques that can promote wellbeing in daily life.

Keywords: mindfulness, decentering, food cravings, qualitative research, thematic analysis

3.1 Introduction

Mindfulness-based instructions have gained both scientific and popular interest in the last few years, including brief interventions and those in the domain of food cravings (Howarth et al., 2019; Van Dam et al., 2018). This interest may relate to a need for simple and effective techniques that improve health and wellbeing. Further, compared to longer term mindfulness-based interventions that entail an extended daily practice (e.g., the 8-week Mindfulness-Based Stress Reduction (MBSR) course; Kabat-Zinn, 1982), brief mindfulness may be more compatible with fast-paced daily lives, especially for non-meditators who are starting to practice mindfulness for the first time. Although 'brief mindfulness' does not have a standard definition in the literature, its brevity has been loosely conceptualised as "a duration of 30 minutes or less on any one occasion" (Howarth et al., 2019). Recent research suggests that even 3-12 minute decentering mindfulness instructions can positively affect cognition and behaviour in domains such as food cravings, cigarette smoking, stressful events, and emotional responding (e.g., Bowen & Marlatt, 2009; Erisman & Roemer, 2010; Keesman et al., 2017, 2019; Lebois et al., 2015). In a systematic review of brief mindfulness-based interventions, 93% of studies reported positive effects of these interventions on health-related outcomes such as stress, negative affect, emotion regulation and memory (Howarth et al., 2019). These outcomes were observed in a wide range of mindfulness-based techniques such as breathing exercises and acceptance practices, with instructions as short as five minutes.

However, so far, brief mindfulness has primarily been studied through quantitative experimental research (for an overview, see Howarth et al., 2019; Jiménez et al., 2020). Although these findings are highly informative and necessary, they lack rich accounts of how participants experience these techniques. As a result, it is not known whether mindfulness instructions are effective for every participant when a study demonstrates their group level effectiveness. Equally, when the instructions are not effective at the group level, the underlying processes that take place at the individual level are unknown. Here, in a qualitative study, we explored how non-meditators learn and apply brief decentering mindfulness instructions in the domain of food cravings. In the Western secular context, mindfulness has been defined as the awareness that develops from paying intentional and non-judgmental attention to experiences, moment-by-moment (Kabat-Zinn, 1994). Beyond this definition, however, mindfulness as a construct may carry different but related meanings within the modern literature, such as a dispositional quality (trait), a state of being, a practice, strategy, or intervention (Chiesa & Malinowski, 2011; Vago & Silbersweig, 2012). In the present study, we refer to mindfulness primarily as a strategy that can be used in the context of an intervention. Accumulating evidence demonstrates the effectiveness of mindfulness-based interventions across various domains of health and wellbeing such as reactivity to food cues, alcohol cravings, nicotine dependence, anxiety, and mood problems (e.g., Baquedano et al., 2017; Ostafin et al., 2012; for meta-analyses, see Goyal et al., 2014; Howarth et al., 2019).

Decentering is a component of mindfulness (also referred to as de-reification, mindful attention, cognitive defusion, and urge surfing; e.g., Bowen & Marlatt, 2009; Lutz et al., 2015; Papies et al., 2012). The term 'decentering' has been coined by Safran and Segal (1990). It refers to the metacognitive insight that one's thoughts, feelings and experiences are transient mental events, rather than accurate reflections of an objective reality (Bishop et al., 2004). If one adopts a decentred perspective, one experiences thoughts and feelings as less subjectively real, and as mental events that come up and go away on their own. Critically, this decentred stance is not the same as dissociation. Whereas dissociation is an unconscious avoidance mechanism, decentering can be better described as a conscious coping strategy (Corrigan, 2002; Zerubavel & Messman-Moore, 2015), which involves deliberately accepting thoughts and feelings for what they are - transient mental events - without elaborating or ruminating on them (Fresco et al., 2007; Williams, 2010). For example, when one imagines their favourite attractive, yet unhealthy food, one may have the thought: "I need to eat it right now". Adopting a decentred perspective may transform one's perception of this thought from an objective truth that needs to be acted upon into a transient mental event (i.e., "I am having the thought that I need to eat it right now, and this thought will pass").

Many quantitative studies suggest that decentering may be effective in regulating problematic cognitive patterns and behaviours (for an overview, see

106

Bernstein et al., 2015). For instance, in the context of negative affect, decentering has been shown to reduce symptoms of anxiety and depression (e.g., Fresco et al., 2007; Lau et al., 2006; Teasdale et al., 2002). In the context of the reward-related process of food cravings, decentering has been shown to reduce cravings, reactivity to food cues, preferences for unhealthy foods, and the actual consumption of attractive, high-calorie foods (e.g., Arch et al., 2016; Jenkins & Tapper, 2014; Lacaille et al., 2014; Papies et al., 2015). In five-minute audio recordings, for example, Lacaille et al. (2014) instructed participants to adopt a decentred or a control perspective toward their food-related thoughts. When participants were then given one minute to look at and interact with their preferred piece of chocolate, the decentering participants reported reduced cravings. Again with brief cognitive defusion instructions, Jenkins and Tapper (2014) demonstrated that chocolate consumption was reduced over a five-day period. Similarly, Papies et al. (2015) instructed non-meditators to adopt a decentred perspective toward attractive but unhealthy, and healthy food images. Compared to a control group, participants in the decentering condition showed lower preferences for unhealthy foods in both laboratory and cafeteria settings (Papies et al., 2015).

One possible mechanism is that decentering reduces reactivity to appetitive stimuli by targeting consumption and reward simulations that lead to desire (Keesman et al., 2017; Papies et al., 2015). According to the Grounded Cognition Theory of Desire and Motivated Behaviour (Papies et al., 2020; Papies & Barsalou, 2015), appetitive stimuli trigger spontaneous, often non-conscious reexperiences of eating and enjoying foods. These re-experiences, or "consumption and reward simulations," can be so compelling that they lead to the conscious experience of desire and cravings (Papies et al., 2020). Here, desire refers to an "affectively charged cognitive event" (Kavanagh et al., 2005) that is focused on a stimulus or experience associated with reward (Papies & Barsalou, 2015). In simpler terms, a desire is an urge or a wish to gain pleasure or relieve discomfort. Although desires do not always conflict with a person's goals and values (Hofmann et al., 2012), in the context of the present work, we are particularly interested in desires that favour short-term hedonic goals over longer-term health and wellbeing goals. This is because some of these desires, such as those toward attractive yet unhealthy or unsustainable foods, may have
negative health or environmental consequences (e.g., weight gain, climate change; Boswell & Kober, 2016; Bryant, 2019).

The Grounded Cognition approach that we have briefly described here is our main theoretical framework of interest, as it seems particularly useful for understanding how decentering can change individuals' responses to appetitive stimuli. Within this framework, assuming that consumption and reward simulations lead to desire (Papies et al., 2020), decentering directly targets these simulations by helping participants to view them and their associated urges as mental events. As such, these experiences are viewed as transient, rather than an objective reality that requires obtaining and consuming the food. Indeed, Keesman et al. (2017) have shown that even when participants experience simulations, decentering instructions reduce subjective cravings, and physiological responses to food such as salivation. Studies in other domains of health and wellbeing also demonstrate that decentering decouples the relationship between motivation and behaviour (e.g., cigarette smoking; Bowen & Marlatt, 2009). In other words, according to quantitative research findings, decentering can change the way in which one relates to one's mental experiences. However, from a deeper personal experience perspective, what happens during this decoupling process is unclear.

Further, quantitative studies of brief mindfulness-based instructions have limitations. Many of these limitations are common to mindfulness-based interventions more generally, such as the lack of a shared conceptual understanding and operational definition of mindfulness (Bergomi et al., 2013; Hanley et al., 2016), and the varying rigour of research designs (Goyal et al., 2014; Howarth et al., 2019; see also, Davidson & Kaszniak, 2015; Goldberg et al., 2017; Jiménez et al., 2020; Rosenkranz et al., 2019; Van Dam et al., 2018). Most importantly for the present work, these studies are based on the underlying assumption that participants apply the specific instructions assessed in the study in the way that the researchers have intended them to. Although some studies call for participants to verbally summarise instructions before applying them (e.g., Lebois et al., 2015), this brief summary runs the risk of being a verbatim recall. This would not gauge the actual semantic or deeper, personal understanding of the instructions. Therefore, without asking participants for a detailed account of their understanding, it is unclear *what* exactly works in

108

studies to cause the effects of brief mindfulness. While the active component could indeed be mindfulness, it could equally be something else. In the same vein, it is unclear what exactly does not work in studies that do *not* support the effectiveness of brief mindfulness. While the mindfulness strategy could indeed be ineffective, the results could equally be due to participants' lack or incomplete understanding of the instructions.

Another major limitation of quantitative experiments on brief mindfulness is the control conditions used (Van Dam et al., 2018). If the control condition resembles the mindfulness condition too closely and participants perceive the control instructions as mindfulness, demand effects may occur. This perceived or real resemblance of the control and mindfulness conditions may account for the lack of effectiveness suggested by these studies. Conversely, in studies that *do* show an effect of brief mindfulness, the control condition might not control for factors such as working memory load and relaxation effects. The control instructions may even contribute to the process that deems the mindfulness instructions effective. Therefore, it is important to get a sense of participant experiences and perceptions beyond what quantitative methodologies and measures can offer.

The qualitative studies conducted so far indeed highlight the importance of gaining a deeper understanding of mindfulness-based instructions based on personal experience (e.g., Howarth et al., 2016; Strauss et al., 2014). Previous qualitative research has been conducted mainly on manualised interventions. For instance, Strauss et al. (2014) interviewed participants who were experiencing major depression and receiving Person-Based Cognitive Therapy (PBCT). They identified themes such as participants' altered relationship to their depressive symptoms after the intervention, characterised by an increased awareness of negative thoughts and rumination. Although rare, qualitative research has also examined brief mindfulness interventions. Howarth et al. (2016), for example, conducted interviews and focus groups with chronic illness patients who received brief body scan instructions. Patients reported positive effects such as relaxation. They also reported feeling positively about the contents of the instructions, but felt that the instructions were too short and rushed. These important perceptions and concerns would not be typically identified through

quantitative research. Importantly, no previous research has studied brief decentering using qualitative methodologies.

The current study was designed to assess how non-meditators learn and apply brief decentering instructions in the domain of food cravings. To this end, we first instructed participants to view highly attractive food images in the way that they normally would, as a control condition, and then again while applying brief mindfulness-based instructions. We conducted interviews after each viewing experience to explore how non-meditators learn and apply brief mindfulness. For this study, we adopted a critical realist epistemological stance. This perspective assumes that the world is "theory-laden" rather than "theorydetermined" (Fletcher, 2017). In other words, knowledge may be gained through theories, one of which is the Grounded Cognition Theory of Desire and Motivated Behaviour (Papies et al., 2020). Critically, some of this knowledge is closer to reality than other knowledge.

3.2 Method

The reporting of this study was informed by the Consolidated Criteria for Reporting Qualitative Research (COREQ) 32-item checklist (Tong et al., 2007). The study was approved by the University of Glasgow Ethics Committee, and pre-registered on the Open Science Framework (OSF; https://osf.io/9cb28/). Also see the OSF for supplementary materials (https://osf.io/5yt2d/). Although the debate on the usefulness and appropriateness of pre-registration in qualitative research is new and ongoing (Haven & Van Grootel, 2019; Kern & Gleditsch, 2017; Pratt et al., 2019), we pre-registered this study to document our research process in a transparent way. We used Kern et al.'s (2017) preregistration template and clearly indicated when we deviated from this (e.g., added sections).

3.2.1 Study design

We used an exploratory case study design. First, each participant viewed foods while applying the 'normal viewing' control instructions. These instructions asked them to view the foods as they normally would. Participants then viewed foods while applying the 'decentering' instructions. These instructions explained the metacognitive concept of decentering and asked participants to observe their responses to food as transient mental events. See Materials for further details of the instructions.

We conducted semi-structured interviews, which are recommended for collecting rich descriptive data (Hill & Lambert, 2004). The semi-structured interview provided structure to study our research question through our theoretical framework of interest (i.e., Grounded Cognition Theory of Desire and Motivated Behaviour; Papies et al., 2020), and flexibility to explore and identify new themes.

3.2.2 Participants

We recruited 10 participants from the general population (8 female; age range: 22-35). See Appendix B (supplementary material 1) for further demographic information, and the Discussion section for a brief account of gender imbalances in our sample.

Participants self-selected to take part based on the inclusion criteria that they currently live in the UK, consume an omnivorous diet, are not on a weight loss or other restrictive diet (e.g., gluten-free), have normal or corrected-to-normal vision, do not have any psychological, psychiatric or neurological condition, or learning disabilities, and have no current eating disorder or a history of eating disorders (without providing any further descriptions of these criteria). Further, participants were screened based on the inclusion criteria that they do not have a past and/or current formal meditation practice, and do not regularly use meditation applications (i.e., at least once a week). If an individual indicated that they had or currently have a meditation practice, they further described the type and nature of this practice in an open textbox. The participants were screened on a case-by-case basis by all authors (e.g., those who practice yoga were eligible, whereas those who have attended an MBSR course were not eligible).

To ensure that participants were not fully satiated, they were asked to refrain from eating and drinking except water, black tea or coffee without sugar one hour prior to their scheduled interview time. Participants were asked to verbally confirm that they had complied with these instructions before beginning the interview.

Participants were recruited with convenience sampling, through the online social networks of RP's personal social network and the University of Glasgow Psychology Subject Pool. None of the researchers knew the participants prior to the study. Interviews were scheduled through email communication. Participants did not know about the researchers' reasons or personal goals for doing this research at the time of participation. They received a gift voucher worth £6 as compensation for their participation.

3.2.3 Interview schedule

We developed the interview questions by reviewing the specific literature on brief decentering instructions, as well as wider literature on brief mindfulness instructions, and interventions that feature decentering as a component such as Acceptance and Commitment Therapy (for example, Bacon et al., 2014; Chittaro & Vianello, 2016; Howarth et al., 2016; Strauss et al., 2014). First, BT (female, PhD student and trainee counsellor) and RP (female, third year undergraduate student) generated and discussed a list of questions that may be relevant to assessing experiences of learning and applying decentering to food cravings. This process was also guided by the Grounded-Cognition Theory of Desire and Motivated Behaviour (Papies et al., 2020; Papies & Barsalou, 2015). EKP reviewed and provided initial feedback on the questions. BT and RP then created an initial interview schedule, shared it with other colleagues for feedback (one masters student, three PhD students, one postdoctoral research assistant, one professor/principal investigator), and refined the interview schedule based on feedback. We pilot-tested the interview on one participant.

The final interview schedule contained a list of pre-determined, open-ended question that all participants were asked, and optional, more closed probing questions that were asked if the interviewer judged them as relevant and potentially informative. The interviewer also asked follow-up questions that were not pre-determined probes, but based on the responses that participants gave to previous interview questions. After both the normal viewing and decentering instructions, we asked participants to describe their experiences of (1) viewing the foods, (2) listening to and learning the instructions, and (3) applying the instruction to the foods. In addition, after the decentering instructions, we asked participants to verbally rate their experiences using the Food Thoughts Overlap Measure (see Materials), and to explain their choice. Then, we asked participants to give a name or title to the decentering instructions, and explored participants' potential future daily use of these instructions. Finally, we asked participants about their previous knowledge and experience of mindfulness and/or meditation. See Appendix B (supplementary material 2) for the full interview schedule.

3.2.4 Materials

3.2.4.1 Food images

Participants viewed two videos, one with normal viewing and one with decentering instructions. Each video contained five highly attractive food images (e.g., brownie, burger). The images were selected from a pilot study where participants had rated the attractiveness of various food images (video 1 attractiveness M = 67.34, SD = 3.19; video 2 attractiveness M = 67.46, SD = 3.60; on a 100-point Visual Analogue Scale). The videos were in a slideshow format, containing an introductory slide, food images shown for 10 seconds each, and a three-second transition between each image. The image sets were matched in sweetness and savouriness.

3.2.4.2 Control and decentering instructions

The normal viewing (control) and decentering instructions were similar in structure and approximately three and five minutes in duration, respectively. The instructions were narrated by BT and presented to participants as audio recordings. To prevent demand effects, the terms "mindfulness" and "meditation" were not used. To check comprehension, participants were asked to summarise what they understood from the instructions. The interviewer then repeated any key details of the instructions that were missing from the summary, corrected mistakes in understanding, and addressed any further questions.

The normal viewing control instructions were based on instructions by Tatar et al. (in preparation). Participants were asked to view foods in the way that they normally would, and to follow up on any thoughts, feelings or physical sensations that may come up. The metaphor of a river was used, where the participants were asked to let their "mind flow freely as a river, full of clear, flowing water".

The decentering instructions were based on instructions by Tatar et al. (in preparation). Participants were asked to observe their thoughts, feelings and physical experiences in response to food as transient mental events that come up and go away on their own. The metaphor of a waterfall was used to further explain this concept, where the constant stream of water was likened to one's stream of thoughts. Participants were asked to "step behind the waterfall", rather than getting carried away in the water, trying to resist the stream, or pretending that it does not exist.

See Appendix B (supplementary material 3) for the full instruction scripts.

3.2.4.3 Food Thoughts Overlap Measure (FTOM)

We adapted the Inclusion of Other in the Self Scale (IOS; Aron et al., 1992) (see Figure 10; see also, Schubert & Otten (2002). We assumed that lower levels of decentering would be reflected in a higher perceived overlap of food thoughts with the self. The FTOM served as a qualitative tool in the current study to further explore participants' experiences.

The interviewer explained to the participants that the pictures represent the distance between them and their food thoughts. They were asked to pick the picture that best represents how they related to their food thoughts during each of the food videos from 1 (complete overlap of circles) to 7 (maximum distance between circles), and to state the number next to the image that they have picked. The interviewer then probed the participants to explore their reasons for choosing this picture.



Figure 10 - Food Thoughts Overlap Measure (FTOM)

3.2.5 Procedure

All study sessions were conducted by RP (female, age: 22 years, referred to as the "interviewer") between June and July, 2020. They were done online using Zoom video communications software, audio-recorded using the interviewer's mobile device with participants' consent, and deleted after transcription. Both parties were in a quiet, private space, unless (minor) disruptions occurred. All sessions with interruptions (e.g., connectivity, doorbell) were resumed and completed. Both the interviewer and participants were at a personal residential setting during the interview. The sessions ranged from 36 to 71 minutes in duration (M = 51 minutes).

For an overview of the study procedure, see Figure 11. Participants were invited to take part in a study entitled, "Exploring experiences with food", between 12 noon and 7 pm. Qualtrics software (Qualtrics, Provo, UT) was used to deliver the information, consent and debriefing forms, to ask demographical questions, and to present audio instructions and food videos.

First, participants viewed the study information form to confirm again that they meet the inclusion criteria. Eligible participants read and signed the consent form. The interviewer emphasised that participants may leave the study or choose to omit any questions that they do not feel comfortable answering. The audio recording of the study session started once participants completed these forms. They were notified before starting to record.

Next, participants described their current levels of hunger and confirmed compliance with the fasting instructions. They listened to the normal viewing instructions. Then, participants were shown the first food video and asked to apply the instructions that they received while viewing the foods. Participants were interviewed about their experiences.

Next, participants listened to the decentering instructions. Participants viewed the second food video while applying the instructions. They were interviewed again and asked if there was anything else they wanted to share. They then provided demographic information (age, allergies for foods shown in the study), and were debriefed and thanked for their participation. The audio recording of the session stopped after the demographic questions, but before debriefing. Participants were notified when the recording had stopped.

The interviewer documented study experiences and reflexive thoughts as soon as possible after each session, and regularly discussed these with BT (see Appendix B, supplementary material 4; Langdridge, 2007; Lazard & McAvoy, 2020). The recordings were transcribed verbatim by RP (participants 1, 2, 3, 4, 7, 8, 10) and BT (participants 5, 6, 9), using pseudonyms assigned by RP. RP and BT cross-checked transcripts for participants 1-4 for quality assurance. Any discrepancies in transcription were discussed and resolved.

Since no personally identifying information was shared in any of the interviews, we did not redact information.





Dashed lines denote when the audio recording will start and end.

3.2.6 Analysis

Reflexive thematic analysis (TA) was used (Braun & Clarke, 2006, 2014, 2019; Clarke et al., 2016; Clarke & Braun, 2017). The data were analysed and managed using NVivo software (Mac version 12). Reflexive TA involves six phases: data familiarisation, initial code generation, theme search, theme review, theme definition and naming, and report writing (see, for example, Braun & Clarke, 2006). This analytic method is not restricted to a specific theory or epistemology (Braun & Clarke, 2006). Further, it is compatible with our critical realist approach. Critical realists explore tendencies in data, termed "demiregularities" (Danermark et al., 2019; Fletcher, 2017). Here, these demiregularities are identified as themes.

BT and RP individually performed phases one and two (i.e., code generation) of reflexive TA for four transcripts (participants 1-4). They then discussed the initial codes, including any discrepancies and duplicates (i.e., different code names for the same interpretation). Following initial coding, BT and RP completed coding and theme search individually for all transcripts. They collaboratively identified a thematic framework (phases three to five). All authors discussed and modified this framework to reach its final version (see Findings). See Appendix B (supplementary material 5) for a description of how we established trustworthiness.

Importantly, the aim of involving multiple researchers in the reflexive thematic analysis was to exchange, explore, and develop richer interpretations of the data, rather than to reach consensus or test coding reliability. Involving multiple researchers is an appropriate approach to conducting reflexive thematic analysis (e.g., Braun & Clarke, 2019, 2020; Byrne, 2021; for a worked example, see Jacob et al, 2022). This approach is characterised by coding that is "open and organic" (Braun & Clarke, 2020, p. 334), which is reflected in our discussion of codes and the collaborative thematic framework identification process.

3.3 Findings

We identified three themes from the data. Theme 1 captures the experiences of learning and the immediate application of the decentering instructions. Theme 2

captures the potential future daily application of these instructions. Theme 3 captures consumption and reward simulations associated with the food images shown to participants. For further descriptions of the themes and sub-themes, see Table 8.

Theme	Sub-theme	Essence of the sub-theme	Participants
1. Learning and	1.1 Specific factors	Factors (e.g., instructions	All participants
applying	and processes	that are appropriately	
decentering	facilitate learning of	challenging) and processes	
instructions	instructions.	(e.g., discussing the	
		instructions with the	
		interviewer) facilitate the	
		learning process.	
	1.2 Instructions	Food stimuli are viewed	All participants
	change the	differently (e.g., as less	
	experience of	tempting) when applying the	
	viewing the foods.	Instructions.	
	1.3 The application	Applying instructions was	2, 5, 7, 8
	fluctuator	enorthal and successful to	
	nucluales.	food stimuli	
	1 4 Normal viewing	The process of learning	2, 3, 4, 6, 7, 9, 10
	instructions increase	decentering may start with	2, 3, 1, 0, 7, 7, 10
	awareness, which	normal viewing, through an	
	may be experienced	increased awareness of	
	as mindfulness.	one's experiences.	
2. Potential daily application of decentering instructions	2.1 Instructions	If there is a perceived need	5, 6, 8, 9
	would be used based	to achieve a goal (e.g.,	
	on need.	losing or maintaining	
		weight), decentering may be	
		used.	
	2.2 Challenges are	It may be challenging to	1, 4, 5, 6, 7, 8, 9,
	anticipated.	apply the instructions in	10
		time)	
	2.3 Instructions may	The instructions may be	2 3 4 5 8 10
	be applied across	relevant and useful beyond	2, 3, 4, 3, 0, 10
	domains.	the domain of food (e.g., in	
		stressful situations).	
3. Consumption and reward simulations	3.1 Simulations arise	The re-experiences of eating	All participants
	spontaneously.	and enjoying foods arise	
		automatically.	
	3.2 Simulations vary	The intensity of simulations	1, 2, 4, 5, 6, 7, 9,
	in intensity.	varies based on contextual	10
		factors (e.g., current levels	
		of hunger) and personal	
)) The online study	Tactors (food preferences).	2 4 7 0 40
	3.3 The online study	Since they cannot be	3, 6, 7, 9, 10
	become a barrier	food images may be	
	against experiencing	nerceived as upreal	
	simulations	therefore not evoking	
	sinducions.	simulations.	

In the following section, we further illustrate each theme with supporting quotes. Where quotes are shortened, it was done so without changing the context and meaning.

3.3.1 Theme 1: Learning and applying decentering instructions

3.3.1.1 Specific factors facilitate learning of instructions

We identified several factors that facilitate the process of learning the decentering instructions. Compared to the normal viewing instructions, most participants found the decentering instructions appropriately structured and challenging, which were perceived as facilitative:

"I was definitely more focused the second time around because the first time, instructions felt this sounded very easy. Whereas the second time because I wanted that extra explanation, I was... I was a bit more focused than the first time around." - Tatiana (lines 440-442)

"I felt like... now... ehm I was asked to do something more specific rather than just look at them as you'd normally look at them, you know, and then I have to ask myself, 'How do I look at food?' and I, I didn't really know what to do. But in this case, I was told to... to look at them, and let thoughts come and go and you know, ground myself, so it was a bit more specific, I think." - Katie (lines 450-454)

Another facilitative process in learning the instruction was having clarifying discussions with the interviewer:

"I, I think probably I've got about 66.6% of it and you had to fill in the extra [laugh]. Ehm, because... yeah, I think, again, it was due to me, wondering about alternative modes of delivery. Ehm, instead of listening, so... I would say, yeah... two thirds of the way there, and you had to give me that extra third [laugh]." - Steve (lines 893-896)

Importantly, almost all participants grasped the rather abstract concept of decentering through the more concrete visual metaphor of the waterfall:

"I think the using the metaphor as a comparison really helps." - Tatiana (line 390)

"It was nice. Uh, the, the imagery was a bit more deep. So, I could, I could... more see like the waterfall in like a forest in front of me and uhm, as, as I described how you let yourself carry like, you can get carried away by the stream or step behind the waterfall like I could see, like, like in a movie sort of that happening." - Christina (lines 556-559)

3.3.1.2 Instructions change the experience of viewing the foods

Compared to experiences of normal viewing, applying decentering to the food stimuli changed participants' experiences of relating to the foods. The experiences ranged from feeling more in control and empowered to feeling less involved and letting go:

"Uhm... I felt like it was... I felt I had more control. I felt like I was looking at the food and I might want the food. I might not want the food, but I felt like I had more control as to whether I wanted it or not. I didn't feel as... uhm like unempowered to make a choice about the food. And the thought would come up, and I could let the thought pass and it felt like I had more of a choice in that." - Patricia (lines 439-443)

"I felt like I had a choice to think about, 'Okay uhm, if it it's coming up, that it feels delicious, but that thought is gonna come, that thought is gonna go'. So I didn't need to act on what think about the food because the thought is gonna come and the thought is gonna go." - Patricia (lines 449-452)

"So I'd usually say, 'Ooh, this is a burger'. And then I'd say, 'It's just a burger. It's just a picture of a burger. It's okay. It's just a burger'. You know not - instead of just - you know, 'It's a burger, oh it looks good, oh I could eat that, oh... what would I put on it if I had a burger?', or, you know. The first time around, I did think about these things. And now I was just thinking, 'Okay, that's a picture'." - Katie (lines 342-346)

"I was less... involved? / Uhm... I still felt, so for example that burger appeared and I'm like, 'Yeah, I'm hungry' [laugh]. 'I wanna, I want to, I want to eat something'. But, ... uhm like there was this, like I had to step back where because I was asked to notice that, as opposed to... uhm... limit, I don't know." - Eleanor (lines 409; 415-418)

3.3.1.3 The application of instructions fluctuates

The quality of experience when applying the decentering instructions fluctuated. This was primarily based on the aspect of the food experience that was most salient for the participants at a given time (i.e., thoughts such as food preferences, feelings or physical sensations). In other words, which facet of their experience participants applied decentering to continually changed, which then led to fluctuations in the quality of experience when applying decentering.

"Uhm... well, at first when I saw that first picture, I thought because I have so many thoughts, I felt a bit like, uff, so many I... thoughts rushing through. And then when I was slowing down I was... I gue-, I guess it was... at the very end there was a bit more emotion rather than a thought because I thought... when, when seeing the brownie, I thought, 'Oh my god, that must be like a 1000 calories in that one'. / And then when I saw burger, I thought 'Oh, I actually like other toppings on my burger'." - Tatiana (lines 309-313; 314-315)

3.3.1.4 Normal viewing instructions increase awareness, which may be experienced as mindfulness

Although the normal viewing instructions were intended as a control condition, they increased most participants' awareness of their current mental and physical state. Through heightened awareness, normal viewing might have played an active, metacognitive role in the process of applying decentering. In other words, since normal viewing was always presented first and decentering was always presented second, normal viewing might have brough food-related experiences to participants' attention, and participants might have applied decentering to these previously identified experiences.

"[normal viewing] made me more aware of my senses." - Eleanor (line 171)

"Uhm... so, since the [normal viewing] instructions... said to like look at the food nat.. like, like I naturally would... ehm... so, I tried to be like well, nat.. like how does that 'naturally' mean? Ehm, [pause] and... but I don't know if I still... paid more attention to the food... than if I would actually, like how I would naturally pay attention to food." - Elizabeth (lines 313-316)

For some participants, the experiences of normal viewing resembled their preconceived notions of mindfulness, especially around the cultivation of awareness. If normal viewing was indeed perceived as mindfulness, this may indeed suggest that the normal viewing instructions played an active role in the decentering process:

"And uh... it [normal viewing] did remind me a bit of, of meditation apps. It's... I had to close my eyes and then it was almost like the

story and it was inviting me to, encouraging me to... to, to look at these foods. It made me excited. It made me... look forward to seeing the pictures of the foods and looking at them." - Katie (lines 116-119)

"I think mindfulness is... in a way it's awareness, trying to be aware of the surroundings." - Katie (lines 640-641)

3.3.2 Theme 2: Potential daily application of decentering instructions

3.3.2.1 Instructions would be used based on need

Participants were confident that they would use the decentering instructions in their daily lives if they felt the need for it.

"Uhm... if I were, if I were trying to watch my food intake, yes." - Katie (line 602)

"I don't think I would just blanket sort of apply it to anything. But if I thought there was something that I personally didn't feel like I had control of or had control of me, I think I would remember this and be like, 'Well, actually, I can use this technique. And I can apply this if I want to'." - Patricia (lines 763-766)

3.3.2.2 Challenges are anticipated

Most participants expected challenges if they were to apply the decentering instructions in their daily lives. Specifically, remembering to apply the instructions was a common barrier:

"I think that just you need to... train yourself to... remember to think like that. So, whenever you see something, food, which has been presented to you, train yourself just to think of it in a different way. / I think it's just training, I think it's training. I don't think there's something you can do or, or something maybe a cue word which you can use, which will then trigger eh, something else." - George (lines 715-717; 723-724)

"I think when you're stressed, you're not very relaxed, very relaxed, relaxed enough in your stress. I'd have to do something that made me calm down first. Then to, to even remember, to remind me that I've done this and I know this, and then I'd have to apply it." - Patricia (lines 790-793)

Other challenges were the effort required to apply the instructions, finding the time, and being in the right broader stage of life to apply them:

"I just need to get started with it and you know, it's effort and it's time and yeah." - Christina (lines 875-876)

"Like, I would need the routine, the structure and the environment to make it stick. ... I like the idea of it. But I also... I, I... I think I would need to also find the right person and the right environment and the right kind of uh mantras and the right context. And that means the right times of my life, as well." - Patricia (lines 854-858)

3.3.2.3 Instructions may be applied across domains

When asked about the potential daily application of the instructions, some participants spontaneously brought up the possibility of applying them in domains other than food:

[in response to "Could you think of where or how you would apply it?"] "Ehm, Is it only about food? / well definitely about food. / but I guess with any kind of sensation or like, kind of... engaging with... like just... this idea of knowing how to like notice your thoughts and letting them go. Like that can work with anything really." - Elizabeth (lines 978; 984; 992-994)

"Just, I guess, (pause) just generally like (pause) could be applied to almost anything to uhm, (pause) not only when it comes to like some stressful situations when you're thinking really fast and you have to be like sharp like fast in your actions. You could maybe sometimes, you know when people say, 'You should think twice before you do something'." - Tatiana (lines 634-637)

3.3.3 Theme 3: Consumption and reward simulations

This theme was identified and interpreted through our main theoretical framework of the Grounded-Cognition Theory of Desire and Motivated Behaviour (Papies & Barsalou, 2015).

3.3.3.1 Simulations arise spontaneously

Simulations readily came up for most participants. The most salient features of these simulations were the taste and texture of the foods, and the context in which they would typically be consumed:

[normal viewing] "So, it was quite easy to imagine, you know, how the texture of eating them, the taste, uhm ... and... like the context of eating these food is quite usually pleasant. This is the kind of food

that you would eat with friends, probably. So, I don't know, there's like a nice feeling about it." - Eleanor (lines 108-111)

[decentering] "so same, same I had, you know, like textures and tastes, like thoughts of what it would taste like and feel like. Uhm... but I also had [pause] uhm [pause] yeah, and I had you know, I had the image of like being eating a burger at a, a place and enjoying it." - Eleanor (lines 427-430)

[normal viewing] "Ehm, well the chicken made me think of one of the cafes that I have been to in city centre and that serves a similar dish. So, it just made me associate that dish to that specific bar I've been to. - Tatiana (lines 54-56)

3.3.3.2 Simulations vary in intensity

Although all participants experienced simulations, the intensity of simulation varied as a function of participants' food preferences:

"I felt like the images of some of the food for me, the some of them the intensity was more stronger in terms of what was presented. And also in terms of the food looking like it was more uhm not inviting, but sort of the burger was more open, and there was the dessert had the sauce pouring down." - Patricia (lines 478-481)

"I first thought the, the carrot cake was quite fluffy but maybe a bit too sweet for... to, to have just now. And, and the chicken looked really good, the fried chicken. But then I thought, 'Maybe that's too much of a, of a meal or a big snack to have just now'. Then the waffles uh seem a great idea for breakfast [laugh]. Eh, nachos weren't that exciting, and the brownie looked really nice, but again, might be too sweet for now. That's what I thought." - Katie (lines 98-102)

3.3.3.3 The online study environment may become a barrier to experiencing simulations

Although most participants experienced simulations, the use of food images as stimuli rather than actual food became a barrier for some of them:

"And during the video, I didn't feel any feeling in looking at the food, probably because it was... an image and it wasn't real." - Olivia (lines 375-376)

"Well I think obviously, like I know it's just a visual. So it's not, you know, I know I'm not going to feel it. I know I'm not going to taste it." - Eleanor (lines 324-325)

"So, like I said before, it's a different environment. It's a different medium, so you're not smelling the food, you're not, you're not touching it. It's just it's one-dimensional." - Steve (lines 378-379)

3.3.4 Food Thoughts Overlap Measure (FTOM) as a tool for exploring decentering effects

The FTOM served as a self-awareness tool for participants to assess the distance between themselves and their food thoughts. Asking participants to rate and explain their perceived distance for both normal viewing and decentering sparked further discussion, including a comparison of the experience of viewing the foods while applying each of the instructions (e.g., subtheme 1.2). Some participants engaged in an elaborate thought process while providing their FTOM ratings:

[normal viewing] "I'm looking down between one and three at the moment. So, somewhere between there. And I'm gonna look more closely. So this is the first video, uhm... probably two. / Because the 'me' and the 'food thoughts' are overlapping somewhat. So there's an area of where there, the two elements are still independent, but there's overlap in the middle." - Patricia (lines 528-530; 536-537)

[decentering] "I'm looking between five and seven. And I'm just going to see, probably I'm gonna choose a six. So... I felt that myself and the thoughts were quite separate. So there was me and there was my thoughts and they were coming up and they were going. So they felt quite independent of each other. And I did definitely felt some, some distance. So greater than the four or five. And I'm gonna go with six." - Patricia (lines 545-549)

3.4 Discussion

This study was designed to provide an in-depth analysis of the personal experiences of learning to apply a decentering perspective to one's spontaneous response to attractive food images. Through thematic analysis of qualitative interviews, we identified three themes that describe how non-meditators learn and apply brief mindfulness instructions (Theme 1), how these instructions may be used in daily life (Theme 2), and the characteristics of the vivid and compelling consumption and reward simulations that participants apply decentering to (Theme 3).

The process of comparing the decentering instructions to the normal viewing instructions seemed key for participants' understanding, application, and evaluation of the decentering instructions. Compared to normal viewing, participants benefitted from the structure and challenging metacognitive contents of the decentering instructions. Also compared to normal viewing, applying decentering changed the way in which participants related to their experiences of food. This altered way of relating included feeling more in control over these experiences, as well as feeling more empowered, and less involved. These findings are supported by previous quantitative research that also show how decentering alters one's relationship to one's urges by decoupling motivation and behaviour (e.g., Bowen & Marlatt, 2009; Keesman et al., 2017).

The decoupling process implicated in decentering can prevent the automatic enacting of impulses, and provide space for more deliberate responding based on more conscious intentions. However, it is important to note that within Western contemporary settings, the decoupling of motivation and behaviour is often conceptualised and taught in a way that does not address ethics or "right mindfulness" (Monteiro et al., 2015; Purser & Milillo, 2015). Given an ethically neutral context, decentering could potentially provide space for acting on good as well as on bad intentions, with potentially harmful consequences (Monteiro et al., 2015). The decentering instructions presented here are intended to introduce an aspect of mindfulness to non-meditators, and to enable these individuals to manage unwanted food cravings in the context of an overall healthy relationship with food.

Importantly, the active role of the normal viewing instructions in participants' understanding and application of decentering was unexpected. Although normal viewing instructions were intended as a control condition, they seemed to actively facilitate the process of decentering, first by increasing participants' awareness of their current thoughts, feelings and physical sensations, and then by serving as a baseline to which participants compare the style, structure, and difficulty of the decentering instructions. This suggests that normal viewing may already have been perceived as a component of mindfulness, raising the question of whether normal viewing serves as an appropriate control condition for experimental research, especially for within-participant designs. This is also in line with findings suggesting that awareness ("attention monitoring") and

126

acceptance skills are key components of mindfulness that interact to improve various outcomes of health and wellbeing (Lindsay & Creswell, 2017). Acceptance skills (i.e., changing one's relation to one's experiences), closely relates to the concept of decentering.

Another factor that facilitated the learning and application of decentering was discussing the instructions with the interviewer/researcher, to clarify the meaning and goals of these instructions. The audio recording may have led to an initial understanding of the instructions, and the interviewer may have further scaffolded this learning. This is similar to qualitative research on the role of teachers in mindfulness courses, where participants emphasised the important role of a supportive teacher in their learning and engagement (van Aalderen et al., 2014). Specifically, they indicated that the teacher should be a compassionate role model who motivates them (van Aalderen et al., 2014). Similarly, participants in the Howarth et al. (2016) gualitative study indicated that the presence of someone knowledgeable was important while listening to the mindfulness recording. Participants found this to be reassuring and motivating. This may disadvantage online mindfulness studies or mindfulness applications, if the interaction with a researcher or teacher is absent. In this context, the model of Supportive Accountability may be relevant for providing human support during online mindfulness research and training (Mohr et al., 2011). This model highlights accountability (e.g., social presence, process focus) and legitimacy (e.g., expertise and trustworthiness of teacher/coach) as factors that are essential for promoting adherence to internet and eHealth interventions.

Finally, participants indicated that they found the visual metaphor of the waterfall helpful, particularly when learning the instructions. We included this metaphor in the instructions to better explain the abstract concept of decentering. This finding is in line with research showing that metaphors enable individuals to draw on previous experiences from concrete and familiar domains, while learning and making sense of abstract concepts (Jamrozik et al., 2016).

Together, these factors suggest a potential multi-stage process of learning brief mindfulness, much like manualised mindfulness-based interventions (e.g., Mindfulness-Based Stress Reduction; Kabat-Zinn, 1982). Specifically, our findings

suggest that one learns brief decentering through the key stages of (1) increased awareness (i.e., effects of normal viewing), (2) conceptual understanding of decentering, (3) receiving feedback from the interviewer (similar to mindfulness teachers), (4) developing further understanding of decentering, and (5) the use of metaphors to aid learning. All of these stages also feature in traditional interventions.

Further, participants were confident that they would use the decentering instructions in their daily lives, if they felt the need for it. This finding was directly linked to the characteristics of our sample, who were generally healthy participants without a restrictive diet and with no history of eating disorders. Most participants, however, expected to face challenges if they were to apply decentering in their daily lives, especially challenges with remembering to apply the instructions. This is different from Howarth et al.'s (2016) findings, where most patients reported that they do not anticipate challenges, due to the minimal time requirement of applying the instructions. Finally in the present study, when asked about the situations in which they would apply decentering, some participants spontaneously brought up domains other than food, such as stress. This may be related to the cognitive psychological concept of transfer of learning, where previous learning of mindfulness in one domain generalises to and facilitates its learning in a different domain (Salomon & Perkins, 1989).

Generally, participants seemed to understand what we intended to convey through the decentering instructions, and most of them benefited from it while viewing the video of attractive foods. While most participants fully understood the instructions after listening to the audio recording, some needed further guidance. Importantly, all participants correctly understood the instructions once they discussed it with the interviewer. This highlights the important role of the participant-researcher interaction in learning decentering, suggesting that a lack of interaction may impede learning for some participants. Overall, these findings elucidate key factors that contribute to learning and applying decentering. Some of these factors are part of the decentering instructions themselves (e.g., visual metaphors), while others relate to other aspects of the study (e.g., perceiving the control condition as mindfulness). Thus, our findings confirm that factors other than brief mindfulness may drive the effects or lack thereof shown in mindfulness studies. It would be important to critically evaluate the potential impact of these factors on study outcomes, especially during the stages of study conceptualisation and design.

In line with our theoretical framework of the Grounded Cognition Theory of Desire and Motivated Behaviour, the thoughts, feelings and physical sensations that participants experienced may be termed "consumption and reward simulations" (Papies et al., 2020). In this study, these simulations came up spontaneously. The most salient features of these simulations were the taste and texture of the foods, and the context in which they would typically be consumed. This is in line with previous work showing that tempting foods activate simulations, including simulations of an eating context (Papies, 2013).

One of the main limitations of this study was the online study environment. Although most participants engaged with the food images and experienced vivid simulations of consuming them, the use of online food images instead of actual food was a barrier for some. Further, participants were presented with a generic selection of tempting foods, which might not have catered to their unique food likes and dislikes. This means that the images might not have elicited the full extent or intensity of simulations that would arise if participants were presented with actual foods that were personalised to reflect their preferences. If so, it might have been easier to apply decentering here, as the experiences would have been less intense. A qualitative study that uses actual, personalised food stimuli would therefore be more informative, and would address potential concerns with the ecological validity of this study. At the same time, food cravings are often triggered by spontaneous, associative thoughts, in the absence of actual foods (Kavanagh et al., 2005). Therefore, understanding how people can apply mindfulness-based instructions in such situations has high ecological validity and practical value.

Another limitation of this study was the control condition used. Although the normal viewing instructions provided unexpected and provocative insights, they did not serve as an adequate control condition. Normal viewing was initially selected to control for potential expectancy effects, without resembling mindfulness too closely (Davidson & Kaszniak, 2015; Van Dam et al., 2018). However, normal viewing was perceived as if it was mindfulness by some participants, as some of its features (e.g., the reference to thoughts, feelings,

and physical experiences; the river metaphor) matched participants' pre-existing knowledge and assumptions around mindfulness. In the future, a different control condition might be used, although a control condition might be unnecessary and omitted altogether in studies like the present work. Regardless of the decision to include a control condition or not, it is important to recognise the difficulty of implementing adequate active control conditions, both in this study, and in general (Davidson & Kaszniak, 2015; Van Dam et al., 2018).

A final limitation was the gender imbalance in our sample. We recruited eight female and two male participants based on participants' interest in our study and their eligibility. However, the imbalance both in the level of interest and the final sample composition may suggest a self-selection bias. Indeed, preliminary findings suggest that women may be more interested in mindfulnessbased interventions than men (Katz & Toner, 2013). While gender differences were not a main focus of this study, it is important to note that male participants have been under-represented in mindfulness research more generally (Bodenlos et al., 2017), and inattention toward gender as a variable is a wider issue within the mindfulness and meditation literature (Hickey, 2010). Since there are mixed findings on gender differences in the effectiveness of mindfulness-based interventions (e.g., Katz & Toner, 2013; Rojiani et al., 2017), future research should be conducted with a gender-balanced sample. This may lead to meaningful between-gender qualitative comparisons of mindfulness experiences.

Future research should also explore how clinical or sub-clinical samples of emotional eaters and those with eating disorders learn and apply brief mindfulness. These samples may differ from a sample of healthy eaters, as they may have a more immediate and real need for improving their eating behaviours. Further, since most participants expected to face challenges when applying decentering in daily life, future research should investigate how different groups of individuals can most easily learn brief mindfulness, and apply it in their daily lives to spontaneously arising food cravings.

In conclusion, this study presents an initial qualitative account of the unique processes that are implicated in learning and applying brief decentering instructions for food cravings. These insights may influence how future

130

experimental studies are designed by emphasizing the value of allowing researcher interaction, of providing metaphors to aid learning, and of providing tools to increase awareness of one's experiences before applying decentering. It may also inform the development of simple, accessible, and effective mindfulness techniques, which may be suitable for integration into daily life, as well as clinical practice.

3.5 Acknowledgements

We would like to thank Lara Wehbe for her useful feedback on the interview schedule.

3.6 Declarations

3.6.1 Funding

This work was partially supported by the Carnegie Trust for the Universities of Scotland (Vacation Scholarship; awarded to RP). This funding source had no involvement in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

3.6.2 Ethical approval

The study was approved by the University of Glasgow College of Science & Engineering Ethics Committee (Date: 10 June 2020; no: 300190247). The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Chapter 4 "It's still there, but it doesn't have as big of an effect on me": Qualitative findings on experiences of applying brief decentering mindfulness in the context of COVID-19 anxiety

This chapter is an exact copy of the following preprint manuscript:

Tatar, B., Pázmányová, R., & Papies, E. K. (2022, May 21). "It's still there, but it doesn't have as big of an effect on me": Qualitative findings on experiences of applying brief mindfulness in the context of COVID-19 anxiety. https://doi.org/10.31234/osf.io/r7myb

4. Abstract

Brief mindfulness-based interventions have received great research attention. However, quantitative studies do not provide in-depth accounts of how brief mindfulness is experienced. In this qualitative study, we explored how nonmeditator undergraduate students learn a brief decentering mindfulness strategy, and apply it to anxiety-provoking aspects of COVID-19. We conducted five focus groups (16 participants). Participants identified an aspect of the pandemic that makes them feel anxious, and engaged in a moderated discussion. They learned a brief decentering strategy, applied it to their aspect, and engaged in another discussion. We conducted reflexive thematic analysis, identifying five themes. Participants found learning the strategy effortless. Applying the instructions altered their relationship to their experiences, where they perceived anxiety-provoking aspects as transient. The metaphor of the waterfall facilitated this process, but participants experienced challenges such as mind-wandering. Participants reported calming effects of applying the instructions, experiencing it within the collective setting of the study. Lastly, participants reported confidence in applying the instructions in the future, particularly for short-term relief. Our findings illustrate various features of the process of learning and applying a brief decentering strategy. Understanding these features is essential for developing effective brief techniques that target distressing daily life situations, including beyond the pandemic.

Keywords: mindfulness, decentering, COVID-19, anxiety, qualitative research, thematic analysis

4.1 Introduction

Mindfulness may benefit individuals during times of distress (Antonova et al., 2021). Indeed, mindfulness-based interventions ranging from 8-week programmes (e.g., Mindfulness-Based Stress Reduction; Kabat-Zinn, 1982) to brief practices of a few minutes have emerged as promising tools in the domain of mental health for alleviating stress and anxiety (e.g., Goyal et al., 2014; Khoury et al., 2013). The interest in brief mindfulness techniques may be related to a need for simple strategies for improving health and wellbeing that are accessible to novice meditators who are practicing mindfulness for the first time, and compatible with individuals' busy daily lives more generally. Howarth and colleagues (2019) conducted a systematic review on brief mindfulness-based interventions, where 93% of the studies reported improvements in health-related outcomes (e.g., depression, stress, emotion regulation). Brief mindfulness may also be a beneficial strategy in the context of the COVID-19 pandemic, which already negatively impacts mental health (Arora et al., 2020; Jia et al., 2020; O'Connor et al., 2020), and may engender long-lasting psychological consequences (Brooks et al., 2020).

Brief mindfulness-based interventions received much research attention in the recent years. Although some qualitative and mixed-methods studies have been conducted (e.g., Keyworth et al., 2014; Luberto et al., 2017), the majority of brief mindfulness research used quantitative methods (for systematic reviews, see Howarth et al., 2019; Jiménez et al., 2020). While quantitative studies are essential for elucidating general group effects of brief mindfulness practices, they are not designed to gather in-depth data on individual participants' experiences of learning and practicing brief mindfulness. In other words, and as argued previously for the domain of food cravings (Tatar et al., 2021), quantitative research does not answer the following critical questions: When brief instructions have group-level effectiveness, which individual experiences account for this finding? Alternatively, when brief instructions do not demonstrate group-level effectiveness, what psychological processes do each of the participants experience? In the present qualitative study, we studied this in the domain of pandemic-related anxiety. Specifically, we explored how nonmeditator first and second-year undergraduate students in the United Kingdom learn brief decentering mindfulness instructions and apply it to anxietyprovoking aspects of the COVID-19 pandemic. We focused on university students because they have been identified as a particularly vulnerable group that face challenges associated with transition to adulthood and university, even in the absence of COVID-19 (Auerbach et al., 2016).

The COVID-19 pandemic has significant immediate mental health consequences. A systematic review and meta-analysis by da Silva and colleagues (2021) included studies from eight countries and reported a 46% pooled prevalence of anxiety symptoms during the pandemic. Similar findings have been reported with UK samples (Fancourt et al., 2020; O'Connor et al., 2020; Smith et al., 2020), suggesting that symptoms of anxiety during this time period significantly exceeded previously reported population norms (Jia et al., 2020). Being female and of younger age are associated with anxiety and depression during COVID-19 (Castellano-Tejedor et al., 2021; Hyland et al., 2020; Jia et al., 2020; Smith et al., 2020). In addition, those who are concerned about the future (Castellano-Tejedor et al., 2021), in a recognised risk group for COVID-19 (Jia et al., 2020), and with higher perceived risk of infection (Hyland et al., 2020) are at higher risk of experiencing the negative social impact of the pandemic.

Starting university studies is an anxiety-provoking time, even without the unique challenges of COVID-19. Students need to navigate new environments and social networks, while also managing a heavy academic workload and oftentimes financial difficulties (Macaskill, 2013; Scanlon et al., 2007). Mental health problems are common amongst the undergraduate student population (Auerbach et al., 2016; Macaskill, 2013), and continue to rise. The last 10 years have been characterised by a dramatic rise in the proportion of students who disclose a mental health condition to their higher education institution, with a higher demand for counselling services (Thorley, 2017). In the case of first-year students, there has been nearly a fivefold increase in rates of disclosure (Thorley, 2017), while other research suggests that anxiety is highest in the second year of studies (Macaskill, 2013). This literature overall speaks to the mental health challenges of time at university.

Based on initial findings, the COVID-19 pandemic aggravated students' anxiety. In a sample of Chinese medical school undergraduates, 24.9% of the participants experienced mild-to-severe anxiety due to the pandemic (Cao et al., 2020). In a sample of French first-year undergraduates, 60.2% indicated that their levels of anxiety have increased during the pandemic (Husky et al., 2020). These findings suggest that university students are greatly vulnerable to pandemic-related anxiety. It is therefore important and timely to study mental health of students in the context of the COVID-19 pandemic, and to develop effective interventions that promote wellbeing.

The most popular Western definition of mindfulness is, "the awareness that arises by paying attention on purpose, in the present moment, and nonjudgmentally" (Kabat-Zinn, 1994). Although a standard definition of 'brief mindfulness interventions' is lacking in extant literature, an intervention may be considered brief if it is of "a duration of 30 minutes or less on any one occasion" (Howarth et al., 2019). Many brief interventions feature a component of mindfulness called *decentering* (also called: cognitive defusion, mindful attention, urge surfing; Bowen & Marlatt, 2009; Lutz et al., 2015; Papies et al., 2015). Decentering is a metacognitive insight into the nature of one's thoughts, feelings and reactions to physical sensations (Safran & Segal, 1990). When one adopts a decentred perspective, one views these experiences as transient mental events, rather than as objectively real or permanent. Using one of the "modifiable" risk factors of COVID-19 as an example (Jia et al., 2020), one may easily get caught up in feelings of loneliness (i.e., "I am lonely"). If one adopts a decentred perspective, one may start perceiving this feeling differently, becoming aware of its impermanence (i.e., "I am having the feeling that I am lonely, and this feeling will pass"). This shift in perspective has been described as the "meta-mechanism" that brings about the effects of mindfulness practice (Shapiro et al., 2006). In the present work, we consider decentering to be a (mechanistic) component of mindfulness, but also a perspective that can be cultivated through targeted instructions (i.e., a brief decentering strategy).

Numerous quantitative studies have demonstrated the association between decentering and reduced negative affect (e.g., Fresco et al., 2007; McCracken et al., 2013; for an overview, see Bernstein et al., 2015). It has been suggested that decentering brings about this effect by decoupling the relationship between internal experiences and behaviour (Bowen & Marlatt, 2009; Feldman et al., 2010; Keesman et al., 2017; for a review, see Levin et al., 2015). Decoupling refers to the process where the "normative relationship" between two internal experiences (e.g., thoughts and feelings) or an internal experience and a behaviour (e.g., negative affect and avoiding certain people or places) is "reduced, eliminated, or altered" (Levin et al., 2015, p. 871). In other words, decoupling is a change (i.e., reduction/elimination/alteration) in the association between internal experiences and behaviour (for examples, see Elwafi et al., 2013; Gilbert & Christopher, 2009; Gutiérrez et al., 2004). For instance, Feldman et al. (2010) compared the effects of a mindful breathing technique to progressive muscle relaxation and loving-kindness meditation. Participants in the mindful breathing condition reported higher levels of decentering compared to the other two conditions. The association between repetitive thoughts (e.g., rumination) and emotional reactivity to these thoughts was weaker in the mindful breathing condition compared to the other two conditions, suggesting a decoupling effect. This suggests that indeed decentering may change one's relationship to mental experiences. However, it is unclear how participants experience this decoupling process, moment-by-moment.

A limited number of qualitative studies have been conducted on brief mindfulness interventions. For instance, in an interview and focus group study, Howarth et al. (2016) found that chronic illness patients received a brief body scan intervention well. Further, Tatar et al. (2021) examined how a non-clinical sample of non-meditators applied a brief decentering strategy to their food cravings. These studies offer rich, first-person accounts of participant perceptions and experiences that can most readily be accessed through qualitative research. In the present study, we conceptually replicate and build on these findings in a different domain and with a slightly different methodology, using focus groups to assess how non-meditator UK university students learn brief decentering instructions, and how they experience applying these instructions to anxiety-provoking aspects of the COVID-19 pandemic.

4.2 Method

We consulted the 32-item checklist of the Consolidated Criteria for Reporting Qualitative Research (COREQ; Tong et al., 2007) when reporting the methods, findings, and analysis of this study.

4.2.1 Study design

This research had an exploratory case study design (Yin, 2009). Participants identified an aspect of the COVID-19 pandemic that makes them anxious, and applied the decentering instructions to this. We conducted five focus groups, with 3-5 participants in each. This sample size was determined based on recommendations for sample and focus group size for a small project (Braun & Clarke, 2013), the estimated number of focus groups needed to reach 90% thematic saturation (Namey et al., 2016), and resource and time limitations.

We chose focus group methodology for its 'hallmark' emphasis on group interaction (Smithson, 2000), which allowed us to tap into the collective sensemaking processes of the groups and to explore how ideas were co-produced within a specific cultural context (Kitzinger, 1994). The emerging 'public' discourse may not be representative of all the 'private' voices in the group. However, what may have been left unsaid in the group context is equally interesting and valuable as what has been expressed strongly.

This study was approved by the University of Glasgow Ethics Committee. Preregistration is relatively new within qualitative research (Haven et al., 2020; Kern & Gleditsch, 2017; Haven & Van Grootel, 2019). We decided to preregister this study because we perceive this as a useful tool for transparently and systematically recording our research process. See the Open Science Framework (OSF; https://osf.io/pagjm/) for the preregistration and all data and study materials.

4.2.2 Participants

We recruited 16 students at the University of Glasgow (13 female, 2 male, 1 nonbinary; age range: 17-25). Further demographic information is available in Appendix C (supplementary material 1), including participants' year and programme of study.

For the first three focus groups, participants were recruited based on the inclusion criteria that they are from the United Kingdom or Europe, are a first-year undergraduate student, are currently living in the UK and away from their parents' or carers' house, and experiencing some anxiety around the COVID-19

pandemic. Participants were excluded if they had a past and/or current formal meditation practice, or were using mindfulness apps at least once a week. They were also excluded if they had any psychological, psychiatric or neurological conditions (e.g., anxiety disorders), or any learning disabilities.

When recruiting for the fourth focus groups, two of the inclusion criteria were amended. Specifically, students who are currently living in their parents' or carers' house became eligible to take part. This was due to the third national lockdown in the UK, when most students were prohibited from traveling to their term-time accommodation. Further, we experienced challenges with recruiting eligible first-year students, as most of them had prior meditation experience. Therefore, we recruited second-year undergraduate students as well. Since most undergraduate students were engaging in online learning, and the face-to-face aspects and challenges of starting university were no longer relevant, these changes did not seem to have introduced undesirable sample heterogeneity.

Although participants were carefully pre-screened based on the inclusion criteria, three participants disclosed ineligibility during the focus group. Participant 12 (Focus Group 3) had previous meditation experience, Participant 53 (Focus Group 4) did not fulfil the nationality criteria, and Participant 82 (Focus Group 4) was residing outside of the UK at the time of the study. Following extensive discussions amongst all authors and based on the significant meaningful contributions that these participants have made within their group, we decided to include their data in our analyses.

Participants were recruited with criterion sampling, through online social platforms (e.g., Twitter) and the University of Glasgow Psychology Subject Pool. Participants received either course credit or a gift voucher worth £6 for their participation. Researchers knew two participants prior to the study. BT knew Participant 26 (Focus Group 1) through her work as a Graduate Teaching Assistant, but had not worked directly with the student. RP knew Participant 14 (Focus Group 4) from a University student society, but did not hold a close relationship with them. BT and RP discussed the potential implications of these relationships, concluding that neither focus group dynamics nor study findings were affected.

4.2.3 Focus group guide

We developed the focus group guide by reviewing the relevant interview and focus group studies on both brief mindfulness and longer mindfulness interventions that include decentering as a component (for example, Chittaro & Vianello, 2016; Howarth et al., 2016). We also consulted the literature in domains other than anxiety, such as chronic pain, depression and food cravings. BT and RP formulated a preliminary focus group guide with questions aimed at exploring experiences of learning decentering and applying it to pandemic-related anxiety. EKP provided feedback on the guide. BT and RP refined the guide, pilot tested it with a group of six undergraduate students, and refined it further.

The final semi-structured focus group guide consisted of open-ended questions that were asked in all focus groups, and probing questions that the moderator (RP) optionally asked if they were relevant to the flow of the discussion. In some instances, RP also asked spontaneous follow-up questions based on group discussions. Importantly, given this was a focus group study, our intention was to stimulate and maximise interaction. Participants were encouraged throughout the focus group to engage in discussion with each other, rather than responding directly to the moderators.

When participants identified an anxiety-provoking aspect, we asked them about their process of identifying this aspect and their experiences of the aspect more generally. After applying the brief decentering strategy, participants shared their (1) experiences of learning, understanding, and applying the strategy, (2) potential future use of decentering, and (3) pre-existing understanding of mindfulness and meditation. We also engaged participants in a short exercise in which they gave a title to the decentering instructions. See Appendix C (supplementary material 2) for the full focus group guide.

4.2.4 Focus group moderators

Both RP and BT were present during all focus groups. RP is a 22-year-old female final year undergraduate student in Psychology. She was the main moderator who led all group discussions. BT is a 28-year-old female PhD researcher and

trainee counsellor. She was responsible for notetaking and technical support during the focus groups. Both moderators documented their reflexive experiences as soon as possible after each focus group, using a framework inspired by Langdridge (2007) and Lazard and McAvoy (2020). See Appendix C (supplementary material 3) for these reflexive accounts.

The influence of moderators' actual or perceived qualities on focus group behaviour has been explored previously (e.g., Smithson, 2000). Here, RP's student background may have been advantageous in building a rapport with the participants. However, as a novice moderator, the probing and follow-up questions that she asked might have had a different impact on group responses than an experienced moderator's question might have.

4.2.5 Materials

4.2.5.1 Aspect identification instructions

Participants were asked to identify an aspect of the pandemic that makes them feel anxious when they think about it today, and to spend two minutes writing about this aspect on a piece of paper. We suggested that this may be a situation they found themselves in (past-oriented) or something that they are afraid of (future-oriented). As examples, we mentioned changes in their living arrangements and studies. Participants were invited and encouraged, but not required to share details of their aspect.

4.2.5.2 Decentering instructions

The decentering instructions were presented to participants as a 5-minute audio recording that was narrated by Kate Bowles (female, age: 22). To prevent demand effects, the instructions did not include the terms "mindfulness" or "meditation". Using the same instructions as Tatar et al. (2021) while adapting them to the topic of the COVID-19 pandemic, participants were asked to observe their pandemic-related thoughts, feelings and physical experiences "as transient mental events that come up and go away on their own" (p. 4). This process was likened to a waterfall, where the stream of water represented one's stream of thoughts. Participants were reminded not to resist the stream or pretend that it does not exist, but instead to "step behind the waterfall" and "look at all the

water that is passing by". To check comprehension, one participant was asked to volunteer a verbal summary of the instructions. RP then repeated the key details of the instructions. Participants were given an opportunity to ask further questions. See Appendix C (supplementary material 4) for the full script and audio recording of the instructions.

4.2.6 Procedure

The focus groups were held between November 2020 and February 2021, using Zoom video communication software. The study was advertised with the title, "exploring experiences with anxiety-provoking aspects of COVID-19". Qualtrics software (Qualtrics, Provo, UT) was used to check participant eligibility, collect demographic information and obtain informed consent. Sessions were audio-recorded and lasted ca. one hour. Moderators and participants attended the focus group from a quiet and private space, without any major interruptions.

Participants were reminded of the confidentiality of the group, and their right to withdraw during or any time up to two weeks after the session. Participants engaged in two moderated discussions within the same session; once after identifying an anxiety-provoking aspect and again after applying the decentering instructions to this aspect. At the end of the focus group, they were given an opportunity to share any additional thoughts. Finally, participants were debriefed and thanked for their contribution. A written debriefing that included mental health resources was sent to participants afterwards.

RP transcribed all recordings. BT conducted quality assurance checks for all transcripts. RP and BT discussed and resolved any discrepancies in transcription. We redacted any information that may be personally identifying such as specific nationalities and names of student societies.

4.2.7 Data analysis

We conducted reflexive thematic analysis (TA; Braun & Clarke, 2006, 2014, 2020; Clarke & Braun, 2017). We used NVivo software (Mac version 12.6.1) as a data management tool to support our analyses (Maher et al., 2018). The six-phase framework of reflexive TA involves familiarisation with the data; generating initial codes; searching for, reviewing, defining and naming themes

(see Braun & Clarke, 2006). Themes were generated through an inductive process, without a predetermined coding frame.

Since TA is theoretically flexible as a "generic method" (Braun & Clarke, 2019), it was possible to adopt a critical realist epistemological stance. In the critical realist approach, the world is "theory-laden, but not theory-determined" (Fletcher, 2017). In other words, all theories provide knowledge, but some theories better capture reality than others (Danermark et al., 2019). Further, critical realists look for tendencies in data, rather than laws (Fletcher, 2017). These tendencies are termed "demi-regularities", and can be identified by coding qualitative data. Here, they are identified as themes.

We are aware that focus group data is often analysed and presented in the same way as interview data (Wilkinson, 1998). However, since the context of and interaction within the focus group "produces" the data (Morgan, 2010), it has been highlighted that analysis may also need to take group dialogue into consideration (Grønkjær et al., 2011; Halkier, 2010; Morgan, 2010). Here, within our analysis, we focused on the interactive nature of data where relevant. While we treated the group as the main unit of analysis, we also paid attention to individual participant voices. Since group interaction was not a particularly salient feature of this study, we did not fully adopt a conversation analysis to explore the action orientation and sequential context of participant responses (Greatbatch & Clark, 2018). The analysis of interactional data was not preregistered (see Appendix C (supplementary material 5) for summary findings).

For the first two focus groups, BT and RP conducted phases one and two of reflexive TA individually (i.e., data familiarisation, code generation). They then discussed their initial codes in a reflexive way and identified an initial, yet flexible thematic framework. The aim of this discussion was to explore potentially different interpretations of the data to ultimately develop a collaborative understanding of it, rather than to reach a consensus or test coding reliability. Involving multiple researchers is a valid and appropriate approach to conducting reflexive TA (Braun & Clarke, 2019, 2020; Byrne, 2021; for a worked example, see Jacob et al., 2022), where the coding and interpretation process is
"open and organic" (Braun & Clarke, 2020, p. 334) rather than fixed and structured.

Following initial discussions, BT and RP continued generating codes for all focus groups. EKP provided feedback. BT then further analysed the data through an interactional perspective. BT and EKP discussed, refined, and finalised the thematic framework. See Appendix C (supplementary material 6) for a discussion of how we ensured trustworthiness of our research.

4.3 Findings

We identified five main themes from the data. Theme 1 captures experiences of learning the brief decentering strategy. Theme 2 illustrates how decentering changes the way individuals relate to their experiences through metaphors, and Theme 3 explores the main challenges of applying the decentering strategy. Theme 4 contextualises decentering experiences in relation to both feelings of calmness and the group setting in which decentering is learned and applied. Lastly, Theme 5 summarises participants' thoughts on applying the decentering strategy in the future.

Since the themes are closely linked to the anxiety-provoking aspects that the participants have identified, first we briefly illustrate these aspects. Then, we explore each theme in turn, using supporting quotes.

4.3.1 Anxiety-provoking aspects of the COVID-19 pandemic

See Table 9 for summaries and key quotes of the anxiety-provoking aspects that participants identified. Where a quote was shortened, we ensured that its meaning was not altered or decontextualised. We used the following convention when referring to quotes: "Focus Group Number, Participant ID, Line Numbers" (e.g., FG1, P10, L100-102).

Since we did not have direct access to the aspects that participants wrote down, some aspects were inferred from the conversation. Further, it was evident that some participants had written down an aspect, including aspects that have been resolved, but they applied decentering to another aspect (e.g., FG1, P6). Yet others may have changed the aspect that they were focusing on, as a result of

the discussions that took place within the group before applying decentering. Finally, some participants had identified multiple aspects (e.g., FG2, P71; FG3, P97). Thus, the overview in Table 9 should be treated as a general impression of anxiety-provoking aspects of the pandemic identified by participants, as closely informed by the data as possible.

In sum, most of the anxiety-provoking aspects centred around uncertainty, restrictions, hopelessness, and/or loss. The critical issues that came up were the travel restrictions, long-term consequences of the pandemic, loss of meaning of past or current priorities, uncertainty of the present moment, uncertainty of the future, and a sense of lack of control.

 Table 9 - Anxiety-provoking aspects of the COVID-19 pandemic that participants have identified

Focus group	ID	Summary of aspect	Key quote (Line number)
1	6	Resolved uncertainty around A-level results and getting into university; uncertainty around traveling home	"I'd already found out that I hadn't gotten into the, my chosen university, which was like [laugh], like, it's all that I'd work myself up for. [] And I was like, resitting my A-levels, and so it was like a really, really hard time." (L127- 132) Applied decentering to: "[] I don't know whether or not I'll be able to get home." (L303)
1	26	Inability to travel to and support ill family member who lives abroad	"[] just over a year ago, my mom was diagnosed with early onset Alzheimer's [] a lot of my anxiety has been coming from knowing that she's alone at home, and I can't really go back and help her with that." (L201- 205)
1	86	Resolved distress around uncertainty of friends getting into university; uncertainty around traveling home	"Like [my friend] didn't know exactly where she was going to uni until like, a week or so before. Ehm, which was quite stressful for her. And then obviously, like speaking to all of them about it, kind of like like stressed me []" (L165-168) Applied decentering to: "[] like being able to go home and like, see my family and stuff." (L279-280)
1	50	Resolved uncertainty around getting into university; long- term consequences of pandemic	"Like, I didn't get into uni until like, literally like four days before we started." (L149-150) Applied decentering to: "[] nothing is ever gonna be how it was once []" (L319-320)
1	56	Resolved anxiety around household that tested positive for coronavirus; not anxious at present	"[] four of my flatmates got coronavirus, which is when we started to become quite anxious in the flat []" (L180-181) "[] I'm like fortunate enough to not really suffer that much with like, anxiety." (L362- 363)
2	92	Not disclosed	None
2	75	Catching coronavirus	"[] I have asthma. So, I do get a bit nervous about going outside. And like seeing other people because I think 'Oh this could go really badly if I did get it'." (L163-165)
2	71	Loss of meaning of previous priorities; guilt about negative feelings	 "[] it's reset of priorities. Like what seemed important earlier, suddenly is almost meaningless." (L383-384) "[] I am interested in working in entertainment in the future. And that feels like something so trivial and unimportant in a time like this." (L388-389) "[] I also feel bad for feeling bad about that, because I'm like, 'there's other people that are suffering way more than this'." (L391-392)

3	79	Worry about family members	"And I like, really worry about my like family, especially that my grandparents who are both in their 90s." (L179-180)
3	97	Long-term consequences of pandemic; police control during lockdown	"[] when life will be normal again. Like even like the repercussions of all of this, like, unemployment and stuff." (L140-141) "[] how much control the police have. Like, I feel like they don't have a right to just like, barge into your house if you've got like your granny over cuz that's like, technically not allowed." (L144-146)
3	12	Worst-case scenario thinking	"It's kind of the worst-case scenario, really." (L128)
3	83	COVID-19 cases and deaths	"[] the daily case numbers like how much we're progressing eh, how much the virus is taking away people." (L168-169)
4	15	Lack of control; hopelessness; fear	"Like, there's nothing I can do about it. So I just feel hopeless and scared." (L162-163)
4	82	Uncertainty of current situation	"[] I've literally wrote down 'the uncertainty of the situation'." (L169-170)
4	14	Loss of meaning of current activities; decrease in performance	"[] when I think about the future, I feel like the things I'm doing right now are pointless, because cuz of the situation, I can't do things as good as I could do them before." (L186-187)
4	53	Lack of control and uncertainty of future	"[] you feel less, you have less control over your future, cuz you can't plan, you don't know what's going to happen." (L179-180)

Note. In this and all subsequent tables, [...] denotes text that has been removed to present data concisely without altering its meaning, and ... denotes a short pause in the participant's speech.

4.3.2 Themes

In this section, we summarise the themes and associated sub-themes, illustrating them with supporting quotes. Most quotes are from a single participant. In addition, where relevant, we have quoted conversations over multiple speaking turns, indicated with a *[sequence start/end]* symbol. See Table 10 for an overview and brief descriptions of the themes and sub-themes.

Table 10 - Overview	of themes	and sub-themes
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Theme	Sub-theme	Essence of the theme/sub-theme
1. Accessible learning of decentering		The decentering instructions were mostly perceived as clear and easy to learn.
2. Changing one's relationship to experience through metaphors	2.1 The decentering instructions changed the way participants related to anxiety-provoking aspects of the pandemic	The anxiety-provoking aspects were perceived as transient and less overwhelming while applying decentering.
	2.2 Importance of visual metaphors	The waterfall metaphor facilitated the process of applying decentering.
3. Challenges to applying decentering	3.1 The beginning is the hardest	Applying decentering was a dynamic process, where the beginning was perceived as the hardest phase.
	3.2 Effortfulness and mind- wandering	It was effortful to apply the instructions and mind-wandering was a common experience.
	3.3 Misunderstanding decentering	The lack of a metacognitive understanding of decentering was associated with challenges in applying it.
4. Experiencing decentering in context	4.1 Feeling calmer	Both learning and applying decentering were associated with feelings of calmness. The calming effects might have been due to the contents or other properties of the decentering audio recording.
	4.2 Collective experiencing	The act of sharing pandemic-related anxieties within the group shifted the assumption that the struggles are unique to each individual.
5. Confidence in future application	5.1 Perceived self-efficacy of applying decentering in the future	Participants anticipated using decentering in the future, despite challenges.
	5.2 Applying decentering for short-term relief	Decentering was perceived as useful for short-term relief, and across various domains (e.g., job interviews, falling asleep).

4.3.2.1 Theme 1: Accessible learning of decentering

The majority of the participants found the process of learning decentering to be effortless (e.g., FG4, P53; see Table 11). Although, participants perceived the contents of the instructions as clear and straightforward, some brought up the contrast between the ease of *learning* the instructions and the challenges

148

associated with *applying* them to anxiety-provoking thoughts (e.g., FG2, P75). See Theme 3 for a further description of this point.

Some participants identified the metaphor of the waterfall within the decentering instructions as a key factor that facilitated the learning process (e.g., FG1, P6). Importantly, although some participants mentioned the metaphor while discussing their experiences of learning decentering, the visual imagery of the waterfall seemed more salient in relation to *applying* decentering (see sub-theme 2.2).

While the majority of participants perceived the process of learning decentering to be easy and straightforward, some participants found it to be challenging (e.g., FG4, P15). The same instructions were therefore perceived to contain the right amount of information (e.g., P75: "there wasn't too much information like chucked at you at the one time") or too much information (e.g., P15: "it was just a lot of new things).

Further, in some cases, the researchers identified a mismatch between participants' perceived learning experiences and the actual learning that was expected to take place from a theoretical perspective. For instance, P50 (FG1) shared that she had a positive learning experience (see Table 11). However, from her later responses, it was inferred that she had not understood decentering as the key metacognitive concept that was presented in the recording. Therefore, P50 may have misunderstood the target of the decentering instructions. While she may have the expectancy that a decentred perspective would resolve a problem (P50: "but you can't be like 'This problem is gonna go away'"), the true target of decentering would be the thoughts and feelings about the problem (i.e., "I am having the thought that this problem won't go away, and this thought will pass"). In other words, this participant did not seem to understand the subtle yet essential difference between acknowledging the transience of her thoughts about an issue, and trying to view the issue itself as transient, where the latter is not always true or possible. In that sense, this participant's experiences also highlight the scope and limitations of decentering mindfulness more generally, as it is not designed to tackle all problems.

Table 11 - Supporting quotes for Theme 1

(Accessible learning of decentering)

Key idea	Quote
Learning as effortless	When responding to, "How much effort did it take for you to understand and learn this strategy?":
	"Not much. It was quite clear." (FG4, P53, L642)
	"Yeah, I got it pretty much immediately I think." (FG4, P82, L645)
Instructions clear and straightforward	"Yeah, there wasn't too much information like chucked at you at the one time. It was very simple, very ehm, thought out and clear. [] it took me a little bit of time to figure out how to apply it to myself. But apart from that, it was easy to understand the benefit []." (FG2, P75, L476-479)
Waterfall as a key factor	"I think like before, like, they brought up the waterfall and stuff, I've kind of found it like hard to concentrate on it. Cuz, I couldn't, there was nothing to really like, visualise. So, I think after, I could start visualising something like the waterfall, the picture, then it was easier to concentrate on and work through." (FG1, P6, L563-566)
Learning as challenging	"I thought it was a bit like almost too much towards the end. [] It was just a lot of new things rather than saying the same concept again. If you know what I mean? So, I felt a bit overwhelmed trying to follow, personally." (FG4, P15, L622-626)
Case study: Participant 50	<i>Positive learning experience:</i> "I thought it was pretty clear. [] I like understood the concept of exactly what she was saying." (FG1, P50, L536-537)
	<i>Misunderstood decentering:</i> "So then how are you meant to be like, 'Oh, this is gonna' I mean, of course, you can say like, 'This moment is gonna pass', but you can't be like 'This problem is gonna go away', because sometimes you literally just feel anxious for no reason" (FG1, P50, L835-837)

4.3.2.2 Theme 2: Changing one's relationship to experience through metaphors

4.3.2.2.1 The decentering instructions changed the way participants related to anxiety-provoking aspects of the pandemic

Participants experienced changes in the way that they related to their aspects while applying decentering. For instance, P79 and P12 in FG3 discussed the process of "standing away from" their thoughts, and how their thoughts started to have "less power" over them (see Table 12). Participants expressed similar experiences in other focus groups as well (e.g., FG1, P26). In other words,

although thoughts and feelings were still present, participants developed a different, decentred relationship to them.

Sub-theme	Focus	Quote
2.1:		[sequence start]
changed the way one related to		P79: [] at the beginning, it was like, it felt like, quite hard to imagine, like standing away from it. But like, as as I got used to it, it made me feel a bit better.
anxiety- provoking aspects of the		P12: Kind of building off from what [name of participant 79] was saying, it did kind of feel like it had like less power or strength. It didn't feel so impending, really.
pandemic		[sequence end] (FG3, L311-320)
		"Yeah like, like I wouldn't I would feel maybe less emotionally and physically overwhelmed. Just like it's still there, but it's doesn't have as big of an effect on me." (FG1, P26, L700-701)
2.2:	Metaphor titles for	"Metaphorical meditation" (FG1, P86, L661-662)
Importance of	decentering	"Waterfall Method" (FG2, P92, L541)
metaphors		"I'd say the 'Waterfall strategy', cuz that's the main thing." (FG3, P83, L553)
		"Waterfall space" (FG4, P53, L704)
	Metaphor as a facilitator for applying decentering	"Like, I was picturing the actual water running in my head. And then like, kind of like the problems on on the water, and it was being carried away I guess." (FG4, P82, L675-677)
		"[] at the beginning, I wasn't really visualising it, and I thought it was quite difficult to just like, observe. Ehm, then so, I like, tried visualising it and it became a bit easier, ehm." (FG3, P79, L420-422)
	Elaborating on metaphor	"[] I think of something that pulls down at the end of the waterfall, kind of like a lake. So that doesn't super help in like making that thought go away, because at the end of the waterfall, it's still down. So mentally, I just added a little river that went out of there. So, like, just to keep the the flow of the thoughts going away." (FG2, P71, L527-531)
	Case study: Participant 26	"[] I'm just not very good at picturing stuff in my head. So, in that sense, the waterfall didn't help me as much. But I think it was helpful in the sense that, uhm like, they repeated the kind of words ehm, 'thinking about your thoughts, your feelings and your physical sensations'. And just having that repeated a lot kind of helped me to focus on that instead of kind of hyper- fixating." (FG1, P26, L546-550)

Table 12 - Supporting quotes for Theme 2(Changing one's relationship experience through metaphors)

4.3.2.2.2 Importance of visual metaphors

The metaphor of the waterfall was central to participants' experience of decentering. It was so significant that when they were asked to suggest a title for the decentering instructions, almost all titles alluded to the waterfall (e.g., FG2, P92). The metaphor was especially salient when participants applied decentering, compared to when they learned it (e.g., FG4, P82). Some participants elaborated on the metaphor by adding extra features to the waterfall that were not part of its original description in the audio recording (e.g., FG2, P71). Although most participants made sense of and applied decentering through the waterfall, this was not always the case. Specifically, P26 found the repeated words and phrases in the recording more helpful than the metaphor (see Table 12).

4.3.2.3 Theme 3: Challenges to applying decentering

4.3.2.3.1 The beginning is the hardest

Applying decentering was a dynamic process that was most challenging when first starting to apply it (e.g., FG2, P75; see Table 13). Even within the short, two-minute timeframe of applying the instructions to the anxiety-provoking aspect, many participants experienced a distinct and slightly more challenging beginning phase to their practice (e.g., FG3, P79). This suggests that a fluctuating sense of ease and difficulty within one's brief decentering practice may be a natural part of the process.

4.3.2.3.2 Effortfulness and mind-wandering

Many participants found the process of *applying* decentering effortful (e.g., FG4, P82; see Table 13). This was in stark contrast with the process of *learning* the instructions, which was perceived to be effortless (e.g., FG4, P82).

Mind-wandering was another challenge when applying decentering (e.g., FG2, P92; FG4, P15). For instance, P15's word choice of "a little fight" (FG4, L410) and "struggle" (FG4, L414) suggest that it was effortful to establish or maintain a focus on adopting a decentred perspective toward anxiety-provoking aspects.

4.3.2.3.3 Misunderstanding decentering

The final challenge to applying decentering was linked to misunderstanding the concept of decentering. As briefly mentioned in Theme 1, some participants have learned decentering as the idea that a problem itself would go away. In contrast, an accurate understanding would entail the metacognitive insight that any thoughts, feelings or physical sensations about the problem would come up and go away on their own. In our sample, if a participant's anxiety-provoking aspect involved uncertainty, a sense of lack of control or hopelessness, *and* they had misunderstood decentering, they experienced this as a challenge to applying decentering. Importantly, unlike the other sub-themes within this theme, participants did not have self-awareness of this challenge. Instead, they experienced it as an incompatibility between the magnitude or properties of their chosen aspect, and decentering as a strategy.

For example, P50 (FG1) had identified the long-term consequences of the pandemic as her anxiety-provoking aspect. She then shared the challenges that she experienced while applying decentering (i.e., finding it hard to let go of the thought that the pandemic will never go away). She also re-iterated that she had correctly understood decentering and would find it easier to apply it to a different aspect (see Table 13). Here, the participant perceived her challenges to be related to the characteristics of the aspect that she had identified. However, from the researchers' perspective, her challenge stemmed from misunderstanding the concept of decentering.

Identifying an aspect that involved uncertainty, a sense of lack of control or hopelessness was not a challenge in itself to practicing decentering. For example, P26 (FG1) had identified an inability to travel to and support an ill family member as her aspect. Although this was an upsetting experience where she lacked control, she seemed to have developed a metacognitive understanding of decentering, therefore being able to apply it to her aspect ("I can just let [the feelings] go without having to like focus on it for too long"; see Table 13). In other words, there was an understanding that the problem and even the thoughts and feelings about the problem may not go away, but there is an alternative way of relating to these experiences. Table 13 - Supporting quotes for Theme 3(Challenges to applying decentering)

Sub-theme	Focus	Quote
3.1: The beginning is the hardest		"[] it takes a little bit of effort in the very beginning, ehm, to try and just like imagine that. Like I didn't know how to imagine my aspect. I didn't know what parts to put into the waterfall. [] Like I thought of how like, different ways the aspect could go in the waterfall and different parts and, you know, different forms, if you like. And once I kind of found one that helped, that then you know, was very easy to keep that in my head. So, in the very beginning, it was a bit confusing, but it eased, it was very easy once I got the hang of it." (FG2, P75, L348-356)
		"[] Yeah, I would agree, I think at the beginning, it felt quite like difficult ehm, to sort of distance myself from like my thoughts and observe them rather than like feel them. Ehm, like, but then like, once you got used to it, it became easier, like as it went on." (FG3, P79, L394-396)
3.2: Effortfulness and mind- wandering	Effortfulness of applying decentering	"You're going against your own brain. And like, the thing, the thoughts that are natural versus like, what you're training it to think basically." (FG4, P82, L492-493)
		"[] I realised it actually takes more effort rather than some, yeah, I wasn't aware of the effort that you have to put it in, and maybe how difficult it is to reach like 'behind the waterfall' []" (FG4, P53, L908-910)
	Effortlessness of learning	When answering, "How much effort did it take for you to understand and learn this strategy?":
	decentering	"Not much. It was quite clear." (FG4, P53, L642)
	applying)	"Yeah, I got it pretty much immediately I think." (FG4, P82, L645)
	Mind- wandering	"[] I think I struggled with after like a certain point of time, my mind kind of wanders, and I kinda just like things on the outside popped into my head. [] I think, sometimes difficult to keep your head thinking about what you're meant to be thinking about and not just kind of daydreaming into something else, so." (FG2, P92, L359-363)
		"I felt for me it was a bit of a almost like a little fight of like, my mind trying to like almost stop the waterfall in that sense. [] Like, the waterfall was like trying to, like let things be and like just like observe and then my mind kind of was like, 'But also, like, look at this, and like, what have you' like, I don't know, I just felt a bit of a was struggle to like, think of it that way." (FG4, P15, L410-414)

3.3: Misunderstanding decentering	Misunderstand ing Case study: Participant 50	"[] I like understood the whole uhm, like metaphor and the waterfall and like, I think if I again, if I had a different uhm, concern than what mine was, then you could just like leave it and just let it go. [] But I feel like yeah, mine was about like, how this is never gonna go away. So, I was like, finding it hard to let that go. But I understand the concept and I think if I had something else, it would like have been easier." (FG1, P50, L397-402)
	Correctly understanding	"[] just kind of helping me realise that if I do ever think about it, and get into kind of like bad
	Case study: Participant 26	mood about it, I don't have to kind of hyper-fixate on that or for too long. [] I can just, if the feelings pass, I can just let it go without having to like focus on it for too long." (FG1, P26, L342-345)

4.3.2.4 Theme 4: Experiencing decentering in context

4.3.2.4.1 Feeling calmer

Participants reported a calming effect of the decentering instructions. This sense of calmness was partly associated with the waterfall metaphor that was used to explain the concept of decentering to participants (e.g., FG1, P56; see Table 14). Participants also found the narrator's voice calming, which is a key aspect of the recording, yet extraneous to its metacognitive contents (e.g., FG4, P14).

4.3.2.4.2 Collective experience

Before learning about decentering, participants briefly discussed the anxietyprovoking aspects that they had chosen. Discussing experiences with the group in this way led to the insight that many challenges and anxieties about the pandemic are shared amongst our sample of undergraduate students (e.g., FG4, P15; see Table 14). The learning and application of decentering therefore took place within the context of this collective experiencing.

156

Table 14 - Supporting quotes for Theme 4

Sub-theme	Focus	Quote
4.1: Feeling calmer	Through the metaphor	"[] like the metaphor of the waterfall I thought was uhm, calming, cuz you could really like, picture it." (FG1, P56, L500-501)
	Through the narrator's voice	"In the beginning, I was quite nervous, eh, just like, you know, having to close my eyes and just listening to her. But then the voice was so calming that it just like, got me relaxed." (FG4, P14, L371-372)
4.2: Collective experience		"[] seeing that other people have things that make them anxious as well about the pandemic is kind of, is kind of reassuring cuz, like I'm not the only one who has issues right now. [] for me personally, it's reassuring. I know that there's some issues out there that I kind of share with other people." (FG4, P15, L225-230)
		"Yeah, just everyone's in the same boat really. [] Like, it's not like you're the only person who's experiencing it." (FG3, P97, L205-206)

(Experiencing decentering in context)

4.3.2.5 Theme 5: Confidence in future application

4.3.2.5.1 Perceived self-efficacy of applying decentering in the future

Participants anticipated using decentering as a strategy in the future to feel calmer and lower their levels of anxiety (e.g., FG1, P86; see Table 15). Timing was identified as a potentially important factor, where it would be ideal and easiest to apply decentering early on during an anxiety-provoking experience, before feelings of anxiety became too intense (e.g., FG1, P56).

Participants anticipated that applying decentering in the future would be associated with challenges, for example forgetting that this strategy is available ("I think I'm gonna forget it, ultimately", P12) or finding the time to apply the strategy. This seemed to be a challenge due to factors such as distraction and participants described as laziness, rather than the actual time demands of the strategy itself (e.g., FG4, P14; FG4, P53).

4.3.2.5.2 Applying decentering for short-term relief

Participants believed that applying the brief decentering instructions would only be useful for short-term relief of distressing emotional states or experiences. So, decentering was considered an in-the-moment management tool rather than a longer-term solution to problems (e.g., FG2, P92; see Table 15). This was also true for situations within the context of the pandemic (e.g., FG3, P12). Participants mentioned that decentering might also be useful in other domains, such as falling sleep, job interviews, and exams (e.g., FG1, P26; FG3, P12).

Table 15 - Supporting quotes for Theme 5

Sub-theme	Key idea	Quote
5.1: Perceived self-efficacy of applying decentering in	Apply to feel calmer/less anxious	"Ehm, I'd potentially use it as like, a method to kind of like, calm myself down and not you know, be constantly thinking about like stressful thoughts and like, overstress myself." (FG1, P86, L433-435)
the future	Timing matters	"I think it would be helpful in stopping it like before you get yourself in, worked up into such a state. But I think once you're in a state, I think it'd be quite hard to focus on and use." (FG1, P56, L816-818)
	Challenge: Forgetting	"[] I think I'm gonna forget it, ultimately." (FG3, P12, L644)
	Challenge: Finding time	"Like, it's easier to think about it than actually do it. [] you either don't have time or can't find time or just you are too lazy. Or it's just like too difficult for you to maintain your tries or something." (FG4, P14, L863-866)
		"Yeah, it seems to me that you have to actively try and find time to do this. Because we have phones, we have things that distract us all the time." (FG4, P53, L869-870)
5.2: Applying decentering for short-term relief	In-the- moment management	"I think short term and in the moment to kind of like, grasp that anxiety and kind of bring it back down to like, lower the panic helps. But I think long-term actually being able to overcome the worry and kind of like, fully squash it - I feel like it's not the best." (FG2, P92, L578-580)
	During the pandemic	"[] when they put the new lockdown, because there's a new variant, it could help with dealing with that kind of initial shock." (FG3, P12, L686-688)
	Other domains (sleep, job interviews, exams)	"Suppose it could be, like helpful if you've got anxiety for like a test or a job interview coming up." (FG3, P12, L659-660)
		"[] when you're trying to go to sleep, and you don't have anything else to focus on. So, you, your thoughts are just running wild. And like just being able to be lying in bed and kinda take a step back from it all." (FG1, P26, L764-766)

(Confidence in future application)

4.4 Discussion

In this focus group study, we explored how non-meditator students at a UK university learned brief decentering instructions, and applied it to anxiety-provoking aspects of the COVID-19 pandemic. We gained insight into the issues that evoke anxiety for students during this time, and identified five themes on learning and applying decentering. Most of the anxiety-provoking aspects were

characterised by a sense of uncertainty, lack of control, hopelessness, loss, and fear. These feelings were associated with pandemic-related measures and consequences such as travel restrictions causing separation from loved ones and past priorities losing their meaning. These themes have been identified in other COVID-19 studies as well (Brooks et al., 2020; Moore et al., 2021), including specifically with university students (Son et al., 2020).

Most participants found the process of learning decentering to be effortless. This is in line with previous brief mindfulness studies where participants reported a positive learning experience (Tahsin et al., 2020; Tatar et al., 2021). Critically, participants' first-person accounts of learning did not always match with the researcher's third-person accounts. While some participants thought that they had successfully learned the instructions, their responses later on in the focus group implied that they misunderstood the metacognitive essence of decentering. It has been acknowledged in previous literature on longer mindfulness-based interventions that the attitudinal dimension of mindfulness (e.g., non-striving, acceptance) is more challenging to understand than the attentional dimension (e.g., present-moment awareness; Malpass et al., 2012; Solhaug et al., 2016). Decentering may be one of the more complex, attitudinal elements of mindfulness, therefore harder to comprehend for some individuals. Keeping this complexity in mind, future research may examine the effects of teaching brief decentering over multiple sessions compared to a single-session induction.

Nevertheless, most participants experienced a change in their relationship to their experiences, which captures the metacognitive essence of the instructions. While applying the instructions to their anxiety-provoking aspects, participants started perceiving their thoughts and feelings as more transient and less overwhelming. In other words, although thoughts and feelings still arose, participants related to them from a different, decentred perspective. This is a shared finding with other qualitative investigations of both longer mindfulness-based programmes (e.g., Mindfulness-Based Stress Reduction) and brief interventions. Specifically, in studies examining longer programmes, participant experiences of "detached observation" (Irving et al., 2014), the emergence of "an observing self" (Kerr et al., 2011), and a shift in attitude characterised by "decreased reactivity" (Solhaug et al., 2016) have been reported (for qualitative)

meta-syntheses, see Malpass et al., 2012; Morgan et al., 2015; Wyatt et al., 2014). Likewise, in studies of brief mindfulness-based interventions, an altered relationship to experience has been reported in the context of both negative affect (e.g., symptoms of depression; Strauss et al., 2014) and reward-related processes (e.g., viewing attractive food stimuli; Tatar et al., 2021). However, a recent meta-analysis of the effect of laboratory-based, single-session mindfulness inductions on measures of self-regulation suggests that inductions lead to immediate attentional changes, but not to more fundamental cognitive changes such as an increase in decentering on the group level (Leyland et al., 2019). Based on these findings, the authors have speculated that cognitive change may call for interventions of greater duration. This highlights the need for further qualitative and quantitative research to continue elucidating the process, outcome, and trajectory of decentering during brief interventions, on both participant and group levels.

For participants in the current study, the metaphor of the waterfall was the key facilitator for understanding and applying the decentering instructions. This aligns with previous findings from a study of brief decentering in the domain of food cravings (Tatar et al., 2021), and research more widely illustrating that metaphors of concrete and familiar previous experiences facilitate the process of acquiring and using abstract concepts (Jamrozik et al., 2016). However, participants' extensive engagement with the metaphor of the waterfall raises the question of whether the metaphor supersedes decentering such that the instructions are perceived as a guided visualisation instead. In other words, does the waterfall become a meditation of its own, rather than functioning as a learning aid? If so, this may imply that other visualisation-related processes and mechanisms may be activated (e.g., visuospatial working memory load; Kavanagh et al., 2005; Tapper, 2018), in addition to or in lieu of decentering. Although it would not be possible to draw causal and mechanistic conclusions from the present study, it is worth noting that participants were able to reflect on their changing relationship with their experiences (i.e., decentering) without mentioning the waterfall (see sub-theme 2.1). This suggests that decentering is understood as the key concept, independent of the metaphor.

Critically, participants experienced some challenges while learning and applying decentering. They found the beginning of their brief practice the hardest, which

got easier toward the end. In contrast to the relative effortlessness of learning decentering, applying it was effortful, where mind-wandering was an especially challenging common experience. Indeed, mind-wandering has been identified as a common challenge within mindfulness practice (Isbel et al., 2020; Lomas et al., 2015; Reyes, 2021; Solhaug et al., 2016; Tatar et al., 2021). Thus, and in line with a decentred perspective, it may be more fruitful to normalise mind-wandering as a part of learning and applying decentering, and even to acknowledge its usefulness during this process. Namely, mind-wandering may provide the opportunity to notice that the mind has indeed wandered, and to practice viewing the contents that the mind has wandered to as transient mental events. While this role of mind-wandering is well-recognised within manualised programmes for comprehensive mindfulness interventions (e.g., Isbel et al., 2020), it is less prominent in brief strategies, and could potentially reduce their effectiveness.

Despite both in-the-moment and anticipated challenges (e.g., forgetting, finding the time, mind-wandering), participants were confident about their future use of the decentering strategy for short-term relief across various domains (e.g., falling asleep, exams, job interviews). This strategy is indeed intended as an inthe-moment self-regulation tool, rather than a longer-term solution or alternative to longer mindfulness-based interventions. Further, participants expected that it would be easiest to apply decentering at the early stages of an anxiety-provoking experience rather than once it escalates. The notion of an optimal affective context for applying decentering has been acknowledged in previous work. In a qualitative study, Lomas et al. (2015) conceptualised this as a "threshold", where one of their participants benefitted from mindfulness at lower levels of anxiety, but found other coping strategies to be more suitable at higher levels. In contrast, Chen et al. (2013) reported in a randomised controlled trial that those with moderate levels of anxiety benefitted the most in a comprehensive mindfulness meditation programme (i.e., reduced anxiety and lower systolic blood pressure), compared to those with low and high levels of anxiety. Together, these early findings suggest that it would be worthwhile to systematically test the optimal context for practicing a brief decentering strategy.

The final insight from our participants highlighted that the specific, targeted process of decentering takes place within a context of non-specific factors. Participants experienced a sense of calmness while learning and applying decentering. This calmness was associated with both the metaphor of the waterfall and the narrator's voice in the audio recording of the instructions. Feelings of calmness have been reported in other qualitative studies as well (Hjeltnes et al., 2015; Malpass et al., 2012; Solhaug et al., 2016), where the tone of voice of the instructor/narrator may have an impact on practice (Schwind et al., 2017). The role of calmness in the context of this brief strategy can be interpreted in various ways. First, adopting a decentred perspective may give rise to calmness. Second, participants may be experiencing calmness independent of decentering, by bypassing decentering-specific content and through non-specific components such as the narrator's voice or the image of the waterfall. Third, calmness may be a natural first step for an individual to experience a metacognitive shift in perspective. In a qualitative study of a 6week mindfulness intervention with young people, Monshat et al. (2013) illustrated this phased approach where participants initially report calm, followed by a shift in mindset later on. It is not possible to assess the plausibility of these potential explanations based on our findings. However, future research may be conducted to investigate the relationship and potential interactions between decentering and relaxation.

Another key contextual feature within our study was the collective experience of the group setting. In contrast to longer mindfulness-based interventions that are often delivered in a group setting, single-session brief mindfulness interventions predominantly take place on a one-to-one basis (for examples, see Howarth et al., 2019). However, the setting for learning the brief decentering strategy in our study resembled a group intervention due to its focus group methodology. This revealed the centrality of the group experience for participants. Through discussions of their pandemic-related anxieties, participants discovered that many of their experiences are shared. This sense of shared humanity may have had a normalising effect above and beyond the effects of decentering. While previous studies of longer mindfulness-based interventions repeatedly highlight the significance of the group setting (e.g., Frank et al., 2019; Hjeltnes et al.,

2015; Imel et al., 2008; Irving et al., 2014), our findings suggest that there may be merits to teaching brief strategies in groups as well.

The main theoretical contribution of this study is the first-person account it offers of participant experiences, which is rare in the brief mindfulness literature. Quantitative studies of brief mindfulness are conducted with the assumption that participants' understanding and application of the mindfulness instructions matches researchers' intended outcomes for the instructions. Although participants are sometimes asked to verbally summarise the instructions before proceeding with the study (e.g., Lebois et al., 2015), this short summary may be a superficial repetition of the instructions, rather than a deeper semantic understanding of mindfulness. Therefore, in studies suggesting that mindfulness is effective, it is unclear which components or processes drive these effects (e.g., the mindfulness instructions, a misunderstood version of the instructions, or non-specific factors such as study environment and rapport with the researcher). Similarly, in studies suggesting that mindfulness is not effective, what exactly gives rise to these findings is unclear. The present study illustrates participant perspectives on many of these fundamental components and processes.

A key strength of this study is our thorough implementation of focus group methodology. We employed credibility strategies such as investigator triangulation, and engaged with reflexivity practices to ensure trustworthiness (Finlay, 2003; Korstjens & Moser, 2018; Lazard & McAvoy, 2020; Mauthner & Doucet, 2003; Tuval-Mashiach, 2017; see Supplemental Online Material 6). While focus groups provide invaluable information on what participants are willing to share in the company of others (Barbour, 2018; Smithson, 2000; Wilson, 1997), the emerging socially acceptable discourse may be different than what participants might have shared in a one-to-one interview that feels more private. However, based on an interview study in the domain of food cravings that reported findings similar to the present study (Tatar et al., 2021), the socially acceptable and private discourses seem to overlap considerably in this case.

We have also identified limitations in our implementation of focus group methodology. For instance, the conversation between participants stalled often,

164

leading to frequent moderator input. This may have stemmed from the online data collection environment. Alternatively, the dynamics of the conversation may have been a function of participant's level of motivation and engagement with the study. Intention is a key component of mindfulness in Shapiro et al.'s (2006) model, along with attention and attitude. It refers to one's personal motivation for learning and practicing mindfulness, which is unique to each individual (Lindahl, 2015). In single-session studies like ours, participants commit to participating in research more generally, rather than committing specifically to a mindfulness practice (Leyland et al., 2019; Schumer et al., 2018). In the absence of information on participant intentions, we may speculate that participants were motivated by a combination of internal motivators (e.g., to alleviate pandemic anxiety) and external motivation (e.g., course credit or monetary compensation), and consequently were motivated to contribute to the conversation to varying degrees.

Finally, it is important to consider sample characteristics and the transferability of our findings to other contexts (Korstjens & Moser, 2018). Overall, we recruited a homogenous sample of first- and second-year undergraduate students to answer our research question. However, given that this was a European sample from a UK Higher Education Institution, our findings may not fully generalise to other countries or cultures. Although a wide range of programmes of study were represented within our sample (e.g., Comparative Literature, Physics, Psychology, Zoology), half of the participants were Psychology students. Further, 13 out of 16 participants were female. Considering anxiety is more prevalent amongst females both during the pandemic (Jia et al., 2020; Patias et al., 2021) and more generally (Hunt & Eisenberg, 2010), this may be interpreted in at least two ways. First, females may have self-selected to participate more readily because they experience more anxiety. Second, females may have benefitted more from the decentering instructions because their baseline anxiety was higher. Since gender imbalance is a wider issue within mindfulness research (Bodenlos et al., 2017; Hickey, 2010; Katz & Toner, 2013), future research should strive for a more gender-balanced sample, and may examine gender differences more specifically. Lastly, we recruited a non-clinical sample who have self-identified to experience pandemic-related anxiety. A different set of findings may have been generated with a clinical sample, especially

considering that those with clinical diagnoses find it more challenging to practice mindfulness for the first time compared to those without a clinical diagnosis (Vitalia & Răban-Motounu, 2014).

The pandemic is no doubt distressing, and the anxieties surrounding it are welljustified. Our findings suggest that there may be an alternative and empowered way of relating to these experiences. Brief decentering mindfulness may be an accessible, flexible, and simple strategy that enables individuals to cultivate this alternative relationship. Although this study has been conducted in the specific context of the pandemic, these insights are also relevant to enhancing the effectiveness of brief strategies that target distressing daily life situations more broadly.

4.5 Acknowledgements

We would like to thank Kate Bowles for narrating the brief mindfulness audio recording.

4.6 Declarations

4.6.1 Funding

No funding was received for conducting this study.

4.6.2 Ethical approval

The study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the University of Glasgow College of Science & Engineering Ethics Committee (Date: 4 November 2020; no: 300200025).

Chapter 5 A brief decentering-based mindfulness strategy reduces pandemic-related anxiety: A mixed-methods experiment

This chapter is an exact copy of the following preprint manuscript:

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5. Abstract

Decentering is a key component of mindfulness, conceptualised as a metacognitive insight into the transience of one's mental experiences (Safran & Segal, 1990). In this preregistered mixed-methods experiment, we examined the effectiveness of a brief decentering-based mindfulness strategy in curbing anxiety related to the COVID-19 pandemic. Participants (N = 316; nonmeditators) were instructed to identify a pandemic-related worry. They selected worries related to physical health, job insecurity, finances, education, loneliness, and the current and future impact of COVID-19. Participants then listened to decentering or control instructions, and in the main task, they applied these instructions to their worry for one minute. We measured state anxiety and vividness of worry imagery both before and after the main task. We also collected qualitative survey data on participants' experiences of applying the instructions, and analysed these data using thematic analysis. The quantitative findings were in line with our hypothesis that imagery of pandemicrelated worries positively predicted state anxiety in the control condition (β = 0.37, p < .001). Also as predicted, decentering reduced state anxiety compared to the control condition ($\beta = -0.51$, p < .001). The predicted interaction of vividness of worry imagery and condition was not significant when a composite pre- and post-task imagery score was used ($\beta = -0.11$, p = .099), but was significant in exploratory analyses using only the post-task imagery score ($\beta = -$ 0.20, p = .004). This suggests that decentering reduced the link between vivid worry imagery experienced during the task and anxiety experienced afterwards. Qualitative analyses showed that some participants applied an accurate version of the instructions, but others misunderstood the instructions. Participants reported a wide range of outcomes such as developing a different way of relating to experiences, relaxation, and reduced negative affect. Together, these findings provide evidence that the brief decentering-based mindfulness strategy studied here may be an effective way to reduce anxiety, and potentially to reduce the link between imagery and anxiety. These findings are applicable not only to the pandemic, but also to other distressing and unpredictable contexts.

Keywords: mindfulness, decentering, COVID-19, anxiety, mixed-methods research

5.1 Introduction

The COVID-19 pandemic has impacted all domains of life, including mental health. Previous studies demonstrated an increase in psychological distress during the pandemic, including a high prevalence of anxiety (Arora et al., 2020; da Silva et al., 2021; O'Connor et al., 2020). A recent review of evidence suggests that increases in psychological distress were particularly prominent in the early stages of the pandemic, with most mental health concerns decreasing to pre-pandemic levels in mid-2020 (Aknin et al., 2022). However, aside from its immediate short-term impact, COVID-19 may have long-term mental health implications yet to be assessed (Aknin et al., 2022). Therefore, there is a clear need for effective strategies to manage distress associated with the pandemic (Torales et al., 2020).

Mindfulness may be an effective strategy in the context of COVID-19 (Antonova et al., 2021). In fact, alleviation of anxiety is one of the most commonly reported benefits of mindfulness-based interventions, where anxiety is a key facet of psychological distress (e.g., Hofmann et al., 2010). While mindfulnessbased interventions typically entail a lengthy daily practice over several weeks (e.g., the 8-week Mindfulness-Based Stress Reduction (MBSR) course; Kabat-Zinn, 1982), recent research suggests that even brief, 3-15 minute mindfulness-based instructions can improve health-related outcomes, for example, by decreasing negative affect and improving emotional responding (Erisman & Roemer, 2010; Keesman et al., 2020; for a systematic review, see Howarth et al., 2019). Here, we examine the effectiveness and potential mechanisms of a brief mindfulness strategy to reduce and/or regulate anxiety around the COVID-19 pandemic. The study is meaningful not only in the context of the pandemic, but also for the assessment of mindfulness-based strategies more generally. In other words, if mindfulness can be meaningfully applied to the multifaceted real-world stressors of the pandemic, the findings may translate to other stressful situations as well.

In the Western secular context, mindfulness has been defined as, "the awareness that arises by paying attention on purpose, in the present moment, and non-judgmentally" (Kabat-Zinn, 1994). There is substantial evidence that demonstrates the effectiveness of mindfulness-based interventions in reducing anxiety, both in clinical populations (e.g., Generalised Anxiety Disorder: Hoge et al., 2013; Hölzel et al., 2013) and non-clinical populations (e.g., healthy adults: Anderson et al., 2007; university students: Kaviani et al., 2011). A meta-analysis by Hofmann et al. (2010) has shown that mindfulness-based interventions such as MBSR are effective in reducing anxiety in an overall clinical sample with a medium effect size, and effective in a subsample of patients with anxiety and mood disorders with a large effect size. Similarly, with non-clinical populations, mindfulness-based interventions lead to a reduction in anxiety (see metaanalyses: Halladay et al., 2019; Khoury et al., 2013; Querstret et al., 2020). For example, in a study with university students, Zeidan et al. (2010) demonstrated that both a brief meditation training and an active control (i.e., listening to an audiobook) were effective in improving overall mood, but only the meditation training reduced anxiety. However, other studies report more nuanced findings when mindfulness is compared to other established treatment approaches or active control groups. For instance, mindfulness-based interventions were equally effective as traditional therapies such as cognitive behavioural therapy in reducing anxiety symptoms of patients with an anxiety disorder (Arch et al., 2013; for a systematic meta-review, see Fumero et al., 2020). Similarly, some studies demonstrated no effects of mindfulness on mental health outcomes, especially when compared with active control groups such as relaxation training (Josefsson et al., 2014; Quinones & Griffiths, 2019; for a review, see Toneatto & Nguyen, 2007).

In addition to research on comprehensive mindfulness-based interventions, there has been a growing interest in brief, single-session mindfulness-based interventions over the last decade (for reviews, see Howarth et al., 2019; Jiménez et al., 2020; Schumer et al., 2018). According to a systematic review by Howarth and colleagues (2019), 93% of published studies reported positive effects of brief mindfulness on health-related outcomes, including reduction in levels of anxiety. More recently, Jiménez et al. (2020) systematically reviewed randomised controlled trials of brief mindfulness-based interventions in the laboratory setting. Of the six studies that assessed anxiety symptoms, three found positive psychological outcomes (Lancaster et al., 2016; McClintock & Anderson, 2015; Paz et al., 2017), two found no significant group differences in outcomes (Garland et al., 2017; Pepping et al., 2015), and one found the brief mindfulness-based intervention to be less effective compared to a hypnosis

condition (Swain & Trevena, 2014). Taken together, it seems that both more traditional (e.g., MBSR) and brief mindfulness-based interventions can be effective at reducing anxiety in clinical and non-clinical populations, but with considerable variability.

Importantly, however, even brief mindfulness-based interventions often have multiple components or "active ingredients", such as mindfulness psychoeducation, sitting meditation, body scans, and yoga poses. This makes it challenging to identify which component(s) drive the positive effects of these interventions. Therefore, it is useful to conduct experimental research that manipulates specific components of brief mindfulness-based interventions, in order to disentangle the unique mechanisms and contributions of each of these components to the overall effect of the interventions. Here, we specifically focus on the decentering component of mindfulness, and examine its effects on experiences of worry and anxiety.

Decentering has been proposed as a key component of mindfulness. It is also referred to as cognitive defusion, de-reification, mindful attention, and urge surfing in the context of cravings (see Bowen & Marlatt, 2009; Hayes et al., 1999; Lutz et al., 2015; Papies et al., 2012). Decentering is an awareness of the nature of one's mental experiences, coupled with the metacognitive insight that thoughts, feelings and reactions to physical experiences come up and go away on their own (Safran & Segal, 1990). Having this insight may shift one's experience of reality from "absolute, immutable, or unalterable" (Safran & Segal, 1990, p. 177) to an awareness of its constructed and transient nature. In other words, the decentering component of mindfulness changes the way one relates to one's mental experiences (Keesman et al., 2017).

A small number of studies have demonstrated that decentering can reduce negative affect (Bieling et al., 2012; Fresco et al., 2007; Hayes-Skelton et al., 2015; Hoge et al., 2015; for a review, see Bernstein et al., 2015). For instance, Hoge et al. (2015) examined decentering as a potential mechanism of MBSR treatment outcomes for generalised anxiety disorder (GAD). They concluded that improvements in GAD symptomatology following the MBSR intervention are partly explained by an increase in self-reported levels of decentering. Keesman et al. (2020) examined the role of decentering in general negative affect through targeted, brief instructions that specifically focus on inducing a decentered perspective on negative experiences. They asked participants to imagine an unpleasant autobiographical event, and while imagining, to adopt a decentered or immersed perspective. In the decentering condition, participants observed their thoughts as mental events. In the immersion condition, participants fully immersed themselves in their thoughts, as if the event were currently happening. Compared to immersion, participants who adopted a decentered perspective experienced less negative affect (Keesman et al., 2020).

Mental imagery, defined as vivid experiences of imagined events, without any visual sensory input (Kosslyn et al., 2001; MacNamara, 2018), may play a key role in experiences of worry and anxiety. For example, in an EEG study, participants with Generalised Anxiety Disorder had increased neural processing of negative imagery (Bauer & MacNamara, 2021). This suggests that vividly immersing oneself in the re-experience of a negative event can reactivate the negative affect that one initially experienced during the event. Similarly, Keesman et al. (2020) found that vividly immersing oneself in one's mental imagery of past events was associated with more negative affect than applying a decentered perspective.

It has been suggested that decentering may reduce negative affect by targeting the vivid imagery that typically leads to negative affective responses (Holmes & Mathews, 2010). Although the mechanisms of how decentering targets such imagery are not fully understood (Tapper, 2018), there are several possible ways. First, decentering may reduce negative affective responses by taxing working memory, thereby reducing mental imagery (Kavanagh et al., 2005; Tapper, 2018). In other words, the abstract, metacognitive contents of decentering may 'compete' for cognitive resources that would otherwise be used to process intrusive negative imagery (Holmes & Mathews, 2010). Second, decentering may de-couple the vivid imagery from the otherwise automatic responses that it elicits. Adopting a decentered perspective makes the transience of mental events salient, meaning one may observe vivid imagery as fleeting, rather than treating it as the reality. In other words, even when the imagery remains active in the mind, decentering may reduce the impact of this imagery on responses through a shift in perspective. Indeed, this de-coupling has been shown previously in domains of food cravings (Keesman et al., 2020).

172

The present mixed-methods study took place within the real-world context of the COVID-19 pandemic, and was designed to assess whether applying decentering to a pandemic-related worry helps to curb anxiety. It is important to note that we used the term "worry" here in its colloquial sense as referring to an anxiety-inducing topic. This was to prompt participants to provide content related to anxiety, to which they would then apply decentering or control instructions. We instructed participants to, "think in detail about one of their worries related to the pandemic", and to "pick a worry that currently causes them anxiety". Participants then rated their imagery of their worry, before they listened to either the decentering or control instructions. We asked participants to think about the worry that they identified and to apply the instructions to this worry for one minute. After asking participants to rate worry imagery again, we assessed state anxiety as the main outcome measure, and asked open-ended questions to conduct a further qualitative assessment of participants' experiences of applying the instructions.

We hypothesised that imagery of pandemic-related experiences would predict state anxiety in the control condition (Hypothesis 1). We further predicted that anxiety would be lower in the decentering condition compared to the control condition (Hypothesis 2). Finally, we predicted that the imagery of pandemicrelated experiences would predict state anxiety less strongly in the decentering condition, compared to the control condition (Hypothesis 3). In other words, we predicted that decentering would reduce the association between imagery and anxiety, akin to the decoupling effects described above for other domains (e.g., Elwafi et al., 2013; Feldman et al., 2010; Ostafin et al., 2012).

We used an active control condition, where participants followed their thoughts, feelings, and physical experiences freely. The control condition was designed to tax working memory (Tapper, 2018), and comprised instructions of similar style as the decentering condition, requiring similar levels of cognitive effort. If decentering reduces anxiety compared to this active control condition, this would make it less likely that decentering reduces negative affective responses by increasing working memory load.

5.2 Method

5.2.1 Design

The experiment had a between-subjects design with condition (control vs. decentering; random assignment) and imagery (continuous predictor) as independent variables. The main dependent variable was state anxiety. This study was approved by the University of Glasgow Ethics Committee. The study preregistration, data, and study materials are available on the Open Science Framework (OSF; https://osf.io/72p64/).

5.2.2 Participants

We recruited 409 Prolific (prolific.co) members based on inclusion criteria that they were living in the United Kingdom at the time of the study and experiencing some anxiety around the COVID-19 pandemic. Further, they did not test positive for COVID-19, and did not have any psychological, psychiatric or neurological conditions (e.g., an anxiety disorder), or learning disabilities. We screened participants' levels of anxiety based on their response to the question, "Overall, how anxious have you been feeling about the COVID-19 pandemic?" (from "not at all" to "extremely"; 100-point Visual Analogue Scale). We excluded 40 participants who scored below the preregistered cut-off value of 25. In addition, we excluded 48 participants who were currently practicing meditation at least once a week, three participants who tested positive for COVID-19, and two participants who did not hear the full decentering instructions due to technical difficulties. After exclusions, 316 participants were included in the analyses (211 female; age M = 34.74, SD = 12.70, range: 18-64; decentering N = 159, control N = 157).

The planned sample size was 408 (204 per condition), which was determined by taking resource limitations into consideration. The final sample size (N = 316) is still much greater than our sample size estimations (i.e., N = 136). Specifically, we conducted *a priori* power analysis to detect a medium effect of pre-task imagery on post-task anxiety in the control condition, with pre-task (i.e., baseline) anxiety included as a covariate in the model (Hypothesis 1; $f^2 = 0.15$, with alpha level = .05 and 80% power in a multiple linear regression; N = 68).

Considering the challenges associated with adequately powering for interaction effects (Simonsohn, 2014), we conducted the analysis based on the control condition only, then doubling the sample size to account for both the decentering and control conditions (i.e., 68×2 ; N = 136). Calculations were made using G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009).

5.2.3 Materials

5.2.3.1 Worry identification instructions

Participants were asked to think in detail about a worry related to the pandemic that is currently causing them anxiety. The instructions included examples of pandemic-related life experiences such as concerns over personal health, career and finances, and social relationships. Participants described their worry in writing in as much detail as possible. They also provided one keyword that captured this worry. For an extensive analysis of the nature of participants' worries, see "qualitative findings on pandemic-related worries".

5.2.3.2 Control and decentering instructions

The control instructions were based on instructions by Tatar and colleagues (2021), and approximately two minutes in duration. Participants were asked to think about their worry in a normal way, described as following up on any thoughts, feelings, and physical experiences that may come up, without suppressing or avoiding them. The instructions were contextualised as general guidance that did not require overthinking.

The decentering instructions were based on instructions by Tatar et al. (in preparation), and approximately five minutes in duration. The instructions described the transience of mental events, asking participants to observe the pandemic-related thoughts, feelings and physical sensations that make them worry come up and go away by themselves. The metaphor of the waterfall was used as a visual representation of this process, where one's stream of thoughts passes by much like the stream of water. Importantly, it was emphasised that the specific target of these instructions is internal experiences rather than the actual source of worry, which may be beyond one's control.

The instructions were delivered as audio recordings. The terms "mindfulness" and "meditation" were not used, as they may generate demand effects. See Appendix D (supplementary material 2) for full scripts of both instructions.

5.2.4 Measures

Unless otherwise stated, participants completed the quantitative measures on 100-point Visual Analogue Scales (VAS). All composite scores are means of the relevant scale items.

5.2.4.1 State anxiety

Participants completed a modified version of the seven-item Generalized Anxiety Disorder questionnaire (GAD-7; Spitzer et al., 2006), both before and after the main task. The main modification was that participants were asked to indicate how much they are bothered by a list of problems "at this moment", rather than the original timescale of GAD-7 (i.e., "over the last two weeks"). An example item is, "I am not able to stop or control worrying", with anchors "not at all" to "very much". Internal consistency was high for both the pre-task and post-task items (Cronbach's a = .89 and .93, respectively), so we computed pretask and post-task composite scores of anxiety using all relevant items.

5.2.4.2 Imagery

Participants rated three statements, both before and after the main task. The pre-task version of the statements were: [At this moment...], (1) my worry is very vivid, (2) my worry includes many details, (3) my worry feels as if happening right now (from "not at all" to "extremely"). In the post-task version, participants rated their experiences of the main task rather than experiences "at this moment", using the same three statements (e.g., [When I thought about it for one minute...] my worry was very vivid).

We computed three composite scores of imagery. The main composite score combined the pre- and post-task measures (i.e., six items; Cronbach's a = .84). This combined composite score was used in all confirmatory analyses, as per our preregistered analysis plan. We also computed two separate pre-task and post-

task composite scores (i.e., three items; Cronbach's a = .75 and .87, respectively), which were used in exploratory analyses.

5.2.4.3 Decentering

Participants rated their experiences of the main task with the seven-item decentering subscale of the Toronto Mindfulness Scale (TMS; Lau et al., 2006). An example item is, "I experienced myself as separate from my changing thoughts and feelings" (from "not at all" to "very much"). We computed a composite score of decentering using all seven items (Cronbach's a = .81).

5.2.4.4 Meditation frequency and experience

Participants answered the following questions: "How often do you currently meditate?" (never/very rarely; once a week; more than once a week), and "Have you ever received formal meditation or mindfulness instructions?" (yes/no, with a textbox to elaborate).

5.2.4.5 Additional questions

Participants rated their perceived effort and success in applying the instructions that they received, with the anchors "not at all" to "very much". Example items are, "To what extent did you try to apply the way of thinking introduced to you, while thinking about your worry" (control condition), and "To what extent were you successful in applying the way of dealing with your thoughts introduced to you, while thinking about your worry?" (decentering condition).

Further, demographic information was gathered (e.g., age), and participants responded to open-ended questions about their study experiences (e.g., what they thought the study aims were, technical issues).

5.2.5 Qualitative survey

Participants responded to three open-ended questions on their experiences of thinking about their worry and applying the instructions that they received (i.e., control or decentering). The questions were: (1) Can you tell us a bit about what happened while you were thinking about the specific worry that makes you anxious? For example, did you notice any thoughts, feelings, physical sensations

or anything else? (2) How exactly did you apply the instructions you received while thinking about your worry? (3) What happened once you applied these instructions?

5.2.6 Procedure

For an overview of the study procedure, see Figure 12. Prolific Academic members were invited to take part in a study "exploring anxiety-provoking aspects of the COVID-19 pandemic" between 9:00 and 21:00 (Greenwich Mean Time). Data collection took place on February 10th and 11th, 2021, during the third national lockdown of the United Kingdom. All study materials were delivered using Qualtrics software (Qualtrics, Provo, UT). The study was approximately 15 minutes in duration.

Participants read the study information sheet and gave informed consent. They completed the pre-task (baseline) measure of state anxiety. They then read the worry identification instructions and described one of their pandemic-related worries both as a free-text response and a single keyword. Next, participants completed the pre-task imagery measure, and listened to their assigned instructions (i.e., control or decentering).

In the main task, participants were asked to think about their specific worry, and to apply the instructions to this worry for one minute. Participants' worry keywords and a written reminder of the instructions were displayed on the screen throughout the task (e.g., "Remember to think about your worry, and feel free to follow up on any thoughts that may come up"). After the main task, participants completed ratings of anxiety, imagery, decentering, and all other measures. They also provided qualitative survey responses and demographic information. At the end of the study, participants were shown a brief, reassuring text for mood repair, including a list of mental health support resources and services. Finally, participants were debriefed, thanked for their participation, and paid.



Figure 12 - Overview of study procedure

5.2.7 Data analysis

5.2.7.1 Quantitative data

Statistical analyses were conducting using R and R Studio (version 1.4.1717; R Core Team, 2019). We checked the state anxiety, imagery, and decentering data for outliers (i.e., a data point that was higher or lower than three standard deviations from the mean for all participants). No outliers were identified in the state anxiety and imagery data.

To test the hypothesis that imagery of pandemic-related worries will predict state anxiety in the control condition (Hypothesis 1), we conducted a multiple linear regression with the combined (pre- and post-task) imagery score in the control condition as a predictor, pre-task (baseline) anxiety as a covariate, and post-task anxiety as the outcome variable. All continuous variables were standardised.

To test the hypotheses that the imagery of pandemic-related worries will predict state anxiety less strongly in the decentering condition compared to the control condition (Hypothesis 3) and state anxiety will be lower in the decentering condition compared to the control condition (Hypothesis 2), we conducted a moderated multiple linear regression with condition, combined imagery, and the condition*combined imagery interaction as predictors, pre-task anxiety as a covariate, and post-task anxiety as the outcome variable. All continuous variables were standardised, and dummy coding was used for the categorical predictor (i.e., condition), where the control condition is the reference group.
In addition to these preregistered confirmatory analyses, we tested all hypotheses (H1-3) once using only the pre-task imagery score, and once using only the post-task imagery score. These analyses were also preregistered, and conducted to assess whether and how the results differ compared to the analyses where we used the combined (pre- and post-task) imagery score.

5.2.7.2 Qualitative data

We analysed two sets of qualitative data: (1) participants' free-text descriptions of the pandemic-related worry that they picked, and (2) qualitative survey responses. We conducted reflexive thematic analysis (Braun & Clarke, 2006), using NVivo software for data management (Mac version 12.6.1). BT conducted the full analyses with feedback from EKP.

5.3 Results

5.3.1 Quantitative results

5.3.1.1 Descriptive statistics and comparison of the decentering and control conditions per study variable

See Table 16 for descriptive statistics of each variable by condition. The order of the variables matches the order in which the participants rated the measures. This table also presents a comparison of the conditions for each variable (i.e., Welch's two-sample t-tests). In sum, there were no differences in pre-task anxiety and pre-task imagery between the decentering and control conditions. Further, participants in the decentering condition reported significantly lower levels of post-task anxiety, post-task imagery (and as a result, combined imagery) compared to the control condition.

	Con	trol	Decen	Decentering					
Variable	М	SD	М	SD	t	df	p	d	95% CI for difference in means
Pre-task anxiety	43.95	19.87	41.58	21.96	1.01	311.64	.316	0.11	-2.27, 7.00
Pre-task imagery	57.79	21.93	57.50	19.52	0.13	308.89	.900	0.01	-4.31, 4.89
Post-task anxiety	46.89	20.94	31.76	20.59	6.48	313.73	<.001**	0.73	10.53, 19.73
Post-task imagery	62.39	22.06	47.94	23.83	5.60	312.71	<.001**	0.63	9.37, 19.54
Combined imagery	60.09	19.55	52.72	18.73	3.42	313.03	<.001**	0.39	3.14, 11.61
**p < .01									

 Table 16 - Descriptive statistics and comparison of the decentering and control conditions

 per study variable

5.3.1.2 Associations between study variables

See Table 17 for bivariate Pearson correlations between the study variables by condition. These were performed with Bonferroni correction for multiple comparisons.

Notably, pre-task anxiety was positively correlated with post-task anxiety, and this association was stronger in the decentering condition compared to control. In other words, anxiety experienced *before* identifying a pandemic-related worry and applying the decentering/control instructions was associated with increased anxiety *after* applying the instructions.

Further, all imagery scores (i.e., pre-task, post-task, and combined) were positively correlated with pre-task and post-task anxiety. Put differently, experiencing worries in vivid detail both *before* and *while* applying the decentering/control instructions was associated with increased anxiety, both *before* and *after* applying the instructions. The correlations between post-task anxiety and the imagery scores were slightly stronger in the control condition compared to decentering.

Post-task anxiety was negatively correlated with the decentering subscale of the TMS in the decentering condition, but not in the control condition. In other words, in the decentering condition, adopting a decentered perspective was

associated with reduced levels of anxiety *after* applying the instructions. Lastly, the positive association between pre-task imagery and post-task imagery was stronger in the control condition compared to the decentering condition.

Table 17	- Bivariate correlations between study variables in each condition
(control	decentering)

2 3 5 1 4 6 1. Pre-task anxiety 2. Post-task .67** | .77** anxiety 3. Pre-task .52** | .52** .52** | .48** imagery 4. Post-task .27** | .31** .57** | .44** .58** | .49** imagery 5. .45** | .47** .61** | .53** .89** | .83** .89** | .89** Combined imagery 6. Decentering .09 | .05 .04 | -.24* .11 | .00 .21 | -.03 .18 | -.02 subscale of the TMS

p < .05; p < .01 (two-tailed). Bonferroni correction for multiple comparisons was applied.

5.3.2 Confirmatory analyses

In line with Hypothesis 1, imagery of pandemic-related experiences significantly and positively predicted post-task state anxiety in the control condition (β = 0.37, 95% CI [0.26, 0.48], p < .001), controlling for the significant positive effect of baseline (i.e., pre-task) anxiety (β = 0.49, 95% CI [0.38, 0.61], p < .001). The overall regression model for Hypothesis 1 significantly predicted post-task anxiety, F(2, 154) = 102.04, p < .001, adjusted $R^2 = 0.56$.

In line with Hypothesis 2, post-task state anxiety was lower in the decentering condition compared to the control condition ($\beta = -0.51$, 95% CI [-0.65, -0.38], p < .001). See Figure 13 for the distribution of post-task state anxiety for each condition.

Contrary to our predictions in Hypothesis 3, the interaction effect of condition and imagery on post-task state anxiety was not significant ($\beta = -0.11$, 95% CI [-0.25, 0.02], p = .099), suggesting that decentering did not reduce the link between imagery and anxiety compared to the control condition. Nevertheless, the negative beta coefficient suggests that the pattern of this relationship is in the hypothesised inverse direction. The overall regression model for Hypotheses 2 and 3 significantly predicted post-task anxiety, F(4, 311) = 142.02, p < .001, adjusted R² = 0.64. See Table 18 for a summary of the full multiple regression model testing Hypotheses 2 and 3, and Figure 14 (panel C) for a scatterplot.



Figure 13 - Violin boxplots showing the data points and distribution of post-task anxiety for each condition.

Black diamonds indicate means, and horizontal lines indicate medians.

Variable	Standardized beta (B)	Standard error	95% CI	t	р
Intercept	0.25	0.05	0.15, 0.34	5.09	< .001**
Pre-task anxiety	0.55	0.04	0.48, 0.63	14.46	< .001**
Condition:					
Control	Reference				
Decentering	-0.51	0.07	-0.65, -0.38	-7.48	< .001**
Combined Imagery	0.35	0.05	0.25, 0.45	6.88	< .001**
Combined imagery x Decentering	-0.11	0.07	-0.25, 0.02	-1.65	.099

Table 18 - Summary of the multiple regression model testing Hypotheses 2 and 3 (post-task state anxiety ~ pre-task state anxiety + condition * combined imagery)

^{**}*p* < .01. Model statistics: *F*(4, 311) = 142.02, *p* < .001, adjusted R² = 0.64



Figure 14 - Scatterplots with regression lines and 95% confidence intervals showing the effect of pre-task imagery (panel A), post-task imagery (panel B), and combined imagery (panel C) on post-task state anxiety per condition (standardised scores).

Note that these figures do not account for pre-task (baseline) anxiety.

5.3.3 Exploratory analyses

5.3.3.1 Testing Hypothesis 1 using the pre-task or post-task imagery scores

In line with Hypothesis 1, imagery of pandemic-related experiences significantly and positively predicted post-task state anxiety in the control condition in both the model using the pre-task imagery score as a predictor and the model using the post-task imagery score. These findings are similar to the confirmatory analysis that used the combined imagery score. See Table 19 for a summary of both multiple regression models.

Model	Model statistics	Variable	Standardized beta (ß)	Standard error	95% CI	t	р
	<i>F</i> (2, 154) =	Intercept	0.31	0.05	0.20, 0.42	5.71	< .001**
Pre- task imagery	73.08, p < .001, adjusted R ²	Pre-task anxiety	0.55	0.04	0.41, 0.68	8.05	< .001**
magery	= 0.48	Imagery	0.21	0.05	0.09, 0.33	3.48	< .001**
	<i>F</i> (2, 154) =	Intercept	0.18	0.05	0.08, 0.28	3.64	< .001**
Post- task imagery	119.44, p < .001, adjusted R ²	Pre-task anxiety	0.55	0.05	0.45, 0.66	10.58	< .001**
	= 0.60	Imagery	0.43	0.05	0.32, 0.54	7.96	< .001**

Table 19 - Summary of the exploratory multiple regression models testing Hypothesis 1 (post-task state anxiety ~ pre-task state anxiety + pre/post-task imagery)

**p < .01

5.3.3.2 Testing Hypothesis 2 using the pre-task or post-task imagery scores

See Table 20 for a summary of the multiple regression model using pre-task imagery as a predictor, and Table 21 for the model using post-task imagery as a predictor. In line with Hypothesis 2, post-task state anxiety was lower in the decentering condition compared to the control condition in both the model using the pre-task imagery score as a predictor and the model using the post-task imagery score. These findings are similar to the confirmatory analysis that used the combined imagery score.

5.3.3.3 Testing Hypothesis 3 using the pre-task or post-task imagery scores

When using the pre-task imagery score as a predictor, the interaction effect of condition and imagery on post-task state anxiety was not significant.

When using the post-task imagery score, the interaction effect was significant, suggesting that decentering reduced the association between imagery and anxiety compared to the control condition. This is different than the findings of the confirmatory analysis, yet in line with our predictions. See again Tables 20 and 21 for a summary of both regression models, and Figure 14 for scatterplots with the pre-task and post-task imagery scores (panels A and B, respectively).

Table 20 - Summary of the multiple regression model testing Hypotheses 2 and 3 using pretask imagery as a predictor

Variable	Standardized beta (β)	Standard error	95% CI	t	р
Intercept	0.31	0.05	0.21, 0.41	6.07	< .001**
Pre-task anxiety	0.60	0.04	0.51, 0.68	14.13	< .001**
Condition:					
Control	Reference				
Decentering	-0.62	0.07	-0.76, -0.47	-8.55	< .001**
Pre-task imagery	0.19	0.05	0.08, 0.29	3.57	< .001**
Pre-task imagery x Decentering	-0.06	0.07	-0.20, 0.08	-0.85	.398

(post-task state anxiety ~ pre-task state anxiety + condition * pre-task imagery)

^{**}p < .01. Model statistics: *F*(4, 311) = 115.30, *p* < .001, adjusted R² = 0.59

186

Table 21 - Summary of the multiple regression model testing Hypotheses 2 and 3 us	sing
post-task imagery as a predictor	

Variable	Standardized beta (B)	Standard error	95% CI	t	р
Intercept	0.18	0.05	0.09, 0.28	3.78	< .001**
Pre-task anxiety	0.59	0.03	0.53, 0.66	17.36	< .001**
Condition:					
Control	Reference				
Decentering	-0.42	0.07	-0.56, -0.29	-6.21	< .001**
Post-task imagery	0.42	0.05	0.32, 0.52	8.17	< .001**
Post-task imagery x Decentering	-0.20	0.07	-0.33, -0.06	-2.89	.004**

(post-task state anxiety ~ pre-task state anxiety + condition * post-task imagery)

 $*^{*}p < .01$. Model statistics: F(4, 311) = 156.73, p < .001, adjusted $R^2 = 0.66$

5.3.3.4 Additional quantitative analyses informed by qualitative survey findings

Based on the qualitative findings that most participants successfully understood and applied their respective instructions (decentering or control), while some misunderstood the instructions (see "Qualitative Survey Findings", sub-themes 2.1 and 2.3), we conducted additional exploratory analyses that were not preregistered. We looked separately at the data from participants who correctly understood or misunderstood the decentering instructions. Specifically, we constructed the same moderated multiple regression as above to test Hypotheses 2 and 3 for the two separate datasets (i.e., understood or misunderstood). The models were constructed by using either the combined, pre-task, or post-task imagery score.

There were 247 participants who correctly understood the instructions (decentering N = 94, control N = 153; i.e., 65 and four participants excluded from the decentering and control conditions, respectively). There were 43 participants in the decentering condition who misunderstood the instructions. We compared the data from participants who misunderstood decentering to all participants in the control condition, as only four participants misunderstood normal viewing (control N = 157, total N = 200). It is worth noting that we did

not directly ask participants to summarise what they understood from the instructions, but rather analysed their qualitative survey responses for any indications of understanding/misunderstanding (i.e., a latent interpretative approach to coding; Braun & Clarke, 2006).

Notably, in the analyses using the post-imagery score, the interaction effect of imagery and condition on state anxiety was significant in the full dataset ($\beta = -0.20$; p = .004) and the dataset with those who *understood* the instructions ($\beta = -0.17$; p = .032). However, the interaction was no longer significant in the dataset of those who *misunderstood* decentering ($\beta = -0.14$; p = .185). In other words, imagery of pandemic-related worries predicted state anxiety less strongly only when participants correctly understood the decentering instruction (and in the full dataset). Detailed descriptions of these findings are presented as supplementary materials (see Appendix D, supplementary material 1).

5.3.3.5 Perceived effort and success in applying the instructions

Participants in the decentering and control conditions spent similar levels of self-reported effort and felt similarly successful when applying their respective instructions. See Table 22 for descriptive statistics and a summary of these comparisons.

	Con	itrol	Decen	tering					
									95% CI for
Variable	М	SD	М	SD	t	df	р	d	difference
									in means
Perceived	77 40	11 11	75 82	17 40	1 86	305 01	064	0.21	-6.88 0.20
effort	72.40	72.40 14.44 75.02 17.40	17.40	1.00 303.01	.004	0.21	-0.00, 0.20		
Perceived	60 61	72 17	60 24	76 17	0 12	200 54	806	0.01	5 1 2 5 96
success	00.01	23.12	00.24	20.42	0.15	507.54	.090	0.01	-3.13, 3.00

Tab	ble 22 - Descriptive statistics and comparison	of the decentering and	control conditions
for	perceived effort and success in applying the	instructions	

5.3.4 Manipulation checks

We assessed whether participants receiving the decentering instructions experienced increased levels of decentering compared to those in the control condition. Since we identified one outlier in the control condition and three outliers in the decentering condition (all 3SD's below the mean), we performed Welch's two-sample t-tests with the composite score of decentering as the dependent variable, once including and once excluding the outliers. Participants in the decentering condition (M = 57.36, SD = 16.64) and control condition (M =56.14, SD = 14.68) reported similar levels of decentering, t(310.11) = 0.69, p =.492, d = 0.08, 95% CI for the difference in means [-2.26, 4.69]. Removing outliers did not change these findings, t(308.34) = 1.13, p = .258, d = 0.13, 95% CI for the difference in means [-1.38, 5.12]; decentering: M = 58.37, SD = 15.08; control: M = 56.50, SD = 14.01. Therefore, based on self-reported data, the decentering manipulation was not successful in inducing a decentered perspective on one's thoughts.

5.3.5 Qualitative findings on pandemic-related worries

We identified four themes from the pandemic-related worries that participants described (for an overview, see Table 23). Together, these capture participants' worries about others' and their own physical health (Theme 1), job insecurity, finances, and education (Theme 2), loneliness and separation from loved ones (Theme 3), and the current and future impact of COVID-19 (Theme 4). Table 24 provides additional demographic information to contextualise these findings. Here, we briefly describe each theme using supporting quotes (Table 25).

Theme	Theme Sub-theme		Count of instances coded per condition		
		Control	Decentering		
1. Physical health	1.1 Health of others	40	50		
	1.2 Self as vulnerable, carer, and transmitter	23	24		
2. Job insecurity,	2.1 Job insecurity and finances	39	29		
education	2.2 Higher education	9	9		
	2.3 Home schooling and secondary education	9	7		
3. Lonely and	3.1 Loneliness and isolation	12	17		
separated	3.2 Physical separation	9	13		
4. Pandemic	4.1 A never-ending lockdown	5	10		
environment: Present and future	4.2 It won't ever be the same	5	6		

Table 23 - Overview of themes and sub-themes for the worry data

	Total count (%)		Count (%) per condition			
			Control	Decentering		
Gender						
Female	211 (66.77)		101 (64.33)	110 (69.18)		
Male	105 (33.23)		56 (35.67)	49 (30.82)		
	Range	Mean (SD)	Mean (SD) j	per condition		
			Control	Decentering		
General pandemic anxiety	7.83 - 99.13	65.87 (15.12)	65.80 (15.62)	65.94 (14.65)		
Age	18 - 64	34.74 (12.70)	34.02 (12.59)	35.46 (12.81)		
Age group	Count (%)					
18-24	92 (29.11)					
25-29	46 (14.56)					
30-34	42 (13.29)					
35-39	27 (8.54)					
40-44	29 (9.18)					
45-49	29 (9.18)					
50-54	17 (5.38)					
55-59	22 (6.96)					
60-64	12 (3.80)					
Current student status	Total count (%)					
Yes	78 (24.68)					
No	238 (75.32)					

Note. Participants reported age as a free-text response, which was then categorised into age groups by the researchers.

General pandemic anxiety was assessed with the question, "Overall, how anxious have you been feeling about the COVID-19 pandemic?" (from "not at all" to "extremely"; 100-point Visual Analogue Scale). Participants with a score lower than 25 were not included in the study.

5.3.5.1 Theme 1. Physical health

5.3.5.1.1 Health of others

Many participants expressed worry over the health of others. Although a few participants were worried about people catching and suffering from COVID-19 more generally, the majority of participants focused on the health of specific loved ones such as partners, parents, children, and pets (e.g., P47, P121). Worry for older adults' health (e.g., parents; P381) was more common than worry for younger individuals, and this was sometimes coupled with a fear of their death (e.g., P17).

5.3.5.1.2 Self as vulnerable, carer, and transmitter

Compared to the health of others, fewer participants were worried about getting infected with, suffering and/or dying from COVID-19 themselves. However, when personal health was mentioned, this was often related to worries about unintentionally transmitting the virus (e.g., P390) or getting sick/hospitalised and therefore being unable to care for loved ones who require support (e.g., children, pets; P309).

5.3.5.2 Theme 2. Job insecurity, finances, and education

5.3.5.2.1 Job insecurity and finances

Many participants identified worries related to their careers and finances. This included the risk of redundancy for those who currently have a job (e.g., P2), and the inability to find employment for those who are currently unemployed (e.g., P44). Given this job-related uncertainty, participants were worried about present and potential longer term economic hardship.

5.3.5.2.2 Higher education

Some participants brought up worries related to the negative impact of the pandemic on their current educational experiences, such as the remote learning environment (e.g., P65). A few other participants were worried about their educational prospects, such as getting accepted to a new course (e.g., P366).

This sub-theme captured parents' worries about the impact of the lockdown on their children's education and future, including worries about the quality of home schooling they provide for their children (e.g., P261).

5.3.5.3 Theme 3. Lonely and separated

5.3.5.3.1 Loneliness and isolation

Some participants were worried about their relationships fading away or getting strained during the pandemic (e.g., P216). This was associated with fears around loneliness, lack of social contact, and relationships ending altogether (e.g., P325).

5.3.5.3.2 Physical separation

In addition to the emotional and relational worries in sub-theme 3.1, physical separation from loved ones was also a source of worry. Participants were worried about being unable to see loved ones in-person for a prolonged period of time (e.g., P170, P138). Participants described a range of physical distances from loved ones (e.g., abroad, living close to each other but unable to meet due to lockdown restrictions), suggesting it was the separation itself rather than the distance that was worrisome.

5.3.5.4 Theme 4. Pandemic environment: Present and future

5.3.5.4.1 A never-ending lockdown

Some participants worried that lockdowns would persist over many years (e.g., P10, P339).

5.3.5.4.2 It won't ever be the same

A few participants shared their worries that life will never go back to the prepandemic 'normal' again (e.g., P73). This was associated with the worry of missing out on life experiences such as traveling (e.g., P176).

Table 25 - Supporting quotes for qualitative findings on pandemic-related worries

Themes and sub-themes	Quotes				
1. Physical health	h				
1.1 Health of	Decentering:				
others	"Worried about the health of my husband as he has to leave home to go to work" (P47, F)				
	"My son has asthma and works in a fast-food restaurant. I worry that because of his lung condition, if he catches COVID, it could be bad for him." (P121, F)				
	Control:				
	"I am worried about the well-being and health of my loved ones. I do not want to lose any member of my family or for them to experience any long-term psychological harm once this pandemic is over." (P17, M)				
	" my parents still work and I worry they can catch the virus. They are fairly old and I feel they are at a higher risk without a vaccine" (P381, M)				
1.2 Self as vulnerable,	Decentering: [transmitter] "I worry that I might have the virus and not know it, so I could infect someone else." (P390, F)				
carer, and transmitter	Control:				
	<i>[self]</i> "Catching it, being really ill and unable to breath and the possibility of dying from the virus." (P269, M)				
	<i>[self and carer]</i> " I worry about catching it and dying. I'm a single parent to two girls. The youngest has learning difficulties and needs me. I worry how she would cope if anything happened to me." (P309, F)				
2 Job insecurity	finances and education				

2.1 Job insecurity and	Decentering: "I am concerned that my job is at risk and then I will be
lindlices	made redundant." (P2, F)
	" I lost my job a few months ago due to COVID I still have a mortgage to pay and bills to pay. Savings will cover it for now but not for the long term." (P90, F)
	Control:
	"I will never be able to have my career back (I work in the arts)." (P44, F)
	"Currently, we have no source of income and ever-mounting debts. I am worried that we may never recover, financially, from this period, and even if we can get back to where we were before COVID, we will still be paying for this for many years" (P195, F)

2.2 Higher	Decentering:
education	"I am scared we'll never get back to normal and I will not be able to go back to university." (P304, F)
	"Failing to get a place on the DEdCPsych course." (P366, F)
	Control:
	" Not being able to have in-person teaching which is vital for my degree is very worrying. Don't know how assessments will work and how will we catch up with everything that we have missed." (P65, F)
2.3 Home schooling and secondary education	<i>Decentering:</i> "Worried about home schooling, I am anxious about the impact that this lockdown is having upon my children's education and worry about the future and how they will catch up." (P145, F)
	<i>Control:</i> "Feeling like I am letting my children down because I don't think I am doing a good job at home schooling them." (P261, F)

3. Lonely and separated

3.1 Loneliness and isolation	<i>Decentering:</i> "Not being able to see any of my friends which makes me feel lonely and feel further away from my friends." (P325, F)
	<i>Control:</i> "I worry that I have become isolated and will struggle to keep and make deeper friendships." (P216, F)
3.2 Physical separation	<i>Decentering:</i> "I won't be able to see my parents that live abroad again." (P170, M)
	<i>Control:</i> "I worry that I will not be allowed to meet my son and grandson in close proximity indoors for a very long time." (P138, F)

4. Pandemic environment: Present and future

4.1 A never- ending lockdown	Decentering: "The lockdown is starting to bother me. The first I could manage, but moving into a new year, and another long period of home working, I feel trapped." (P339, M)
	<i>Control:</i> "My worry is that the vaccine will only work temporarily and we will be going through lockdowns for years." (P10, M)
4.2 It won't ever be the same	<i>Decentering:</i> "We are never going to get back to normal, no lockdown, no wearing masks, able to hug our family and friends." (P73, F)
	<i>Control:</i> "I am worried that life will never go back to normal and that I won't be able to do all the things that I have always wanted to do and imagined doing e.g., travelling to different countries." (P176, F)

Note. In this table and tables 13-18, '...' indicates text that was removed to present the relevant data extract concisely, and without altering its meaning. Spelling was corrected to improve readability, again without altering meaning. Participant number and gender is indicated for each quote (i.e., Pxx, F/M).

5.3.6 Qualitative survey findings

We identified three themes from the qualitative survey (for the survey questions, see Table 26; for an overview of themes, see Table 27). Theme 1 illustrates the specific thoughts, feelings, and physical sensations that participants experienced when thinking about the pandemic-related worry that they identified. Theme 2 describes how participants applied an accurate or misunderstood version of the decentering and control instructions, and the challenges they experienced while doing so. Theme 3 captures the wide range of outcomes that participants reported after applying the decentering or control instructions to their specific worry. Next, we describe each theme and subtheme, provide supporting quotes, and highlight instances where a sub-theme is more or less salient for the decentering and control conditions. The demographic information provided when describing participants' pandemic-related worries contextualises the findings here as well (see Table 24).

Table 26 - Qualitative survey questions

Question

- Can you tell us a bit about what happened while you were thinking about the specific worry that makes you anxious? For example, did you notice any thoughts, feelings, physical sensations or anything else?
- **2.** How exactly did you apply the instructions you received while thinking about your worry?
- 3. What happened once you applied these instructions?

Theme	Sub-theme	Count of instances coded per condition	
	-	Control	Decentering
1. Worry experiences	1.1 Spiralling, worst-case, and 'what-if' thoughts	52	50
	1.2 Feelings of anxiety, fear, sadness, and anger	54	39
	1.3 Physical sensations of the heart, chest, and stomach	37	23
2. Applying	2.1 Successfully applied the instructions		
the instructions: Successes,	2.1.1 Applied using waterfall and other imagery (decentering only)	0	60
challenges, and misunderstan	2.1.2 Applied in a thought-based or metacognitive way	99	34
dings	2.1.3 Applied as an aspect of mindfulness (control only)	25	0
	2.1.4 Applied as relaxation (control only)	18	0
	2.2 Difficulty with applying the instructions	6	21
	2.3 Misunderstood the instructions and applied something different	4	43
3. Outcomes	3.1 A different way of relating	41	101
	3.1.1 A new perspective	25	35
	3.1.2 Decentering and distance	12	26
	3.1.3 Acceptance	2	22
	3.2 Relaxation	24	94
	3.3 Reduced negative affect	19	31
	3.4 Increased negative affect	59	12
	3.5 Vivid, ruminative thoughts (control only)	48	0
	3.6 No change	10	12
	3.7 Negative opinions (decentering only)	0	12

Table 27 - Overview of qualitative survey themes and sub-themes

5.3.6.1 Theme 1. Worry experiences

Participants often described their experiences of thinking about their worry through a combination of thoughts, feelings, and physical sensations. While keeping the multidimensional experience of participants in mind, we found it informative to understand each aspect of their experience in turn, as its own sub-theme. See Table 28 for supporting quotes.

5.3.6.1.1 Spiralling, worst-case, and 'what-if' thoughts

Many participants in both conditions found themselves spiralling into other negative thoughts related to their initial worry (e.g., P404), catastrophising about worst-case scenarios (e.g., P60), and engaging in 'what-if' thinking around their worry becoming a reality (e.g., losing son to COVID-19; P121). These thoughts were future-oriented, and often captured a network of associated thoughts rather than the initially identified worry in isolation.

5.3.6.1.2 Feelings of anxiety, fear, sadness, and anger

Participants felt predominantly anxious, afraid, and sad, and to a lesser extent, angry (e.g., P117, P345). They sometimes identified a mix of feelings associated with their worry, such as a combination of anxiety and fear (e.g., P56).

5.3.6.1.3 Physical sensations of the heart, chest, and stomach

Although less salient than thoughts (sub-theme 1.1) and feelings (sub-theme 1.2), participants also experienced physical sensations in specific parts of their bodies. For instance, their heart started beating faster (e.g., P22), chest tightened (e.g., P15), and stomach felt upset (e.g., P197). A few participants also mentioned changes in their breathing (e.g., P269). Some participants recognised these sensations as familiar, since they experienced them during previous instances of anxiety and worry (e.g., P15).

Table 28 - Supporting quotes for Theme 1

(Worry experiences)

Sub-Theme	Quote
1.1 Spiralling, worst-case, and 'what-if' thoughts	Decentering:
	"I started catastrophising about what would happen if my son caught asthma and what would happen and how would we deal with it, I worried about losing him." (P121, F)
	" there was the initially worry, and then the thought of multiple different ways things could go if the worry came together around the same time and my mind flicked between them." (P404, M)
	Control:
	"I felt an abundance of thoughts regarding health, and why I was afraid something might happen to it." (P25, F)
	"My mind went to the worst-case scenarios relating to my worry." (P60, F)
1.2 Feelings of	Decentering:
anxiety, fear, sadness, and anger	"I felt a tingle of anxiety all over. I felt passing feelings of anger, frustration, sadness, guilt, boredom" (P117, F)
anger	" Feeling sad for [my children] and angry at the situation we are in." (P345, F)
	Control:
	"I felt very scared for everyone, and I began to worry even more. People don't listen to the rules like they should it makes me anxious as they don't care" (P56, F)
	"I had a moment of feeling sad that I wouldn't be part of my child's birth as it's such a major thing in my life." (P9, M)
1.3 Physical	Decentering:
sensations of the heart, chest, and stomach	"I feel a tightness in my chest, as I usually do when anxious." (P15, F)
	"I began to feel a ball of anxiety in my stomach and my heart began to beat faster." (P22, F)
	Control:
	"My head became heavy and my heart fluttered. I felt sick to my stomach with my heart racing." (P197, F)
	" I found myself breathless and unable to breathe naturally" (P269, M)

5.3.6.2 Theme 2. Applying the instructions: Successes, challenges, and misunderstandings

Most participants applied their assigned instructions successfully (sub-theme 2.1), while some experienced challenges (sub-theme 2.2) or applied a misunderstood version of the instructions (sub-theme 2.3).

5.3.6.2.1 Successfully applied the instructions

The way in which participants correctly applied the instructions was more varied in the control condition compared to decentering. This mirrors the contrast between the specificity of the decentering instructions (i.e., "observe your worry about the pandemic, and look at the thoughts that make you anxious come and go") and the open-endedness of the control instructions (i.e., "think in a normal way... you're free to follow up on any thoughts, feelings and physical experiences in your body"). See Table 29 for supporting quotes.

5.3.6.2.1.1 Applied using waterfall and other imagery (decentering only).

Since the waterfall metaphor is a key feature of the decentering instructions, most participants in this condition applied the instructions through the metaphor or other similar imagery. Participants engaged with the metaphor in various ways. While many participants used the original metaphor as it was described in the instructions (e.g., P2), a few others elaborated on it by thinking about the metaphorical meaning of various other features of the waterfall (e.g., water washes away but returns due to the water cycle, P384). A minority of participants engaged with other metaphors that came up while applying the instructions to their worries, such as cars approaching and disappearing (P406). Importantly, most participants understood the metaphorical use of this imagery to elucidate a metacognitive concept, rather than focusing on the physical properties of the image for its own sake. This was evident in participants' responses, which mentioned both the worry/worry thoughts and the imagery (e.g., "I thought about my worry as if it were part of the waterfall...", P2). Participants who used the waterfall solely as a visualisation tool are discussed in sub-theme 2.3.

5.3.6.2.1.2 Applied in a thought-based way or without reliance on imagery

Some participants in both conditions applied the instructions in a thought-based way or without reliance on imagery. For participants in the decentering condition, this was characterised by a lack of mentioning of imagery (e.g., P52, P130). Participants in the control condition described the cognitive or metacognitive process of thinking or observing how their thoughts developed naturally (e.g., P69, P251). Applying the instructions in this way was more salient in the control condition. This makes sense, given any metaphors or imagery were not mentioned in the control instructions.

5.3.6.2.1.3 Applied as an aspect of mindfulness (control only)

A considerable number of participants in the control condition interpreted and applied the instructions as an aspect of mindfulness, including decentering (e.g., P29), acceptance (e.g., P99), and openness and curiosity (e.g., P72). Parts of the control instructions may bear resemblance to acceptance, openness and curiosity, as participants were instructed to "let their thoughts develop freely" and reminded that "any experiences that they may have are completely fine". However, participants' interpretation of the instructions as decentering was novel, given the instructions did mention thoughts coming up, but did not mention them going away.

5.3.6.2.1.4 Applied as relaxation (control only)

Although it was not mentioned in the instructions, some participants in the control condition incorporated relaxation into their practice. Participants tended to relax first, then applied the instructions to follow up on any thoughts, feelings and physical sensations that may come up (e.g., P302, P68).

5.3.6.2.2 Difficulty with applying the instructions

See Table 30 for supporting quotes. Participants experienced various difficulties when applying the instructions, including a general sense of struggle (e.g., P99), but also specific challenges such as being re-immersed in intrusive thoughts

(e.g., P142) and needing to hear the instructions again (e.g., P249). Many more participants experienced difficulties in the decentering condition (N = 21) compared to the control condition (N = 6).

5.3.6.2.3 Misunderstood the instructions and applied something different

See Table 30 for supporting quotes. A misunderstood application of the instruction typically involved blocking and suppression of experiences (e.g., P104, P30), distraction (e.g., P202), and relaxation (e.g., P111). Further, some participants in the decentering condition used the waterfall imagery as a direct visualisation tool rather than a metaphor (e.g., P22). Many more participants in the decentering condition (N = 43) misunderstood the instructions compared to those in the control condition (N = 4). This may be because the vague control instructions to think about worries in a normal way and to follow up on any experiences leaves more space for participant interpretation compared to the decentering instructions. As such, it is more challenging to gauge whether control participants misunderstood the instructions, or the flexible instructions led them toward a particular application. Here, we considered participants in the control condition to have misunderstood the instructions if they tried to actively block out experiences rather than following them up (e.g., P30).

Table 29 - Supporting quotes for Sub-theme 2.1

(Applied the instructions)

Code	Quote
2.1.1 Applied using waterfall and other imagery (decentering only)	[original waterfall metaphor] "I thought about my worry as if it were part of the waterfall and was coming and going just as quickly." (P2, F)
	[elaboration on waterfall metaphor] "I tried to imagine it washing away but then I thought to myself that in a waterfall, water washes away then because of the water cycle, it will probably end up coming back to that same waterfall again. So the problem never goes away." (P384, F)
	[new metaphor] "during the minute, I found another image kept getting in the way. It was the image of a city, with the cars all blurred. (You see it in movies/TV occasionally). The cars move very fast (time- lapse) then disappear. I felt this was similar to how I felt. The cars representing the fleeting worry thoughts coming and going but not constant." (P406, M)
2.1.2 Applied	Decentering:
in a thought- based or metacognitive way	"I imagined the worries flowing past, and observing them rather than trying to solve them in that moment." (P52, F)
	"I tried to follow the instructions by passively observing my thoughts and feelings and imagining them flowing by without being caught up myself. This meant taking a 'step back' from my worry and trying to examine it from the outside." (P130, F)
	Control:
	"I just let the thoughts come and tried not to dwell on them or interrupt the thoughts coming into my head." (P69, F)
	"I thought about the anxiety I had mentioned and let the thoughts escalate as they naturally did without stopping myself thinking about it as I normally would." (P251, F)
2.1.3 Applied as an aspect of mindfulness (control only)	<i>[decentering]</i> "I sat down and let anything come into my mind and I didn't push the thought away, I simply let it come and fade away." (P29, F)
	<i>[acceptance]</i> "I let my feelings about my career prospects arrive and tried to allow them and the uncomfortable feelings to come in, I listened to them without reasoning with them." (P99, F)
	[curiosity and openness] "I decided to let my mind wander to see where it led me." (P72, F)
2.1.4 Applied as relaxation	"I tried to relax and give the thoughts space to move and develop." (P302, F)
(control only)	"I just relaxed and let my mind wander." (P68, M)

204

Table 30 - Supporting quotes for Sub-themes 2.2 and 2.3

Sub-theme	Quote
2.2 Difficulty with applying the instructions	Decentering:
	"I tried to distance myself from my thoughts and try to 'watch them go by' as instructed, but I found it hard to and soon found myself tangled in them again." (P142, M)
	" I find it quite hard, and could have done with hearing the audio again." (P249, F)
	Control:
	" I tried not to control or influence what came up but it was quite challenging." (P99, F)
	"I tried to think 'normally' but there isn't a way to do that. Normal is relative." (P216, F)
2.3	Decentering:
Misunderstood the instructions and applied something else	<i>[distraction]</i> "I just started focusing on something else in order to not think about it." (P202, M)
	[blocking] "Tried to blank everything first but it was too difficult." (P104, M)
	[relaxation] "I closed my eyes and relaxed." (P111, F)
	<i>[waterfall visualisation]</i> "I tried to visualise the waterfall. I tried to sit in a small cave, almost, watching the water drop down but I was safe in my cave." (P22, F)
	Control:
	[blocking] "I tried to actively block out any thought not related to my worry that came into my head during the 1 minute." (P30, M)

(Difficulty with applying the instructions; Misunderstood the instructions and applied something else)

5.3.6.3 Theme 3. Outcomes of applying the instructions

See supporting quotes for sub-theme 3.1 in Table 31, sub-themes 3.2-3.5 in Table 32, and sub-themes 3.6 and 3.7 in Table 33.

5.3.6.3.1 A different way of relating

This sub-theme captures instances where, although the worries were still present, participants developed a new relationship to their worries after applying the instructions.

5.3.6.3.1.1 A new perspective

Many participants adopted various new ways of making sense of their worries (e.g., P90). This new perspective often involved a reassessment of the magnitude of the worry. Worries seemed smaller to participants after applying the instructions (e.g., P41). Participants in the control condition also developed clarity and awareness (e.g., P26, P177). The control instructions may have provided a structured time and space to follow up on experiences for participants who do not routinely engage with worry experiences in their daily lives, which may have led to new insights.

5.3.6.3.1.2 Decentering and distance

Participants became aware that their worry experiences are separate from themselves (e.g., P146), and this awareness allowed some participants to create further distance between themselves and their experiences (e.g., P149). While these are central concepts in the decentering instructions, therefore unsurprising outcomes for the participants in the decentering condition, a few participants in the control condition also described processes akin to decentering. For example, one participant spontaneously separated herself from her worry (P18), and another participant noticed the transience of her negative thoughts as they "passed her by" (P217).

5.3.6.3.1.3 Acceptance

Some participants acknowledged their lack of control over their worries, and so accepted them as is (e.g., P27). Acceptance was sometimes expressed as "embracing" (P354) and "coming at peace with" (P106) worry experiences. Many more participants in the decentering condition (N = 22) expressed acceptance compared to the control condition (N = 2).

5.3.6.3.2 Relaxation

Calmness and relaxation were common outcomes of applying the instructions (e.g., P173), especially for participants in the decentering condition (e.g., P391, P115). This included the physical manifestation of relaxation, such as slowing

down of one's breathing (e.g., P239). Speculatively, 'relaxation' may be considered the opposite of 'anxiety' in colloquial terms. For instance, one participant felt more "relaxed rather than anxious and rigid" (P106), which directly juxtaposes anxiety felt at the start of applying the instructions with relaxation felt at the end.

5.3.6.3.3 Reduced negative affect

After applying the instructions, participants experienced reduced levels of anxiety (e.g., P183, P175) and/or reported feeling better generally. More participants in the decentering condition (N = 31) felt this way compared to the control condition (N = 19). Participants experiencing a reduction in negative affect implies that during the minute of applying the instructions, at least some participants experienced an initial surge of feelings, followed by a reduction. For example, one participant described the initial anxiety that he felt, which was reduced once he started to view thoughts as mental events (P394).

5.3.6.3.4 Increased negative affect

While some participants experienced *reduced* negative affect (sub-theme 3.3), others felt increased stress (e.g., P147), anxiety (e.g., P168), anger (e.g., P318), hopelessness and helplessness (e.g., P318) when they applied the instructions. This was sometimes paired with a desire to avoid or escape from these feelings (e.g., P29). More participants in the control condition (N = 59) felt this way compared to those in the decentering condition (N = 12).

5.3.6.3.5 Vivid, ruminative thoughts (control only)

Many participants in the control condition described continued ruminative thinking as an outcome of applying the instructions. Participants 'spiralled' and 'snowballed' through a network of vivid thoughts (e.g., P94, P382). This makes sense, given participants in this condition were explicitly instructed that it is fine for them to "get carried away with whatever comes up".

5.3.6.3.6 No change

A few participants in both conditions experienced no change in their experiences after applying the instructions (e.g., P331). In some cases, this was because participants were not in the actual worry context of their daily lives, but instead were thinking about their worry from a distance (e.g., P334).

5.3.6.3.7 Negative opinions (decentering only)

A few participants developed strong negative opinions of the decentering instructions. The instructions to observe thoughts as mental events that go away on their own was experienced by some as insensitive for dismissing and belittling people's genuine worries (e.g., P364, P386). Further, some participants felt resistance toward applying decentering due to its resemblance to other wellbeing techniques that they have previously encountered (e.g., P170 was "fed up with all the 'gurus' and the 'techniques'").

Table 31 - Supporting quotes for Sub-theme 3.1

(A different way of relating)

Code	Quote
3.1.1 A new perspective	Decentering:
	" my worries started to seem smaller. I feel as if I have a little more perspective." (P41, M)
	"It also felt as though I could objectively assess my thoughts and make a note of which were unrealistic and which were genuine." (P90, F)
	Control:
	"I was able to approach the problem from different angles and reason it through." (P26, F)
	"I think my worry wasn't as great as I realised there's more important things in life." (P177, F)
3.1.2	Decentering:
Decentering and distance	"I realised that these thoughts were separate to me. I felt that maybe I could control my reaction to the thoughts in future and not let them overwhelm me. I have never really thought about my worries this way before." (P146, F)
	"I felt able to distance myself from the worry and separate the things that are making me anxious from the here and now." (P149, F
	Control:
	"The negative thoughts didn't consume me too much, but instead seemed to kind of pass me by. They were still worrying thoughts, but they didn't become overwhelming." (P217, F)
	"I felt better in that I can try to separate the worry from my being and realise that it is not part of me." (P18, F)
3.1.3 Acceptance	Decentering:
	"I felt like the water was going to keep falling no matter what so I will embrace it more and try not to worry as much about it." (P354, F)
	"Instead of dreading about it, I came at peace to the idea of it." (P106, M)
	Control:
	"I realised that I could not control things out of my hands and to accept the feelings I had." (P27, F)

3.2 Relaxation

Table 32 - Supporting quotes for Sub-themes 3.2, 3.3, 3.4, and 3.5

Decentering:

(P391, M)

(Relaxation; Reduced negative affect; Increased negative affect; Vivid, ruminative thoughts)		
Sub-Theme	Quote	

"I was starting to get anxious, but when I decided to observe my thoughts rather than just experience them, I felt calmer a bit."

"I felt more at peace and relaxed rather than anxious and

rigid." (P106, M) "I felt physically calmer and more relaxed. My breathing slowed and at the end I felt more of a sense of peace." (P239, F) "I felt more in control of my thoughts and this helped me feel calmer." (P115, F) Control: "I became calmer and reflective on the situation." (P173, M) "I felt a lot calmer and less rushed to fix something..." (P382, F) 3.3 Reduced Decentering: negative "My anxiety dropped slightly from total worry to something that affect is very frustrating currently." (P183, M) "After initial anxiety taking the approach that it is a mental event reduced the anxiety a lot..." (P394, M) Control: "I felt slightly less anxious as I addressed it more as a task and a bit of a release of pent-up emotion." (P175, F) "It helped slightly ease my nerves." (P323, M) 3.4 Increased Decentering: negative "I felt a bit stressed, as despite the metaphor I knew that the affect stress wouldn't be washed away, but would recur." (P147, F) "I felt that I was more anxious by giving more attention to the worry." (P168, F) Control: "I was getting anxious, as the more time I spend not doing anything, the more hopeless I feel. I felt helpless and slightly angry especially towards the government for being so flimsy in their decisions." (P318, F) "I became more stressed and worried the longer time went on. I

"I became more stressed and worried the longer time went on. I found myself wanting to be distracted and try to forget about it." (P29, F)

3.5 Vivid, ruminative thoughts (control only)	"I noticed my thoughts spiralling - it started out with one specific worry that snowballed until the process of losing my job ended up with me basically homeless and hopeless." (P94, F)
	" It almost felt like I'd already lost my job and I had to rush and find another job there and then" (P382, F)

Table 33 - Supporting quotes for Sub-themes 3.6 and 3.7

(No change; Negative opinions)

Sub-Theme	Quote
3.6 No change	Decentering:
	"Not much, as thinking about it is different than actually being in the situation so not realistic." (P334, F)
	Control:
	"It didn't seem to make any difference to how I felt." (P331, M)
3.7 Negative opinions (decentering only)	"I was irritated after listening to the recording. I don't like people telling me what to do, I am fed up with all the 'gurus' and the 'techniques' that are out there 'helping' people" (P170, M)
	"This made me feel more anxious and worried. I feel like by trying to relax and disassociate from the issue it belittles the issue itself as it is all encompassing I felt angry at the ridiculousness of trying to 'accept' the issue as something that will pass. Only active pursuit on my part will allow this issue to pass" (P364, F)
	" although it is correct that there are some things which are beyond the control of people as the situation currently stands, simply attempting to mentally hand-wave away thoughts of a damaging ongoing situation, with serious material and long-lasting impacts, is unhealthy, unhelpful, and minimising acceptance of genuine distress many are experiencing I became resistant to the suggested method and angry at the thought that millions of social lives experiencing extensive and in some cases perhaps unresolvable damage can be imagined away you cannot dismiss loneliness as 'a passing thought', particularly in the long term, much as you cannot dismiss a long-term disease as a concern to be 'let go'" (P386, M)

5.4 Discussion

5.4.1 Study summary

In this study, we examined whether a brief decentering-based mindfulness strategy can be used to regulate anxiety related to pandemic worries in a sample of non-meditators. Participants identified one pandemic-related worry that causes them anxiety, listened to the decentering or control instructions, and applied the instructions to their worry for one minute. We collected quantitative data on state anxiety and imagery, and qualitative data on participants' firstperson accounts of the worry they identified and their experiences of applying the decentering/control instructions.

5.4.2 Quantitative findings

The quantitative results suggest that in the control condition where participants followed their thoughts, feelings and physical experiences freely, imagery of pandemic worries predicted state anxiety. This provides further empirical support for the relationship between negative imagery and anxiety (e.g., Bauer & MacNamara, 2021; Hackmann et al., 2000; Hirsch et al., 2006; Rauch et al., 2004).

Our findings also suggest that the decentering instructions reduced state anxiety compared to the control condition. This finding also aligns with previous literature (e.g., Feldman et al., 2010; Hoge et al., 2015; Paz et al., 2017). Especially relevant to this study, Keesman et al. (2020) also demonstrated this effect, where applying decentering reduced negative affect compared to vivid immersion in one's imagery of past unpleasant autobiographical events. Further, Schumer et al. (2018) conducted a meta-analysis of 65 randomised controlled trials to assess the effectiveness of brief mindfulness interventions in reducing negative affectivity. They reported a small, yet significant effect of brief mindfulness in reducing negative affect compared to control interventions. Importantly, Schumer et al. (2018) also reported a significant moderator effect of mindfulness intervention type. Studies classified by the researchers as "other types of mindfulness exercises" had greater effects compared to body scan and focused breathing exercises. These "other" exercises included decentering (e.g., Rogojanski et al., 2011), which supports the findings of our study and contextualises its effectiveness in relation to other brief mindfulness interventions.

The finding that decentering reduces state anxiety compared to the control condition is comparable in terms of effect size to some of the studies mentioned above. Keesman et al. (2020) used a Bayesian approach to statistical analysis, and found extreme evidence in two experiments for the hypothesis that applying decentering reduces negative affect compared to an active control condition. Rogojanski et al. (2011) reported a reduction in negative affect for participants in the mindfulness condition compared to a suppression condition with a large effect size (partial $\eta^2 = .15$). Lastly, Schumer et al. (2018) reported a small effect of brief mindfulness reducing negative affect compared to control training

(Hedge's g = .208), with a greater effect for the "other" mindfulness exercises category, which included decentering (Hedge's g = .304). Within the confirmatory multiple regression model of our highly powered study, decentering reduced state anxiety compared to the control condition with a medium effect strength ($\beta = .0.51$). This places the current study in between the individual studies reporting a large effect (i.e., Keesman et al., 2020; Rogojanski et al., 2011) and the meta-analysis reporting a smaller effect (i.e., Schumer et al., 2018). However, this should be treated as a very approximate comparison, since the analytic approaches taken are very different from each other, especially for the meta-analysis (Schumer et al., 2018).

The findings on the interaction effect of condition (decentering vs. control) and imagery on state anxiety were mixed. Based on the confirmatory analysis where the model included a combined score of pre- and post-imagery, decentering did not reduce the link between imagery and anxiety compared to the control condition. However, based on the exploratory analysis where the model included only the post-imagery score, decentering indeed reduced this link, in line with our predictions. The decoupling effect of mindfulness generally, and decentering specifically has been illustrated (Ainsworth et al., 2015; Feldman et al., 2010; Keesman et al., 2020). Levin and colleagues (2015) conducted a literature review of acceptance and mindfulness-based therapies. Of the 44 studies included in the review, 41 reported a decoupling of internal experience (e.g., vivid negative imagery) from the response that it typically elicits (e.g., anxiety). Ainsworth et al. (2015) implemented a novel carbon dioxide (CO_2) challenge as an experimental model of anxiety, and compared the effect of brief open monitoring, focused attention, and relaxation instructions. Although participants in all conditions reported similar levels of autonomic arousal in response to the CO2 challenge (i.e., increased heart rate and blood pressure), open monitoring reduced subjective feelings of anxiety the most. This suggests a decoupling of the subjective psychological experiencing of anxiety from its physiological manifestations. With its emphasis on monitoring and acceptance of experiences, open monitoring most closely resembles decentering out of these conditions. Therefore, the significant exploratory finding is in line with the literature.

The discrepancy in the confirmatory and exploratory findings on the interaction effect can be explained through the timing and context of the pre- and post-task

imagery measures. Our rationale for using a combined imagery measure in the confirmatory analysis was to comprehensively capture both the initial vividness of imagery when participants identified a pandemic worry (i.e., pre-task score) and the subsequent vividness of imagery when participants applied the instructions to this worry (i.e., post-task score). In other words, the pre-task score is meaningful for capturing the first moment when participants were exposed to the worry, the post-task score is meaningful for capturing participants' experiences while they applied the instructions, and when combined, these scores capture the full "encounter". However, since participants thought about and worked with the worry for a longer period of time before providing post-task imagery ratings, it makes sense that the decoupling effects are uniquely observed here. While the slope showing the relation of imagery with anxiety for the control condition seems to be steeper pre-to-post task, the slope for decentering seems less steep post-task compared to pre-task (see Figure 14). In other words, thinking about worries in a normal way for one minute (i.e., control condition) seems to increase the association between imagery and anxiety, while viewing thoughts as mental events (i.e., decentering condition) appears to decrease it. Together, the significant main effect in the confirmatory analysis and the significant interaction effect when using the post-task imagery score in the exploratory analysis are suggestive of a dual effect of decentering: decentering reduces levels of anxiety, but it also down-regulates any anxiety that has already developed. In turn, regulation - for example in the form of decoupling - can prevent development of further anxiety in a cyclical fashion. Similar dual effects of prevention and reduction have been demonstrated in the domain of food cravings (Wilson et al., 2021). Future research should assess processes of affect development and affect management more systematically, and by taking into consideration the timing and contextual issues of measurement described above.

5.4.3 Qualitative findings on pandemic-related worries

We identified four themes from our qualitative analysis of pandemic-related worries. Participants expressed worries about the physical health of others, while also acknowledging their own health vulnerabilities, role as a carer of loved ones, and a potential transmitter of COVID-19 (Theme 1). Participants also worried about losing their jobs or being unable to find employment during the pandemic, which was linked to current and longer-term financial worries. Those currently attending or planning to attend higher education identified worries around the impact of the pandemic on their educational experiences. In a similar vein, parents worried about the impact of home schooling on their children's quality of education (Theme 2). Further, participants worried about the social impact of the pandemic, such as loneliness relationship strain, or physical separation from loved ones (Theme 3). Lastly, participants worried about the potential for lockdowns to persist over many years, and the prospects of never being able to return to a pre-pandemic life (Theme 4).

All four themes have been identified in previous studies of COVID-19 (for reviews, see Aknin et al., 2022; Wirkner et al., 2021). Specifically, previous research highlights worries about the health of others (Presti et al., 2020), health of one's self (Son et al., 2020), employment instability (Bu et al., 2020; Crayne, 2020), finances (Aknin et al., 2022), higher education (Son et al., 2020), living with young children (Pierce et al., 2020), social relationships and loneliness (Moore et al., 2021), separation from loved ones (Conversano et al., 2020), and concerns about the future (Castellano-Tejedor et al., 2021) as stressors and mental health risk factors of COVID-19.

5.4.4 Qualitative survey findings

We identified three themes from our analysis of qualitative survey responses, some of which we further elaborate on here. Participants experienced a combination of worry thoughts, feelings, and physical sensations (Theme 1). They also applied either an accurate or misunderstood version of the decentering and control instructions, while experiencing challenges during this process such as re-immersion in intrusive thoughts (Theme 2). Finally, participants described a range of outcomes after applying the decentering or control instructions, ranging from no change in experiences to relaxation or a different way of relating to experiences (Theme 3).

Some participants misunderstood the instructions, mainly in the decentering condition, and as a form of blocking or suppression of experiences, distraction, relaxation, or visualisation (sub-theme 2.3). Such misunderstandings have been reported for mindfulness-based interventions generally (e.g., York, 2007; for a
meta-ethnography of qualitative studies, see Malpass et al., 2012), and brief decentering-based mindfulness instructions specifically (e.g., Tatar et al., 2022). Since both worry and decentering are abstract complex concepts, it is understandable that some participants would need prolonged engagement with the instructions beyond listening to the recording once to be able to successfully apply it to their worries. The misunderstanding and need for prolonged engagement may be partly related to participants not knowing that this study is about mindfulness. Therefore, in contrast to many studies in this domain, their self-selection to take part was independent of their attitude toward or interest in practicing mindfulness. Without prior knowledge, expectation, or preparation to learn and apply a mindfulness-based strategy, fully understanding decentering may take longer than the duration of a single study session.

Misunderstanding the instructions may have a critical impact. For instance, blocking, suppression, and distraction transform what was intended as an engagement-based coping strategy (i.e., approaching the stressor/emotions with an "attitude of orientation toward experiences"; Götmann & Bechtoldt, 2021) into a disengagement-based coping strategy (i.e., avoidance of the stressor/emotions through escape, denial, and withdrawal). Importantly, in the absence of qualitative responses, quantitative data alone cannot identify participants who misunderstood the instructions. This may be an overlooked issue in the literature, where quantitative studies of mindfulness may be presenting aggregated effects of mindfulness - both understood and misunderstood. The exploratory finding from the current study that decentering did not reduce the link between post-task imagery and state anxiety for participants who misunderstood the decentering instructions (vs. those who correctly understood) demonstrates the importance of gauging participants' understanding of decentering and incorporating this knowledge into quantitative analyses (see "Additional Quantitative Analyses Informed by Qualitative Survey Findings" and Appendix D, supplementary material 1).

Future research can make use of the finding that some participants misunderstood the decentering instructions and that misunderstanding has a profound impact on quantitative findings in at least two ways. First, a data screening process can be employed to ensure that the quantitative findings reported indeed capture the true effects of correctly applied mindfulness instructions. Second, rather than screening out individuals, studies can simply assess how exactly individuals come to understand or misunderstand the instructions. In other words, what personal and contextual factors lead to different levels of understanding? And how can this feedback be used to make brief mindfulness more accessible?

The cultivation of a different way of relating to experiences was a key outcome of applying the decentering instructions (sub-theme 3.1). Some participants came to view their worry experiences through a decentered perspective and as separate from themselves. Participants in previous qualitative studies of brief and longer mindfulness-based interventions reported similar experiences of decentering (Kerr et al., 2011; Solhaug et al., 2016; Tatar et al., 2021), and the emergence of an "observing self" (Kerr et al., 2011) that is capable of "detached observation" (Irving et al., 2014; for qualitative reviews, see Morgan et al., 2015; Wyatt et al., 2014).

Relaxation was another outcome of applying decentering (sub-theme 3.2), where participants may have phrased and/or experienced a reduction in levels of anxiety as relaxation. Indeed, the coupling of reduced anxiety and increased relaxation has been observed in previous studies (Monshat et al., 2013; Schwind et al., 2017). For instance, Monshat et al. (2013) conducted a qualitative study of a six-week mindfulness intervention, where participants initially found the mindfulness practice relaxing. They experienced a shift in mindset and a more sophisticated engagement with the intervention later on. In sum, participants may have articulated reduced anxiety as relaxation, or indeed some of them may have experienced relaxation effects during their first exposure to the instructions.

Lastly, the outcome that most closely mirrored the quantitative findings was the reduction of negative affect, which was reported more frequently in the decentering condition compared to the control condition (sub-theme 3.3). A reduction in anxiety also implies that during the minute of applying the instructions, at least some participants experienced an initial surge of anxiety, followed by a reduction. In other words, the decentering instructions did not completely prevent the development of anxiety for those participants. However, this is only partly informative. Decentering may have prevented the escalation

of anxiety for some participants, but the absence of anxiety may have been less intuitive to report than the presence and reduction of it.

5.4.5 Evaluation of the decentering manipulation

Interestingly, participants in the decentering and control conditions did not differ in levels of decentering, as measured by the decentering subscale of the Toronto Mindfulness Scale (TMS; Lau et al., 2006). This finding can be explained in at least two ways. First, this may be a measurement issue, as it has been suggested that the TMS is a challenging measure for novices to understand and complete (Ireland et al., 2019). Participants in the present experiment are not even 'novices' in that, while taking part in the study, they were not aware that they applied a mindfulness strategy. Therefore, participant's ratings may not have accurately captured the success of the decentering manipulation or true levels of decentering in the two conditions. Second, the finding may be accurate such that the decentering manipulation was indeed unsuccessful. This may imply that the decentering instructions worked through another unknown mechanism such as attentional changes (Leyland et al., 2019) to generate the reduction of state anxiety observed in the confirmatory analysis and the decoupling of imagery and anxiety observed in the exploratory analysis. It may also suggest that the control instructions, given their emphasis on following up on one's thoughts, feelings and physical experiences without suppression and avoidance may have been perceived as mindfulness by some participants. The qualitative data provides insightful, but inconclusive information. Namely, some participants in the decentering condition described experiences of decentering upon applying the instructions, and some participants in the control condition indeed construed the instructions as mindfulness and/or reported decentering as an outcome of applying the instructions. Future research can explore this by assessing decentering with a different measure and/or using a different active control condition.

5.4.6 Study strengths and limitations

This study has two key methodological strengths. First, we used an active control condition that was well-matched to the decentering condition on the two key features of working memory load and possible expectancy effects around the

positive effects of the instructions. The importance of comparing mindfulnessbased interventions - brief or otherwise - against an active and well-matched control condition has been recognised in the literature (Davidson & Kaszniak, 2015; Van Dam et al., 2018). Second, the combination of quantitative and qualitative methods provided a sophisticated account of whether and how decentering curbs pandemic-related anxiety. Complementing group-level findings with participants' rich and nuanced first-person accounts in this way presents a multifaceted narrative of decentering effects.

A mixed strength and limitation of this study is the use of "worry" terminology. In this study, we used "worry" closer to its colloquial definition to denote any situation or event that is a source of anxiety. The rationale behind this was to communicate the task of identifying an anxiety-provoking aspect effectively, using language that is accessible to participants to allow them to retrieve meaningful content. This is not fully aligned with theoretical models that conceptualise worry as an often ineffective coping strategy to avoid emotional processing of the real presenting problem (Behar et al., 2009; Borkovec et al., 1998). In short, this was a trade-off between being participant-centred and adopting a theoretically clean approach. While we believe that being participant-centred was worthwhile in generating rich data, this trade-off means that this study is unable to provide clear-cut mechanistic answers, as was offered previously in the context of Mindfulness-Based Stress Reduction (Hoge et al., 2015). Future work may use "worry" terminology closer to its theoretical meaning (i.e., not as a source of anxiety, but as a coping strategy that is closely related to anxiety). One way to achieve this would be to induce worry and measure worry, instead of measuring anxiety as we did here.

We identify four main limitations of this study. First, the cross-sectional nature of the study meant that we were only able to assess immediate effects of brief decentering-based mindfulness. This is a shared limitation for most other studies of brief mindfulness (Howarth et al., 2019; Jiménez et al., 2020). Second, the study procedure was possibly not ideal for allowing participants to identify optimal content for the application of decentering. Specifically, when first identifying a worry, participants were unaware of how exactly they would be working with their worry for the duration of the study. Given that some COVID-19 worries require a healthy level of concern, a solution or an action (Farris et al., 2021), the decentering instructions may not have been the most appropriate response for the specific worry that participants identified. Future research should provide participants even more guidance so that they identify the most relevant worry they are comfortable working with.

Third, we did not assess trait mindfulness as a potentially important moderator, reflecting how individuals differ in how mindful they are by disposition (Baer et al., 2006; Brown & Ryan, 2003). Previous research demonstrates the association between higher trait mindfulness and lower levels of negative affect (Carpenter et al., 2019), including in the specific context of COVID-19 (Dillard & Meier, 2021). Further, it has been suggested that individuals with high levels of trait mindfulness pre-intervention benefit more from longer (Shapiro et al., 2011) and shorter (Creswell et al., 2007) mindfulness interventions. It can be assumed that participants in this study present with varying levels of trait mindfulness, yet we do not have specific information on this. Future studies should measure trait mindfulness and assess moderation effects.

Fourth and finally, this study focuses on the effect of decentering on mental health risk factors of the COVID-19 pandemic, which is only part of the picture. Individuals not only face stressors and challenges, but are also equipped with a host of protective factors such as spirituality, resilience, and social support (Barczak-Scarboro et al., 2021; Wirkner et al., 2021). It would be worthwhile to study the interplay between risk and protective factors as they relate to the effects of decentering shown here.

5.4.7 Implications

This study makes important theoretical contributions, as it examined imagery and anxiety both in relation to each other and in the context of the brief mindfulness strategy. To our knowledge, this is the first study to specifically explore the effect of brief decentering on negative mental imagery and anxiety. Therefore, these findings are meaningful not only in the context of the rapidly evolving pandemic literature, but also more widely for understanding the onset and maintenance processes associated with anxiety, and how the decentering component of mindfulness may help address anxiety through these processes. Further, this study has applied implications, again in the context of COVID-19 and beyond. Given that longer mindfulness practices may be challenging for novice practitioners (Banerjee et al., 2017; Desbordes et al., 2015), shorter practices such as the one studied here may be both effective in managing anxiety and a feasible starting point for novices (Strohmaier, 2020). Despite advances in physical health care such as vaccination, the mental health effects of COVID-19 may persist over time (Aknin et al., 2022). It is therefore essential to develop effective strategies to tackle these mental health challenges. The initial findings reported here suggest that brief decentering-based mindfulness instructions have the potential to be further tested and developed into an evidence-based strategy, which may be applicable to other situations of extreme stress and unpredictability such as natural disasters and climate anxiety (Clayton, 2020; Hickman et al., 2021; Hrabok et al., 2020).

5.4.8 Conclusion

Uncontrollable, unpredictable, and anxiety-provoking events are a ubiquitous part of daily life. The COVID-19 pandemic testifies to how it may not be possible to avoid these events, and the automatic negative affective responses that they elicit (Bavel et al., 2020). In recognition of this, the brief mindfulness instructions studied here target one's perception of and relationship to these events and responses. Our findings suggest that cultivating a new relationship with negative affective experiences may paradoxically reduce anxiety. Once further developed, this brief, simple and accessible strategy may be one effective way of curbing anxiety, both in the aftermath of the COVID-19 pandemic and in other distressing contexts.

5.5 Declarations

5.5.1 Funding

No funding was received for conducting this study.

5.5.2 Ethical approval

The study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the University of Glasgow College of Science & Engineering Ethics Committee (date: 24 April 2020; no: 300190221).

Chapter 6 General discussion

The main aim of this thesis was to investigate how brief decentering strategies are learned and applied in the domains of food cravings (Chapter 2 and 3) and pandemic-related anxiety (Chapter 4 and 5). Here, I briefly summarise the grounded cognition theory as the main theoretical framework of this thesis (Papies et al., 2020, 2022; Papies & Barsalou, 2015), followed by a summary of key findings. Then, I discuss the overall contributions and implications of this work, its strengths and limitations, and future research directions.

6.1 Grounded cognition theory: A summary

The grounded cognition theory is the shared theoretical framework of this thesis across the domains of food cravings and anxiety. The theory proposes that an individual represents their past experiences in memory as multi-modal 'situated conceptualisations' (Barsalou, 2009, 2016). Then, as the individual experiences daily life events, the situated conceptualisations that best match those events get partially re-enacted as 'simulations' (Papies et al., 2020, 2022; Papies & Barsalou, 2015). Such simulations may lead to motivational states and behaviours (e.g., food cravings, consumption; Keesman et al., 2016; Papies et al., 2020) or affective states (e.g., anxiety; MacNamara, 2018; Rauch et al., 2004).

The grounded cognition framework identifies simulations as a common mechanism in the approach-based domain of food cravings and the avoidancebased domain of anxiety. In the domain of food cravings, simulations manifest as re-experiences of eating and enjoying foods (i.e., 'consumption and reward simulations'; Papies et al., 2022). In the domain of anxiety, simulations manifest as distressing re-experiences of past affective events (i.e., negative mental imagery; Ji et al., 2016). In both domains, simulations are vivid, intrusive, and they arise spontaneously.

This unified theoretical account identifies simulations as a clear and potentially effective target for intervention. Namely, interventions may be developed to reduce the effect of simulations on motivational/affective states (food cravings, anxiety) and related behaviour. This thesis investigates how brief decentering strategies are learned and applied, with a particular focus on whether and how decentering may target simulations to reduce their effect on motivational/affective states. See especially Chapters 2 and 5 for an assessment of this decoupling effect.

6.2 Summary of findings

Chapter 2 presents two experiments on the question of domain specificity. In other words, should brief decentering be taught with specific reference to the domain of interest to be effective, or is it sufficient or even more effective to teach it in a more general way? I studied this question within the domain of food cravings and by measuring salivation to crisps as a physiological proxy for desire. Findings of Experiment 1 suggest that, although domain general and domain-specific decentering instructions did not change the amount of salivation to crisps, general decentering reduced the association between consumption simulations and salivation compared to relaxation (control condition). This suggests a decoupling effect of simulations from desire. Experiment 2 was designed as a replication study with a larger sample and a different active control condition. Critically, the decoupling effect observed in Experiment 1 was absent in Experiment 2 for both the general and domain-specific decentering instructions.

Together, the experiments in Chapter 2 provide mixed evidence on whether decentering decouples the link between consumption simulations and desire, and insufficient evidence to draw any conclusions on the need for domain specificity when learning decentering. Chapter 2 delves into potential explanations for inconclusive findings, including issues with power and influential data points. While informative as an initial investigation, such mixed evidence emphasises the need for further research on the question of domain specificity.

Chapter 3 presents the first qualitative interview study that specifically explores how non-meditators learn and apply brief decentering instructions in the domain of food cravings. Reflexive thematic analysis of the data demonstrated that applying decentering led to a change in perspective, where participants started experiencing their thoughts and feelings related to food as transient. Various factors facilitated this shift in perspective, including the use of metaphors to teach the metacognitive concept of decentering. Participants expressed confidence in their ability to apply the strategy during daily life food encounters, while also anticipating challenges such as remembering to apply the strategy. The qualitative nature of this study provides a rich and nuanced account of participants' experiences of decentering. These insights complement knowledge gained through quantitative assessments, which may optimise the design, empirical study, and delivery of decentering strategies.

Chapter 4 presents a qualitative focus group study on how non-meditator undergraduate students learn and apply brief decentering instructions in the domain of pandemic anxiety. Results of reflexive thematic analysis illustrate that while most participants found learning decentering to be effortless, some participants misunderstood the metacognitive concept of decentering. Namely, they misunderstood the target of decentering to be the pandemic worry that they identified (i.e., "This problem will go away"), where the decentering instructions actually targeted thoughts and feelings about the worry (i.e., "My thoughts about this problem will pass"). Such misunderstanding is crucial in that it is possible to develop awareness of the transience of thoughts and feelings, whereas it may not always be accurate, relevant, or feasible to view the problems themselves as transient. As with Chapter 3, participants experienced a shift in perspective, where they started perceiving the anxiety-provoking aspects of the pandemic as transient. Participants reported that the collective setting of the focus group was a key aspect of their experience while learning and applying decentering. Similar to findings of Chapter 3, participants expressed confidence in their ability to apply the strategy in daily life, particularly for short-term relief. This study provides another rich and nuanced account of participants' experiences of decentering. These insights may be relevant not only in the context of the pandemic, but also across a wider range of distressing life events, especially for student populations.

The final empirical chapter of this thesis, **Chapter 5**, presents a mixed-methods experiment in the domain of pandemic anxiety, examining whether and how a brief decentering strategy may curb anxiety related to the COVID-19 pandemic. Quantitative assessment demonstrates that decentering reduced both anxiety, and the association between worry imagery and anxiety that was experienced while applying decentering. As with Chapter 2, this suggests a decoupling effect

of imagery from anxiety. Qualitative assessment portrays a more fine-grained account of participant experiences of applying decentering. For instance, participants reported a wide range of outcomes, including a changed relationship to experience, reduced negative affect (as also demonstrated by quantitative findings), and relaxation (see Chapter 5 for a detailed description of all outcomes). Importantly, qualitative assessment showed that a considerable number of participants misunderstood the decentering strategy. Exploratory analysis informed by this finding showed that the decentering manipulation did *not* decouple the link between worry imagery and anxiety for those participants who misunderstood the instructions. Together, the evidence suggests that a brief decentering strategy may effectively curb anxiety. The study also demonstrates the merits of conducting mixed-methods research to fully appreciate the nuances of (mis)understanding and applying decentering.

Together, this work generated new knowledge toward the study of decentering, both as a brief strategy and a key component of mindfulness. Across the studies reported here, it is evident that some individuals learned decentering more readily and accurately than others. The qualitative and mixed-method studies, especially in Chapters 4 and 5, illustrate that some participants misunderstood the decentering instructions. This can explain the findings of Chapter 2. Namely, a substantial proportion of the sample might have misunderstood decentering. Data from a mixed sample of individuals who correctly understood or misunderstood decentering may have yielded insufficient evidence to draw conclusions on the importance of domain specificity or the effect of decentering on consumption simulations. Although participants' understanding was not assessed in Chapter 2, findings of Chapters 3-5 suggest that misunderstanding is a common phenomenon and therefore also a possibility for the experiments described in Chapter 2.

Further, across studies, most individuals experienced decentering as a changed relationship to their craving or anxiety experiences, where thoughts felt more transient and less overwhelming. This supports the notion that brief decentering strategies are simple and accessible, at least in principle. However, 'simple' does not necessarily mean 'easy'. The findings of this thesis suggest that individuals experience challenges while applying decentering (e.g., re-immersion in intrusive thoughts; Chapter 5). They also identify anticipated challenges for

their potential future daily application of decentering (e.g., forgetting to apply the strategy; Chapters 3 and 4). This work collectively illustrates the wide spectrum of experiences that take place when learning and applying decentering - from understandings to misunderstandings, from successes to challenges. Next, I discuss various salient aspects of this work in more depth.

6.3 Thesis contributions and implications

A key theoretical contribution of this work is that it challenges an underlying assumption of brief mindfulness research through qualitative and mixed-methods assessment. Namely, researchers are often unquestioning of how exactly a brief mindfulness strategy is perceived and implemented when they adopt a solely quantitative approach to investigation. This is perhaps combined with the assumption that the way in which individuals experience brief mindfulness can be controlled or predicted by researchers, without a need for individuals' qualitative input. This thesis, and especially Chapters 3-5 demonstrate that such assumptions are far from accurate. Seeking individuals' own descriptions of their experiences both alone (i.e., Chapters 3 and 4) and in combination with quantitative assessment (i.e., Chapter 5) has proven invaluable in gaining insight into phenomena that would have remained obscure in an exclusively quantitative study. For instance, Chapters 4 and 5 confirmed that some individuals misunderstand decentering, which may lead to different experiences and outcomes compared to those who correctly understood decentering (e.g., in Chapter 5, decentering did *not* decouple the link between imagery and anxiety for those who misunderstood the instructions).

Since learning and applying mindfulness is a highly complex process that only sometimes aligns with assumptions, there is merit in continuing to study it through mixed quantitative and qualitative studies (Solhaug et al., 2016). Expressed differently, a process as complex as learning and applying mindfulness deserves an equally complex and nuanced empirical understanding. That way, individuals who take part in mindfulness research become true and active 'participants' of the process rather than passive 'subjects' of measurement. The value of first-person qualitative inquiry is recognised somewhat in research on contemplative practices and longer mindfulness-based interventions, and recognised even less so in brief mindfulness research (Birtwell et al., 2021; Howarth et al., 2016; Keyworth et al., 2014; Luberto et al., 2017; Lutz et al., 2002; Strauss et al., 2014). This thesis adopts qualitative and mixed-methods approaches specifically toward the study of brief decentering for the first time.

Importantly, each empirical chapter of this thesis relates to the study of the underlying working mechanisms of decentering. The question of domain specificity in Chapter 2 is one of practical importance, as determining the ideal level of specificity would inform whether decentering is taught generally or with reference to a specific domain. However, it is also a mechanistic question relating to whether decentering brings about its effects by targeting domainspecific factors (e.g., food consumption simulations, negative mental imagery) or other general, trans-domain factors (e.g., more general realisation that one has strong and vivid responses to internal/external cues and one does not need to act on them). Interestingly, there may be a bidirectional relationship between the questions of specificity and mechanism: How decentering is learned and applied may inform our understanding of its working mechanisms, and understanding its mechanisms may help optimise how decentering is taught. Although the work described in Chapter 2 does not provide conclusive answers to either question, it serves as a strong starting point for continued research on questions that are clearly meaningful and interesting.

The qualitative studies in Chapter 3 (food cravings) and Chapter 4 (pandemic anxiety) contribute to the study of decentering mechanisms by illustrating that even in a brief strategy that is specifically focused on decentering, other nonspecific factors may be driving some of the beneficial effects of the strategy. Examples include the collective social setting of the focus groups in Chapter 4 and participants' supportive interaction with the researcher in Chapters 3 and 4. This highlights the need to consider the influence of non-specific factors when studying decentering, for example through carefully designed control conditions in quantitative research. The role of non-specific factors may also explain findings from the wider literature where decentering or other mindfulness-based interventions are as effective as, but not superior to, active control conditions that are well-matched in non-specific factors (e.g., Tapper & Turner, 2018; Toneatto & Nguyen, 2007). The issue of control conditions is further discussed later in the context of strengths and limitations. Of the empirical work, Chapters 2 and 5 have the most explicit link to decentering mechanisms through their investigation of decoupling as a key process. Chapter 2 investigated whether decentering decouples the relationship between food consumption simulations and desire, providing inconclusive evidence that decoupling effects of decentering prevent the development of motivational states. Nevertheless, this chapter contributes a grounded cognition account of decentering with its emphasis on consumption simulations as a potential target for intervention. Studies of brief mindfulness in the domain of cravings support conditioning-based models and the elaborated intrusion theory of desire the most (Tapper, 2018). It is therefore important to determine the empirical relevance of the grounded cognition theory of desire and motivated behaviour to brief mindfulness research (Papies et al., 2020; Papies & Barsalou, 2015). In a parallel process, Chapter 5 tested whether decentering decouples the relationship between negative mental imagery and state anxiety. This work provided evidence that decentering indeed reduces the link between vivid worry imagery and state anxiety, thereby building on previous work (e.g., Keesman et al, 2020).

In terms of applied implications, brief mindfulness strategies like the ones studied in this thesis may be feasible and useful entry points into mindfulness practice for first-time practitioners. Chapters 3-5 provide qualitative and quantitative evidence that non-meditators experience immediate benefits of applying decentering instructions, such as the regulation of cravings and anxiety. Other research supports the idea that shorter practices may be more helpful for novices, as they start familiarising themselves with various mindfulness concepts, skills, and experiences (Cavanagh et al., 2013; Strohmaier et al., 2021). This thesis contributes to the literature by showing that brief strategies based on the decentering component of mindfulness may also serve as beneficial starting points for beginners, where most (but not all) individuals manage to understand and apply decentering.

Brief decentering-based strategies may have a place in experienced meditators' practice as well, complementing their longer practices. The brevity of the strategies deems them suitable and desirable for use in the heat of the moment, regardless of one's background and experience of mindfulness. Dealing with life situations such as exposure to tempting foods or surges of anxiety requires

simple and effective management tools. This thesis shows that brief decentering-based strategies are strong candidates as tools for the management of such situations, in the heat of the moment. This is especially true in the domain of anxiety (Chapter 5), where decentering not only reduced state anxiety, but also decoupled the association between vivid worry imagery and anxiety. This suggest that in addition to reducing levels of anxiety, brief decentering strategies may also serve a preventive function by targeting preanxiety states (i.e., imagery).

6.4 Strengths and limitations

The empirical work described in this thesis has several overarching strengths and limitations. A major strength is the novelty and diversity of methodologies used. For example, Chapter 2 uses salivation as a physiological measure of desire, Chapters 3 and 4 employ qualitive interview and focus group techniques, and Chapter 5 combines qualitative surveys with quantitative self-report assessments in a mixed-methods design. Employing novel data collection approaches in this thesis was a deliberate choice in recognition of criticism regarding overreliance on self-report questionnaires in mindfulness research, and the related call for diversifying research practices (Grossman, 2008; Van Dam et al., 2018). This thesis illustrates the successful implementation of several non-self-report data collection methods such as interviews and the Food Thoughts Overlap Measure, which is discussed in more detail later on. The creative approach of this thesis is therefore an implicit invitation to continue employing other underused methods when studying mindfulness, such as observer-rater measures, ecological momentary assessment, and other physiological measures (e.g., skin conductance).

Qualitative research, in particular, adds great value to the study of mindfulness, as demonstrated in Chapters 3, 4, and 5 of this thesis. More generally, qualitative research offers new and nuanced insights on a given research topic, ultimately deepening and improving our understanding of it (Gergen et al., 2015; Rich, 2017; Willig, 2019). Qualitative research enables exploration of subjective experiences, contributes 'thick descriptions' of phenomena, and challenges assumptions within existing knowledge on a topic (Carr, 1994; Stickley et al., 2022; Willig, 2019). Specifically, this thesis contributes the first studies on

subjective experiences of learning and applying decentering ('thick description'; see Chapters 3, 4, and 5). It also challenges the preconceived notions under which quantitative research on decentering has been conducted so far. For instance, contradictory to assumptions, some individuals may not be understanding and applying decentering as intended by the researchers (see Chapters 4 and 5). Overall, qualitative research is extremely valuable in studies of mindfulness, as it contributes a unique and elaborate understanding of it.

A second methodological strength of this work is the careful selection and design of active control conditions. According to the elaborated intrusion theory of desire, elaboration on tempting cues brings about motivational states such as cravings and desire (Kavanagh et al., 2005; May et al., 2012). Elaboration in turn requires working memory resources. According to this theory, any task that disrupts elaboration by loading working memory would prevent craving development (e.g., a clay modelling task for chocolate cravings; Andrade et al., 2012). As such, if disrupting working memory through *any* means is effective in regulating cravings and negative affect, the superiority of mindfulness to any other strategy should be tested by controlling for working memory load (Tapper & Turner, 2018). Brief decentering was compared to active control conditions that were designed to create a comparable visuospatial working memory load in two instances within this work. This was to demonstrate the effectiveness of decentering above and beyond working memory disruption, if any. Specifically, both Chapter 2 Experiment 2 and Chapter 3 employed 'normal viewing' control instructions that included the metaphor of a river, in comparison to the waterfall metaphor in the decentering instructions. Indeed, the quantitative assessment in Chapter 2 failed to demonstrate the superiority of decentering over and above an active control condition matched in working memory load.

While the other control conditions used in this work did not load working memory (i.e., progressive muscle relaxation in Chapter 2 Experiment 1; thinking in a 'normal way' in Chapter 5), they were still well-matched with the decentering instructions in other key non-specific factors. Examples include structure, expectations of a benefit, interaction with the researcher and learning a new skill. All these factors have been highlighted in the literature as best practices for designing a control condition (Rosenkranz et al., 2019). That said, it is extremely challenging to design fully-matched control conditions (Davidson & Kaszniak, 2015). Therefore, future research should incorporate both active and no-intervention (passive) control conditions where possible, to allow for a full comparison of effects.

Collectively, this work has overarching limitations regarding sample characteristics, and the ecological validity and transferability of findings. First, the data for all chapters came from a relatively homogenous sample in terms of race, ethnicity, and gender (i.e., primarily female). Further, with the potential exception of Chapter 5 where data collection took place online via Prolific Academic, the samples came from relatively high socioeconomic backgrounds (socioeconomic information was not collected as part of the experiment reported in Chapter 5). However, it is extremely important to assess how brief decentering is perceived and whether it is effective across a wide range of backgrounds. For example, research shows that there are various demographic disparities in domains of maladaptive eating and obesity (Calzo et al., 2017; Krueger & Reither, 2015; Margues et al., 2011). Therefore, where feasible, mindfulness research should be conducted with diverse samples in recognition of the possibility that mindfulness effects may differ across population sub-groups. Unfortunately, this was not possible when conducting my work, given the relative homogeneity of the local institutional participant pool.

A related limitation is that the samples studied in this work, while still relevant to the research questions, do not always match the specific target population of interest. For studies in the domain of food cravings (i.e., Chapters 2 and 3), the target population would be those who experience sub-clinical levels of maladaptive eating and/or related weight problems, and are motivated to change their relationship to food. For studies in the domain of anxiety (i.e., Chapters 4 and 5), the target population would be those who experience sub-clinical levels of anxiety around the COVID-19 pandemic. These are identified as target populations because the brief decentering strategies studied here were designed to address sub-clinically problematic cravings and anxiety. However, participants would still need to experience *some* maladaptive cravings or anxiety so that they have stimuli to work with during the studies. Lastly, for the domain of food cravings, participants would need to experience cravings as not only rewarding but also harmful to their wellbeing, while also having the motivation to improve wellbeing by managing such cravings (vs. seeking reward). It can be

argued that motivation is less of an issue with anxiety, as this is already an avoidance-based domain where there is a natural drive to reduce discomfort.

The actual samples studied in this thesis were sometimes different than the target populations. In the domain of food cravings, participants who like crisps were recruited in both experiments of Chapter 2. In retrospect, the liking criterion was not fully useful, as liking is not the same as the target population characteristics of having a problematic relationship with or wanting to reduce consumption of crisps. The qualitative study in Chapter 3 did not include any relevant inclusion criterion such as having a problematic relationship with processed foods or wanting to reduce consumption of such foods. The possible mismatch between the target population and study samples means that a different pattern of findings may have emerged if participants were recruited based on more specific criteria regarding need for intervention and motivation (Tapper, 2017). The studies in Chapter 2 and 3 were also conducted with participants who had a 'normal' weight status, on average, as assessed by their BMI. This again may have led to different findings than what would be observed with individuals affected by excess weight and/or suffering from obesity (Seguias & Tapper, 2022).

The work in the domain of anxiety is more targeted, since only participants who experience pandemic-related anxiety were recruited. While participants self-selected to participate in the focus group study (i.e., Chapter 4), we quantitatively screened for anxiety through a cut-off score in the mixed-methods experiment (i.e., Chapter 5). The improvement in the recruitment strategy from the work on food cravings to anxiety portrays my underlying learning and development process that informed and improved design choices for each subsequent study.

Lastly, and as already discussed at length in individual chapters, ecological validity and transferability are overarching limitations of this work. Specifically, although the experiments described in Chapter 2 used actual food as stimuli, they nevertheless took place in a laboratory setting that was far removed from participants' natural environment. The interview study in Chapter 3 was conducted online using food images, where half of the participants reported that the virtual environment of the prevented them from fully immersing themselves

in the food context. As such, the findings reported here may have limited generalisability to daily life food situations.

In the domain of anxiety (i.e., Chapters 4 and 5), participants chose an aspect of the pandemic that causes them anxiety and applied decentering to that aspect. Although still not fully matched with daily life contexts where anxiety arises more spontaneously without any prompting, this personalised approach is much closer to participants' daily life experiences compared to viewing images of foods (Chapter 3) or real foods in an incongruent laboratory context (Chapter 2). Overall, and despite its limitations, the laboratory and online work presented here lay a strong foundation for future research that can be conducted in naturalistic settings.

6.5 Implications for application of mindfulness

Upon reflecting on this thesis as a whole, several other thoughts come up. First, mindfulness-based interventions are not a panacea for all problems (Lomas et al., 2015; Van Dam et al., 2014). In other words, mindfulness is not effective for everyone and for every domain. Even for a specific individual, it may not be effective in every situation or time context. In fact, it has already been recognised that certain population sub-groups may benefit more from mindfulness-based interventions than others (Creswell & Lindsay, 2014). This thesis demonstrates that brief decentering-based mindfulness strategies are no exception. The clearest portrayal of this is the mixed-methods experiment in Chapter 5, where based on qualitative responses, some participants benefitted from applying the decentering strategy while others did not.

Related to the idea that mindfulness-based interventions are not a panacea is the notion that meaningful and sustained change often requires practice over a prolonged period of time (Alberts, 2017). Problems related to health and wellbeing develop and persist for many years. For instance, in the domain of maladaptive eating, it has been shown that children as young as five years old engage in binge eating behaviours (Shapiro et al., 2007). Changing such deeply ingrained behaviour takes time, and it is important to contextualise the aim and scope of brief decentering strategies in recognition of that. Specifically, the programme of research here investigates brief decentering as a single-session research tool, but also as a potentially effective strategy that can be further developed for daily use. The latter is beyond the scope of this thesis, as this research was not designed with the expectation that applying decentering once would lead to sustained change. It therefore remains an open question whether repeated practice of a brief decentering strategy leads to longer-term behaviour change, and how the new behaviours could potentially become new habits.

The question of whether applying brief decentering leads to meaningful and sustained change relates to the wider debate on public health value. In other words, how much do we know about decentering, and is what we know sufficient for the design, dissemination, and implementation of decentering-based interventions? In a clinical study that is relevant to this question, Dimidjian and Segal (2015) analysed research on mindfulness-based interventions in relation to the National Institute of Health Stage Model for behavioural intervention development (Onken et al., 2014). The six stages of the model range from basic science (Stage 0) to implementation and dissemination (Stage V). The researchers concluded that evidence on mindfulness-based interventions is most populated in Stage I (intervention generation and refinement), followed by Stages 0 (basic science) and II (efficacy in research clinics). There was extremely limited research in further stages that are associated with the dissemination of interventions. When adopting the perspective of this stage model, the work that form my thesis belongs to Stage 0 (basic science), as it addresses preintervention questions about how best decentering can be taught/learned and applied. As such, it is extremely early to comment on the public health value of the decentering strategies studied here.

That said, it is possible to make some concrete recommendations based on the findings of this thesis, specifically for teaching decentering as a standalone strategy or as part of multi-component interventions (e.g., Mindfulness-Based Cognitive Therapy; Segal et al., 2002). First, the findings suggest that some people misunderstand the metacognitive essence of decentering, especially in the domain of anxiety (see Chapters 4 and 5). It would therefore be important for instructors and researchers to anticipate that misunderstanding may occur, and to emphasise in their teaching that decentering targets *reactions* to problems (e.g., thoughts, feelings) rather than the problems themselves. Second, qualitative survey findings of Chapter 5 suggest that a small but

considerable number of people experience increased negative affect when applying decentering (see sub-theme 3.4). Instructors and researchers should be aware that decentering, especially if misunderstood, can have unintended outcomes such as negative affective states. Such awareness would allow instructors/researchers to intervene appropriately (e.g., stop practice, signpost to appropriate resources). Lastly, findings of Chapter 5 also suggest that some individuals have a negative view of decentering instructions based on their perception that it dismisses people's genuine suffering. Such negative views may also be related to previous unhelpful experiences with similar wellbeing techniques (see gualitative survey sub-theme 3.7). Therefore, and as discussed above, it is important to keep in mind that mindfulness generally and decentering specifically are not panaceas; they do not work for every individual and in every context. This needs to be clearly communicated to those who would like to try decentering, so that they have a realistic understanding that they may find decentering beneficial or unhelpful. This also needs to be communicated to other parties involved such as researcher and teachers, as well as parents and caregivers whose children might be taught mindfulness in school settings.

It is also important to consider how this work relates to the notion of "McMindfulness" - the secularisation of mindfulness in contrast to its original Buddhist ethical foundations, and the commodification of mindfulness into a technique for achieving symptomatic relief (also referred to as "spiritual bypassing"; Kelly, 2022, Purser & Loy 2013). As is the case with most Western mindfulness-based interventions, the decentering strategies examined in this thesis are taught from an ethically neutral stance, rather than the Buddhist stance of "right mindfulness" (Monteiro et al., 2015; Purser & Milillo, 2015). It is assumed that individuals come to learn about secularised mindfulness strategies with a prior understanding of ethics acquired from other sources such as their upbringing or societal influences. However, if this is an erroneous assumption, a secular mindfulness strategy may facilitate good and bad intentions equally well (Monteiro et al., 2015). For instance, unquestioningly practicing decentering in anxiety-provoking situations may lead to inaction, even when action needs to be taken for greater personal or social good. In single-session strategies like the ones studied in this thesis, the brevity of the instructions does not leave space for deeper ethical discussion. Therefore, it is not realistic to expect ethical

teachings or the emergence of sophisticated self-insight from these strategies. However, the issue of commodification of mindfulness is highly pertinent, since brief interventions are often designed for symptomatic relief. This is not necessarily bad, and "McMindfulness" is not the only view on this matter. For example, Anālayo (2020) argues that Buddha's teachings and practices included brief mindfulness for the sole purpose of achieving health goals. While aware of the debate on "right mindfulness", this thesis adds knowledge on strategies that are explicitly and transparently neutral in their ethical stance.

6.6 Future research directions

The work presented in this thesis may lead to various exciting research directions. Most proximate to the present work, the findings may inform future replication studies. For example, a well-powered direct replication study can be conducted to re-examine the question of domain specificity (Chapter 2), thereby addressing the issue of small sample sizes. Further, conceptual replication studies can build on Chapters 3 and 4 by examining how individuals learn and apply brief mindfulness in other highly distressing life contexts such as climate anxiety.

Another interesting avenue for future research is the question of synergy. There is merit in studying components of mindfulness individually to understand their unique effects and to determine whether they are indeed 'active' components. The present work provides compelling evidence suggesting that decentering is one such 'active' component. However, various components such as presentmoment awareness, attention regulation and decentering, may be interacting with each other to bring about synergistic effects that are greater than the sum of their individual effects. For example, Papies (2017) suggested that training attention regulation skills may facilitate the learning and application of decentering, ultimately amplifying its effects. Studying components in various possible combinations may inform the development of interventions that contain all components necessary for optimal synergistic effect.

Perhaps the most meaningful future research direction would be to study brief decentering in daily life contexts. There is a growing evidence base for the effectiveness of decentering across various domains of health and wellbeing

(e.g., Erisman & Roemer, 2010; Keesman et al., 2017, 2020; Lebois et al., 2015; Papies et al., 2012, 2015). This thesis contributes evidence specifically in the domains of food cravings and anxiety. However, the bulk of the evidence comes from cross-sectional laboratory studies. The natural next step would be to conduct longitudinal studies of repeated decentering practice. This would open the possibility for investigating various research questions. For example, how do individuals apply decentering in their daily life encounters with tempting foods or anxiety-provoking events? Does daily practice over an extended period of time lead to more fundamental changes such as updated memory representations (i.e., situated conceptualisations) of food cues or anxiety-provoking events, which lead to weaker consumption simulations or negative mental imagery over time? Does repeated practice of decentering lead to increased trait mindfulness? And relatedly, does one need to practice decentering as a strategy perpetually to reap its benefits, or does it suffice to practice for a certain amount of time to benefit from lasting effects? These questions could all be addressed using longitudinal research methods such as ecological momentary assessment (EMA). Although there are several EMA studies of mindfulness (e.g., Ruscio, Muench, Brede, MacIntyre, et al., 2016; Ruscio, Muench, Brede, & Waters, 2016; for a systematic review, see Enkema et al., 2020), there are none to my knowledge specifically on decentering.

Future research should also systematically consider the boundary conditions of brief decentering. Namely, for whom and under which conditions is a brief decentering strategy most effective? Conversely, for whom, when and where does it particularly *not* work, including potential adverse effects. The importance of addressing these questions has been brought up in the wider mindfulness literature, especially in the context of mindfulness-based interventions such as MBSR (Ratcliff et al., 2021; Roth & Fonagy, 2005). Research on adverse effects of mindfulness and meditation is especially sparse (Baer et al., 2019; Wong et al., 2018). However, the available findings suggest no evidence of increased harm compared to a waitlist control group (Hirshberg et al., 2020), and a prevalence of harmful effects that is comparable to other psychotherapeutic approaches (Farias et al., 2020). While findings based on mindfulness-based interventions are informative, future studies should

investigate the boundary conditions and potential adverse effects of brief decentering strategies specifically.

Lastly, the Food Thoughts Overlap Measure (FTOM) emerged as a potentially useful visual measure of decentering during this work. It was designed as part of this thesis and used in two instances. In the interview study (Chapter 3), the FTOM was used as a qualitative tool to facilitate discussions on participants' experiences of applying decentering to their food cravings. Further, in the second experiment on domain specificity (Chapter 2), it was used as a quantitative measure of perceived distance to thoughts. The FTOM appears as a promising visual measure of decentering, especially in relation to the limitations of text-based self-report measures (Bergomi et al., 2013; Grossman & Dam, 2011; Hadash et al., 2017). As the FTOM was not the main focus of this thesis, it deserves its own program of research for further development and validation, including in other domains (e.g., 'Stress Thoughts Overlap Measure', 'Alcohol Thoughts Overlap Measure').

6.7 Conclusion

This thesis illustrated how individuals learn and apply decentering - the metacognitive insight into the transience of mental events. The programme of research summarised here employed novel and creative methods of data collection, including experiments with a physiological measure, qualitative studies, and a mixed-methods experiment. Together, this thesis shows that adopting a decentred perspective toward food cravings or anxiety-provoking aspects of the pandemic enables most, but not all, individuals to cultivate a new relationship with the events of the mind. In other words, this thesis demonstrates that decentering may be an effective brief strategy to create space between stimulus and *reaction*, allowing individuals to instead enact a deliberate *response*. Beyond the question of effectiveness, this thesis offers insights into how exactly decentering may create that space, such as through decoupling of unconscious processes from related motivational or affective states. In a world imbued with temptations and stressors, decentering appears as one promising tool to boost and sustain health and wellbeing.

Supplementary material 1: Decentering and relaxation control instructions (Experiment 1)

General decentering instructions

We will now introduce to you a specific way of dealing with your thoughts. Once we have explained this, you will practice this way of dealing with your thoughts.

If you apply this way of dealing with your thoughts, then you try to see your thoughts as mental events, which come and go. I will use the metaphor of a waterfall to illustrate this.

Try to imagine a waterfall. The constant stream of water is like your stream of thoughts. It does not stop, it goes on continuously, and the water can easily carry you away if you end up in it. Don't try to resist this stream, and don't try to pretend that this waterfall does not exist. Simply try to step behind the waterfall. This way, you can simply look at all the water that is passing by.

You can also deal with your thoughts this way. Observe the thoughts that you have, and look at them come up and go away.

We would now like to ask you to practice this way of dealing with your thoughts during this study. How can you best do this? If, for example, you have certain thoughts, emotions or physical reactions come up, try to be aware of them, but also try to stay aware of where you are right now - on a chair, in this room.

Try to notice the thoughts, physical reactions, and emotions that come up in you. But also realize that these are merely mental events. They are merely passing phenomena that are being produced by your brain. And because of that, you don't have to do anything about them. These thoughts will always simply disappear by themselves.

Just like the water in the waterfall, simply try to observe how your thoughts go by.

Some thoughts can be confronting, but try not to suppress them or to avoid them.

Simply note how they come up and disappear again. Just like you don't have to react to a few drops of water, you don't have to react to these thoughts.

If you apply this way of dealing with your thoughts, you could still find yourself being carried away in your thoughts now and again. This simply happens sometimes and is actually very natural.

As soon as you notice this, just let it go, because it is only a mental event, and try to again adopt the perspective of observing how your thoughts arise and dissipate.

Is this way of dealing with your thoughts as passing mental events clear to you? If you have any questions at all, please pause the recording, and talk to the experimenter who will be happy to help.

Soon, we will start applying this perspective. We would like to ask you to apply this way of dealing with your thoughts to any thoughts that you have. Try to see all your thoughts as passing, in other words, as mental events that come up and dissipate. While you are doing this, it can sometimes be helpful to try to remain aware of the situation in which you currently are. Try, for example, to feel your body rest on the chair, and feel how your feet are resting on the ground.

Do you have any more questions about this exercise? If so, please talk to the experimenter who will be happy to help. This is the end of this recording.

Domain-specific decentering instructions

We will now introduce to you a specific way of dealing with your thoughts. Once we have explained this, you will learn to apply this way of dealing with your thoughts to the food thoughts that you have as you look at the various foods in this study.

We will now start introducing this way of dealing with your thoughts to you. If you apply this way of dealing with your thoughts, then you try to see your thoughts as mental events, which come and go. I will use the metaphor of a waterfall to illustrate this.

Try to imagine a waterfall. The constant stream of water is like your stream of thoughts. It does not stop, it goes on continuously, and the water can easily carry you away if you end up in it. Don't try to resist this stream, and don't try to pretend that this waterfall does not exist. Simply try to step behind the waterfall. This way, you can simply look at all the water that is passing by.

You can also deal with your thoughts about food this way. Observe the thoughts that you have in response to any foods, cravings you have about these foods or any thoughts about eating them, and look at them come up and go away.

We would now like to ask you to apply this way of dealing with your thoughts to the thoughts about the foods that we will show you. How can you best do this? If, for example, you have certain thoughts, emotions or cravings when you see the food, try to be aware of these thoughts, but also try to stay aware of where you are right now - on a chair, in this room.

Try to notice the thoughts, physical reactions, and emotions that come up in you when you look at these foods. But also realize that these are merely mental events. They are merely passing phenomena that are being produced by your brain. And because of that, you don't have to do anything about them. These thoughts will always simply disappear by themselves.

Just like the water in the waterfall, simply try to observe how your thoughts go by. Some thoughts can be confronting, but try not to suppress them or to avoid them. Simply note how they come up and disappear again. Just like you don't have to react to a few drops of water, you don't have to react to these thoughts.

If you apply this way of dealing with your thoughts to the thoughts about food that you have during this study, you could still find yourself being carried away in your thoughts now and again. This simply happens sometimes and is actually very natural.

As soon as you notice this, just let it go, because it is only a mental event, and try to again adopt the perspective of observing how your thoughts in response to the foods arise and dissipate. Is this way of dealing with your thoughts as passing mental events clear to you? If you have any questions at all, please pause the video, and talk to the experimenter who will be happy to help.

Soon, we will start applying this perspective. You will be shown a number of food products. We would like to ask you to apply this way of dealing with your thoughts to any cravings or thoughts of eating that you have when you see those foods. Try to see all your thoughts that you have when you see the foods as passing, in other words, as mental events that come up and dissipate.

While you are doing this, it can sometimes be helpful to try to remain aware of the situation in which you currently are. Try, for example, to feel your body rest on the chair, and feel how your feet are resting on the ground.

Do you have any more questions about this exercise? If so, please talk to the experimenter who will be happy to help. This is the end of this recording.

Relaxation instructions

We will now introduce to you a specific technique of relaxation. Once we have explained this, you can apply this technique in any situation.

We will now start introducing this way of relaxing to you. In this technique, you relax your mind and body, first by focusing on your breath, then by progressively tensing and relaxing your feet.

You will tense your feet as much as possible without straining them, without causing pain or discomfort. Then suddenly, you will let go of the tension and feel the muscles of your feet relax. Each time, try to tense your muscles up to a count of five.

You can apply this technique in any situation, with any thoughts and experiences. How can you best do this?

Start with your breath. Breathe in deeply and hold your breath up to a count of five. When you release, let all the air go out slowly and release the tension in your body.

Take another deep breath, hold... and let go.

Take a final deep breath, hold... and let go.

Now, focus on your feet. Like the roots of a tree, our feet connect us to the earth and in turn, to something greater than ourselves. Feeling grounded in this way is important physically and psychologically.

Feel your feet on the ground. Squeeze all muscles of your feet.

Hold the tension... and relax. Let all the tension go and notice how your feet are feeling.

Tightly squeeze your feet again.

Hold the tension... and relax.

Squeeze your feet one last time.

Hold... and let go.

Different parts of your feet may feel tenser or more relaxed than others. This is very natural.

Apply this technique at a steady pace that feels right for you.

Is this way of relaxing clear to you? If you have any questions at all, please pause the recording, and talk to the experimenter who will be happy to help.

Soon, you will be given a number of products to look at. Remember that you can apply this way of relaxation in any situation or during any experience that you have.

While you are doing this, make sure to sit comfortably, your back resting against the chair and your feet on the ground.

Do you have any more questions about this exercise? If so, please talk to the experimenter who will be happy to help. This is the end of this recording.

244

Supplementary material 2: Decentering and 'normal viewing' control instructions (Experiment 2)

General decentering instructions

We will now introduce to you a specific way of dealing with your thoughts. Once we have explained this, you will practice this way of dealing with your thoughts.

If you apply this way of dealing with your thoughts, then you try to see your thoughts as mental events, which come and go. I will use the metaphor of a waterfall to illustrate this.

Try to imagine a waterfall. The constant stream of water is like your stream of thoughts. It doesn't stop, it goes on continuously, and the water can easily carry you away if you end up in it. Don't try to resist this stream, and don't try to pretend that this waterfall doesn't exist. Simply try to step behind the waterfall. This way, you can simply look at all the water that is passing by.

You can also deal with your thoughts this way. Observe the thoughts that you have, and look at them come up and go away.

We would now like to ask you to practice this way of dealing with your thoughts during this study. How can you best do this? If, for example, you have certain thoughts, emotions or physical sensations come up, try to be aware of them.

Try to notice the thoughts, physical sensations, and emotions that come up in you. But also realize that these are merely mental events. They are merely passing phenomena that are being produced by your mind. And because of that, you don't have to do anything about them. These thoughts will always simply disappear by themselves.

Just like the water in the waterfall, simply try to observe how your thoughts go by, while you try to stay aware of where you are right now - on a chair, in this room.

However vivid or intense your thoughts are, try not to suppress them or to avoid them. Simply note how they come up and disappear again. Just like you don't have to react to a few drops of water, you don't have to react to these thoughts.

If you apply this way of dealing with your thoughts, you could still find yourself being carried away in your thoughts now and again. This simply happens sometimes and is actually very natural. As soon as you notice this, just let it go, and try to again adopt the perspective of observing how your thoughts pass by, like the water.

While you're doing this, it can sometimes be helpful to try to remain aware of the situation in which you currently are. Try, for example, to feel your body rest on the chair, and feel how your feet are resting on the ground.

Soon, we will start applying this perspective. We would like to ask you to apply this way of dealing with your thoughts to any thoughts that you have. Try to see all your thoughts as passing, in other words, as mental events that come up and go away.

Is this way of dealing with your thoughts as passing mental events clear to you? If you have any questions at all, please talk to the experimenter who will be happy to help. This is the end of this recording.

Domain-specific decentering instructions

We will now introduce to you a specific way of dealing with your thoughts. Once we have explained this, you will practice applying this to the food thoughts that you may have in this study.

If you apply this way of dealing with your thoughts about food, then you try to see your thoughts about food as mental events, which come and go. I will use the metaphor of a waterfall to illustrate this.

Try to imagine a waterfall. The constant stream of water is like your stream of thoughts, including thoughts about food. It doesn't stop, it goes on continuously, and the water can easily carry you away if you end up in it. Don't try to resist this stream, and don't try to pretend that this waterfall doesn't exist. Simply try

246

to step behind the waterfall. This way, you can simply look at all the water that is passing by.

You can also deal with your thoughts about food this way. Observe the thoughts that you have in response to the food, and look at them come up and go away.

We would now like to ask you to apply this perspective to the thoughts about the food that we will show you. How can you best do this? If, for example, you have certain thoughts, emotions or physical sensations when you see the food, try to be aware of them.

Try to notice the thoughts, physical sensations, and emotions that come up in you when you look at the food. But also realize that these are merely mental events. They are merely passing phenomena that are being produced by your mind. And because of that, you don't have to do anything about them. These thoughts about the food will always simply disappear by themselves.

Just like the water in the waterfall, simply try to observe how your thoughts go by, while you try to stay aware of where you are right now - on a chair, in this room.

However vivid or intense your thoughts about food are, try not to suppress them or to avoid them. Simply note how they come up and disappear again. Just like you don't have to react to a few drops of water, you don't have to react to these thoughts about food.

If you apply this way of dealing with your thoughts to your food thoughts in this study, you could still find yourself being carried away by your food thoughts now and again. This simply happens sometimes and is actually very natural. As soon as you notice this, just let it go and try to again adopt the perspective of observing how your thoughts in response to the food pass by, like the water.

While you're doing this, it can sometimes be helpful to try to remain aware of the situation in which you currently are. Try, for example, to feel your body rest on the chair, and feel how your feet are resting on the ground. Soon, we will show you a food product, and we will start applying this perspective. We would like to ask you to apply this way of dealing with your thoughts to any thoughts that you have when you see the food. Try to see all your thoughts about the food as passing, in other words, as mental events that come up and go away.

Is this way of dealing with your thoughts as passing mental events clear to you? If you have any questions at all, please talk to the experimenter who will be happy to help. This is the end of this recording.

Normal viewing instructions

We will now introduce to you a specific way of looking at objects. Once we have explained this, you will have a chance to practice this way of looking at objects.

If you apply this way of looking at objects, then you view objects as you normally would. This means that you're free to follow up on any thoughts that come up, as you normally would.

You will look at the object that will be placed in front of you. You will try to simply view this object in the way that you normally would. For example, any responses, thoughts, emotions that you may have are completely fine, and you're free to follow up on these if you wish. Give them space to develop, if this is what you would normally do.

It's fine to let your mind flow freely as a river. In other words, you will simply look at the object in a normal and unconstrained way. It's fine for your mind to carry you away with whatever comes up.

We would now like to ask you to apply this way of looking at objects during this study. How can you best do this? If, for example, an object is placed in front of you that you've seen before, simply look at this in the way that you would normally look at it.

Let yourself be guided by the object. Let your mind flow freely as a river, if that is what you would normally do. Simply look at the object, recognise the object, and view it in a normal and unconstrained way.

Soon, we will start applying this perspective. We would like to ask you to apply this way of looking at objects during this study. Try to simply view and look at what is placed in front of you, and let the object guide your thoughts normally.

Is this way of looking at objects clear to you? If you have any questions at all, please talk to the experimenter who will be happy to help. This is the end of this recording.

Supplementary material 3: Model comparison tables for Bayesian regression analyses

Table A1 - Bayesian regression m	odel comparisons for	the normal viewing contro
condition		

Models	P(M)	P(M data)	BF _M	BF ₁₀	R ²
Null model	0.250	0.007	0.02	1.00	0.00
Baseline salivation	0.250	0.768	9.96	115.57	0.51
Baseline salivation + Consumption simulations	0.250	0.222	0.86	33.41	0.51
Consumption simulations	0.250	0.003	0.01	0.41	0.01

Note: P(M) = prior model probability; P(M|data) = probability of the posterior distribution after observing the data; BF_M = model improvement after observing the data; BF₁₀ = Bayes Factor in favour of H₁ over H₀.

Models	P(M)	P(M data)	BFM	BF ₁₀	R ²
Null model	0.250	< 0.001	< 0.01	1.00	0.00
Baseline salivation	0.250	0.654	5.67	> 1000	0.58
Baseline salivation + Consumption simulations	0.250	0.346	1.59	> 1000	0.60
Consumption simulations	0.250	< 0.001	< 0.01	0.89	0.06

Table A2 - Bayesian regression model comparisons for the general decentering condition

Note: $P(M) = prior model probability; <math>P(M|data) = probability of the posterior distribution after observing the data; <math>BF_M = model$ improvement after observing the data; $BF_{10} = Bayes$ Factor in favour of H_1 over H_0 .

Models	P(M)	P(M data)	BFM	BF_{10}	R ²
Null model	0.250	< 0.001	< 0.01	1.00	0.00
Baseline salivation	0.250	0.651	5.59	> 1000	0.60
Baseline salivation + Consumption simulations	0.250	0.349	1.61	> 1000	0.62
Consumption simulations	0.250	< 0.001	< 0.01	0.81	0.05

Table A3 - Bayesian regression model comparisons for the domain-specific decentering condition

Note: P(M) = prior model probability; P(M|data) = probability of the posterior distribution after observing the data; BF_M = model improvement after observing the data; BF_{10} = Bayes Factor in favour of H_1 over H_0 .
Appendix B Supplementary materials for Chapter 3

Supplementary material 1: Further participant demographic information

Participant number / Pseudonym	Age	Sex	Current student status
1 / Sophie	24	Female	Non-student
2 / Tatiana	30	Female	Non-student
3 / Steve	27	Male	Non-student
4 / Elizabeth	31	Female	Student
5 / Patricia	35	Female	Non-student
6 / Katie	22	Female	Student
7 / Olivia	25	Female	Student
8 / George	33	Male	Non-student
9 / Eleanor	35	Female	Non-student
10 / Christina	25	Female	Student

Table B1 - Participant demographic information

Supplementary material 2: Interview schedule

At the beginning of the interview, the researcher will use variations of the following statement to avoid participants from providing perceived desirable responses:

"Throughout this interview, it is important to note that there are no right or wrong answers to the questions that I will ask you. I want to know your experiences, rather than what you think I would want to hear."

Please note that the following section includes prompts that may be appropriate to use during the interview. The prompts will be used based on the information already provided by the participants and the researcher's judgement.

Block 1: Normal viewing

The first part of the interview focuses on the participants' experience of viewing the first food video.

1. How did you find the experience of viewing the foods?

Note: If participants cannot recall some or all of the foods in the video, the researcher will remind them of the foods by listing their names (e.g., burger, chocolate cake), without elaborating further.

Prompt 1. Did you feel any physical sensations (in your mouth, shoulders or stomach) during the video? How would you describe them? To what extent did it make you feel comfortable or uncomfortable?

Prompt 2. Did you experience any emotions during the slideshow? How would you describe them?

Note: If participants mention food cravings or an urge to eat, the following prompt will be asked:

Prompt 3. To what extent did you feel an urge to eat the foods on the video? How would you describe the intensity of your cravings?

The following part of the interview focuses on the participants' understanding and learning of the normal viewing instructions.

2. How did you find the experience of listening to the instructions?

Prompt 1. To what extent did you find the instructions clear?

Prompt 2. Were there any features of the instructions that particularly resonated with you? If yes, could you give examples?

Prompt 3. What physical sensations, thoughts and emotions did they elicit?

3. How much effort did it take to understand and learn the instructions?

Prompt 1. Tell me more.

Next section of the interview focuses on participants' experience of applying the normal viewing instructions.

4. How did you find the experience of applying the instructions to the foods?

5. How much effort did it take to view the slideshows in the way we described?

Prompt 1. Did you find it useful to apply the instructions when viewing the foods?

Prompt 2. Did you find anything that helped when applying the instructions? How would you describe it?

Prompt 3. Did you find any barriers when applying the instructions? If so, how would you describe them?

Prompt 4. To what extent would you say you remembered to use the instructions during the video?

6. If you were to compare how you felt during the video you just viewed and how you experience foods in daily life, in what ways are they similar? In what ways are they different?

Block 2: Decentering

The decentering block contains all questions from the normal viewing block, additional questions specifically on decentering experiences, and questions for comparing normal viewing and decentering experiences.

The following part of the interview focuses on the experience of viewing the second food video.

7. How did you find the experience of viewing the foods?

Note: If participants cannot recall some or all of the foods in the video, the researcher will remind them of the foods by listing their names (e.g., burger, chocolate cake), without elaborating further.

Prompt 1. Did you feel any physical sensations (in your mouth, shoulders or stomach) during the video? How would you describe them? To what extent did it make you feel comfortable or uncomfortable?

Prompt 2. Did you experience any emotions during the slideshow? How would you describe them?

Note: If participants mention food cravings or an urge to eat, the following prompt will be asked:

Prompt 3. To what extent did you feel an urge to eat the foods on the video? How would you describe the intensity of your cravings?

The Food Thoughts Overlap Measure (FTOM) will be used to further explore participants' experiences. The researcher will first introduce the activity to the participant.

"We will now do an exercise to further explore your experiences. You will see circles on your screen that represent you and your food thoughts. There are numbers next to the circles that represent the distance between you and your food thoughts."

Note. If participants do not understand this exercise, the researcher will explain the relationship between "you" and "food thoughts" by reminding them of the visual metaphors from the audio instructions.

8. Now, I want to ask you to think about the foods that you viewed in the first video. Which image best represents how you related to your food thoughts overall while viewing the video? You may refer to the numbers next to each image.

Note: If participants cannot recall some or all of the foods in the video, the researcher will remind them of the foods by listing their names (e.g., burger, chocolate cake), without elaborating further.

Prompt 1. What made you choose this image?

Note: If participants mention differences in their ratings/image selection per food item, these differences will be explored.

9. Now, I want to ask you to think about the foods that you viewed in the second video. Which image best represents how you related to your food thoughts overall while viewing the video? You may refer to the numbers next to each image.

Note: If participants cannot recall some or all of the foods in the video, the researcher will remind them of the foods by listing their names (e.g., burger, chocolate cake), without elaborating further.

Prompt 1. What made you choose this representation?

Note: If participants mention differences in their ratings/image selection per food item, these differences will be explored.

The following section focuses on the participants' understanding and learning of the decentering instructions.

10. How did you find the experience of listening to the instructions?

Prompt 1. To what extent did you find the instructions clear?

Prompt 2. Were there any features of the instructions that particularly resonated with you? If yes, could you give examples?

Prompt 3. What physical sensations, thoughts and emotions did they elicit?

11. How much effort did it take to understand and learn the instructions?

Prompt 1. Tell me more.

12. Take a moment to think about your experiences of listening to the two instructions. How would you compare them?

Prompt 1. How did listening to the instructions make you feel?

Prompt 2. To what extent you were able to focus on both instructions? What changed for you in this regard?

Next section of the interview focuses on participants' experience of applying the decentering instructions.

13. How did you find the experience of applying the instructions to the foods?

14. How much effort did it take to view the slideshows in the way we described?

Prompt 1. Did you find it useful to apply the instructions when viewing the foods?

Prompt 2. Did you find anything that helped when applying the instructions? How would you describe them?

Prompt 3. Did you find any barriers when applying the instructions? If so, how would you describe them?

Prompt 4. To what extent would you say you remembered to use the instructions during the video?

15. If you were to compare how you felt during the video you just viewed and how you experience foods in daily life, in what ways are they similar? In what ways are they different?

The following section focuses on participants' potential application of the decentering instructions in the future. First, participants will be asked to give a name to the instructions, based on a question in Howarth et al.'s study (2016):

16. If you were to give a name or title to the second audio, what would you call it?

The researcher will ask the following set of questions using the name or title that participants will provide:

17. Would you apply the [name] in your daily life? If yes:

Prompt 1. How do you think you could apply it in your everyday life?

Prompt 2. When would you consider applying it?

Prompt 3. What would make it more likely for you to use it?

Prompt 4. How useful do you think it would be for you to apply the instructions in your everyday life?

Prompt 5. What challenges, if any, do you expect to experience when applying the instruction in your daily life?

Note: If participants share that they would not apply the instructions in their daily life, only prompts 3, 4, and 5 will be asked.

258

Next, the researcher will disclose that that the instructions are based on mindfulness:

"Thank you for naming the instructions. Some would call these instructions, 'mindfulness'."

18. What does mindfulness mean to you?

Prompt 1. Can you give an example of mindfulness practice?

19. What is your knowledge and experience of meditation?

Prompt 1. This may include your personal sense of it, as well as what you know from your friends, family and from your environment in general.

Prompt 2. If you meditate at some point in the future, how would you expect for it to go?

20. Would you consider yourself mindful in your everyday life?

Prompt 1. Can you give an example of that?

Conclusion:

21. Are there things that we did not talk about in this conversation that you feel are important to share?"

Supplementary material 3: Normal viewing (control) and decentering instructions

Normal viewing instructions

We would like to ask you to sit comfortably in your chair, and if it feels comfortable, to close your eyes.

We will now describe to you a way of looking at foods. Once we have explained this, you will have a chance to practice it.

If you apply this way of looking at foods, then you view them as you normally would. This means that you're free to follow up on any thoughts, feelings and physical experiences in your body that come up.

When we show you various foods, try to simply view them in the way that you normally would. For example, any thoughts, feelings and bodily experiences that you may have are completely fine, and you're free to follow up on these if you wish. Give them space to develop, if this is what you would normally do.

It's fine to let your mind flow freely as a river, full of clear, flowing water. In other words, you will simply look at the foods in a normal and natural way. It's fine for you to get carried away with whatever comes up.

We would now like to ask you to apply this way of looking at the foods that we will show you. How can you best do this? If, for example, you are shown foods that you've seen before, simply look at them in the way that you normally would. Again, you can think about this like a river, and you let your thoughts flow freely like the water in a river. So, when looking at foods, allow your mind to flow freely, if that is what you would normally do. Simply look at the foods, recognise the foods, and view them freely and naturally.

Soon, we will show you various foods. We would like to ask you to apply this way of looking. So, try to simply view and look at what is shown to you, and allow the foods to guide your thoughts, feelings and bodily experiences normally.

Is this way of looking at foods clear to you? If you have any questions at all, please talk to the researcher, who will be happy to help.

This is the end of this recording. If you had closed your eyes, please open them when you are ready.

Decentering instructions

We would again like to ask you to sit comfortably and close your eyes, if you want to.

We will now introduce to you a specific way of dealing with your thoughts, feelings, and the physical experiences in your body. Once we have explained this, you will practice applying it to what you experience when you see the foods in this study. During the rest of the recording, we will sometimes refer to "thoughts, feelings, and the experiences in your body" as simply, "thoughts".

If you apply this specific way of dealing with your thoughts about food, then you try to see your thoughts as mental events, which come and go. We will use the metaphor of a waterfall to illustrate this.

Try to imagine a waterfall. The constant stream of water is like your stream of thoughts, including thoughts about food. It doesn't stop, it goes on continuously, and the water can easily carry you away if you end up in it. Don't try to resist this stream, and don't try to pretend that this waterfall doesn't exist. Simply try to step behind the waterfall. This way, you can look at all the water that is passing by. You can also deal with your thoughts about food this way. Observe the thoughts that you have in response to food, and look at them come up and go by.

We would now like to ask you to apply this perspective to the thoughts about the foods that we will show you. How can you best do this? If, for example, you have certain thoughts when you look at the foods, try to notice them and be aware of how they appear and disappear on their own. Realize that these are merely mental events. They are passing phenomena that are being produced by your mind. And because of that, you don't have to do anything about them. These thoughts about the food will always simply go away by themselves.

Just like the water in the waterfall, simply try to observe how your thoughts go by, while you try to stay aware of where you are right now - on a chair, in this room. However vivid or intense your thoughts about food are, try not to suppress them or to avoid them. Simply note how they come up and disappear again. Just like you don't have to react to the water that you observe, you don't have to react to these thoughts about food. If you apply this way of dealing with thoughts when looking at foods, you could still find yourself being carried away by your thoughts time to time. This simply happens sometimes and is actually very normal. As soon as you notice this, just let it go and try to again adopt the perspective of observing how your thoughts in response to the foods pass by, like the water. While you're doing this, it can sometimes be helpful to try to remain aware of the situation in which you currently are. Try, for example, to feel your body resting on the chair, and feel how your feet are resting on the ground.

Soon, we will again show you various foods. We would then like to ask you to apply this way of dealing with your thoughts to any thoughts that you have when you see the foods. Try to observe all your thoughts about food as passing, without you having to act upon them.

Is this way of dealing with your thoughts clear to you? If you have any questions at all, please talk to the researcher, who will be happy to help.

This is the end of this recording. If you had closed your eyes, please open them when you are ready.

Both BT and RP engaged in a reflexive thought process during data collection and analysis, using the questions outlined by Langdridge (2007).

Reflexivity - Betül Tatar

1. Why am I carrying out this research?

In addition to my personal background and interest in brief mindfulness, I have been studying this topic academically since my MSc in Psychological Science in 2017. For my MSc dissertation project, I studied the effect of brief decentering instructions on salivation to attractive foods. The decentering instructions were similar to the one that was used in the current study. Esther Papies supervised my dissertation. While working on this project, I developed a greater appreciation for how much there is yet to be studied on this topic. I am currently in the third year of my PhD, again under Dr Papies' supervision, aiming to address some of these unanswered questions on brief mindfulness, especially in the context of health behaviours.

Through personal experiential knowledge, I know that some people may benefit from practicing mindfulness. Through my academic knowledge and growing expertise, I know again that mindfulness may improve some people's health and wellbeing. I carry out this research to contribute to a more holistic and nuanced collective understanding of brief mindfulness. In other words, who benefits from mindfulness? How do they benefit from it? And what are these benefits?

2. What do I hope to achieve with this research?

This is the first qualitative study that I am conducting on brief mindfulness. This is also the first qualitative study on decentering instructions. Although I appreciate the importance of quantitative experimental research, I believe it is equally important, if not more important, to gain a rich phenomenological understanding of how people learn and apply mindfulness. I find it essential to ask people how they receive, perceive, and apply brief decentering instructions, rather than solely relying on quantitative measures. I hope that the research community will use what we learned from this study to design brief mindfulness instructions and interventions more deliberately, and based on direct participant experience and input.

3. What is my relationship with the topic being investigated?

My personal and academic views on this topic inevitably come up during each stage of the research cycle (see Question 1). However, I see these as my automatic, 'knee-jerk' reactions. I am careful to introduce a space between my automatic reactions and research-related decisions. This is to ensure that I do not act upon my personal biases and assumptions, but adopt a more wellrounded approach. This is relatively easy for me, as I am a trainee counsellor in the second year of my MSc in Counselling. As part of my training, I meet clients, colleagues, and supervisors who have different views than my own, including on brief mindfulness. Therefore, I am experienced in keeping an open mind, rather than approaching the research process with my own personal agenda. I actively question my assumptions. These include assumptions around the good/bad dichotomy of food cravings ("All food cravings are bad and unwanted."), and the usefulness of mindfulness ("Brief mindfulness works."). Overall, I make sure to be open-minded toward participants' past and present experiences that are different than my own.

4. Who am I and how might I influence the research being conducted?

I am a 27-year-old female PhD student. I was born and raised in Turkey. However, I spent five years in the USA for my undergraduate studies, and I have been living in the UK for the last five years. Although I did not conduct the interviews in this study, my background may have influenced the study design and data analysis. Specifically, my background includes some of the stereotypical traits of someone who would be interested in mindfulness - whitelooking (although from a mixed ethnic background), female and from a middleclass background. I acknowledge that there is some truth to this stereotype, because I have the resources (e.g., time, space, energy) that allow me to focus on concepts such as self-care and self-development. Therefore, it is important to consider whether the instructions we design and study are accessible to a wider range of people, but also whether the research questions we ask are relevant to these groups.

5. How do I feel about the work?

I personally found this qualitative work very fulfilling. I view this study as a meaningful contribution to the brief mindfulness literature. I look forward to conducting follow-up research on the processes that underlie the learning and

application of brief mindfulness. I also look forward to sharing this work with the academic community and to engage in fruitful discussions.

6. How will my subject position influence the analysis?

I find myself in a unique position in terms of data analysis. Since RP conducted all the interviews, my first encounter with the data was during data transcription and analysis. This put me in a unique observer position, where I met our participants through their anonymised audio recordings, rather than meeting them in person. RP inevitably had personal reactions to each participant, including liking and disliking them, feeling connected or disconnected with them. She managed these reactions appropriately. However, I presume they were still part of the analysis process for her. On the contrary, I started data transcription and analysis as a 'blank slate', without prior reactions to or knowledge of the participants. Since RP and I engaged in extensive discussions during the interpretation of our data, we had the opportunity to benefit from both of our perspectives. I believe our interpretation of the data is all the richer and more comprehensive as a result.

7. How might the outside world influence the presentation of findings?

In addition to its recent popularity, brief mindfulness is also widely criticised for its short- lived benefits and disconnectedness from its ethical and/or Buddhist origins (e.g., "McMindfulness"; Purser, 2019). The outside world may bring similar critiques to the findings presented here, for example, on the brevity of the instructions, the highly controlled study environment, potential lack of ecological validity, and the online food stimuli used. These critiques are welcome when voiced open-mindedly, as healthy criticism and dialogue ultimately lead to higher-quality research.

8. How might the findings impact on the participants?

The participants may incorporate the decentering instructions into their daily lives, both during daily food encounters, and in other domains such as stress. The findings highlight some of the factors that support the learning and application of the instructions, and may therefore ease the application of the instructions in participants' everyday lives. For example, participants may refer back to the metaphor of the waterfall, both to remind themselves to apply the instructions, and to remember the concept of decentering.

9. How might the findings impact psychology and my career in it?

The findings may shape how brief mindfulness-based interventions are designed, implemented, and investigated in psychological research. They may also lead to research-informed interventions that are accessible and easy to use in daily life.

10. How might the findings impact wider understanding of the topic?

In general, understanding how individuals learn and apply mindfulness is a critical first step for developing effective instructions for research, and for daily use.

Reflectivity - Rebeka Pázmányová

1. Why am I carrying out this research?

Being in the penultimate year of my Psychology undergraduate degree, I wanted to get more involved within my field. In September 2019 (nine months before the start of data collection), I started volunteering in a charity, where I facilitate self-help groups for adults diagnosed with bipolar disorder and their carers. During a few self-help group meetings, we had conversations about meditation and mindfulness. Some members mentioned that they are using mindfulness as a part of their self-management routine. Other members expressed their familiarity with it. Although they were curious about the effects of meditation, they also mentioned the challenges that prevent them from practicing it. This motivated me to contact the University of Glasgow, and find a guest speaker who would join the self-help group to talk about mindfulness from a scientific point of view. In March 2020, BT presented as the guest speaker.

Around the time of BT's talk at the charity, I was considering doing a summer internship to get involved with Psychology beyond the requirements of my degree. Learning more about mindfulness at the self-help group and getting to know a researcher who is working on this topic motivated me to conduct this project. In addition, I have a personal interest in mindfulness and meditation, which further motivated me to conduct this project. Shortly after her talk, BT and I decided to collaborate on a project, which became my summer internship. I was awarded a Vacation Scholarship by the Carnegie Trust for the Universities of Scotland to undertake this project.

2. What do I hope to achieve with this research?

I see people's unique experiences as a rich source of information. Brief mindfulness-based instructions have been shown to improve health and wellbeing (e.g., Howarth et al., 2019). However, we do not know the specific processes that bring about these benefits. By exploring how people learn and apply brief mindfulness-based instructions, we present a detailed account of individuals' experiences, which will further inform how interventions are delivered effectively.

3. What is my relationship with the topic being investigated?

When I started high school at the age of 15, I had to wake up very early in the morning to travel to school. For the first few months, I was feeling very tired, and I lacked the energy to engage with my extracurricular activities, which were very important to me. Then I started to meditate and practice yoga in the mornings. Through my meditation and yoga practice, getting up in the morning became easier, and I had more energy throughout the day. Soon, my practice became a part of my identity.

Nevertheless, when I started university, I stopped my daily practice of meditation and yoga. I have been trying to rekindle the joy it used to give me, but I never returned to the regular practice that I used to have. Still, I think about mindfulness frequently in my everyday life. For example, there are moments when I catch myself doing things chaotically and without thinking, and I remind myself to be more mindful. During those moments, mindfulness reminds me to stay grounded. Perhaps, by studying brief mindfulness-based instructions, I feel like I am getting closer to my own meditation practice.

Regarding the food domain, my diet plans were very important to me in my teenage years. This never posed a risk to my physical health, but it caused me to worry about food. It is only a decade later that I do not feel pressured to control my food intake. Now, I enjoy food, I choose foods that I feel are good for myself and for the planet. My experience from my teenage years showed me how much influence food and food cravings can have on an individual. Today, I have a healthier relationship with food, and I wish my younger self felt this way about food as well. I think about ways in which this could have been achieved. Briefmindfulness based strategies are one of the ways in which one may create a healthier attitude towards food.

During this project, I gained insight into other people's relationship with food and their experiences with decentering. Every participant in our study had a different experience while looking at foods. Decentering influenced these experiences in different ways. I think it is important to understand how a healthy lifestyle can be achieved without restriction, pressure, and worry. However, neither decentering nor specific diet plans work for everyone - one size does not fit all. When people understand that everyone benefits from different strategies and approaches, they can choose what works best for them.

4. Who am I and how might I influence the research being conducted?

I am a 22-year-old female undergraduate student. My gender, age, and educational background (undergraduate student) may have influenced how I carried out this research.

I conducted all the interviews for this project. Before the first couple of interviews, I was a bit worried that as a young undergraduate student, I would be perceived by the participants as someone who lacks credibility. However, this feeling was minimal, almost non-existent during the interviews. On the contrary, I had the impression that my age and educational background were of benefit, and that they led participants to feel more relaxed. One participant expressed this at the end of the interview, after I stopped recording. Specifically, they thought that I was a professor during our pre-interview email communication, and they were a bit nervous about the interview. However, when they saw me on Zoom, they felt a bit more relaxed.

Inevitably, I found some participants more interesting than others, and I enjoyed some interviews more than others. Even though I tried to interact in the same way with all participants, my underlying feelings might have influenced our conversations. For example, in general, I felt a much stronger connection with female participants. One reason for this was that as a female researcher, I felt unequal to the male participants, and I felt like I had to 'fight' to keep my dominant role. For me, this issue was very present during interviews with both male participants, where I faced a greater emotional load compared to the interviews with female participants. This possibly influenced my communication style. I think I was more directive with male participants because they had a greater tendency to go off-topic compared to females. This was connected to my impression that male participants were trying to answer my questions in a way

that would please me. In other words, sometimes their answers seemed dishonest, as if they were trying to guess what I wanted to hear, then say it to impress me. During these interviews, I felt pressured to look out for such remarks, and I had to remind male participants that there are no right or wrong answers, much more than I had to do with the female participants. I felt that we easily achieved an honest level of communication with the female participants, which led me to speak with them in a more relaxed manner. However, since our sample was predominantly female, my observations about the effect of genderbased differences on my attitude toward participants might be superficial.

5. How do I feel about the work?

This work contributed to both my personal and academic development. From the academic point of view, I gained new knowledge on brief-mindfulness instructions, and their use for health behaviours. This project also widened my knowledge of qualitative research methodologies and good practices within it. I learned how to better formulate questions for an interview schedule and how to conduct semi-structured interviews. I improved my time management skills due to the short timeframe of this project (3 months). Further, I learned how to effectively keep track of my progress in each stage of a project, from forming initial ideas, to applying for funding, doing a literature review, data collection, data analysis, and write-up.

For the participants, this study was an opportunity for them to reflect on their eating habits and perceptions of food, and for them to try a mindfulness-based strategy. I believe that the experience of applying decentering was meaningful for the participants beyond their study session, as they may use this strategy in their daily lives when they experience a need for it.

6. How will my subject position influence the analysis?

Before starting this project, my knowledge of qualitative research methods was based solely on a qualitative group project that I conducted as part of my university course. Nevertheless, I had an interest in qualitative research since the first time I learned about it during my studies. This was not only due to the philosophical underpinnings of qualitative research, but also my personal preferences. I prefer to feel a greater sense of personal connection with the research I conduct. Meeting and talking with participants created greater understanding of their individual experiences. Nevertheless, this understanding, which is partly based on an emphatic concern toward the participants, might have influenced how I perceive and analyse what they have shared with me. Specifically, even though I tried to make sure that I understood participants' responses correctly during the interviews, I may have perceived aspects of their responses in a different way than what they meant. However, both the process of double coding with BT, and our extensive discussions safeguards against these kinds of misinterpretations.

Supplementary material 5: Trustworthiness

We established trustworthiness through extensive documentation, selfreflection, and critical discussions (Korstjens & Moser, 2018). Below, we address whether our findings can be trusted, using the quality criteria and the trustworthiness strategies outlined by Korstjens & Moser (2018).

We ensured credibility of our research findings through continued discussions between BT and RP during the data coding and analysis process. BT and RP thoroughly reviewed each other's coding and interpretation. Then, all researchers engaged in further discussions, to evaluate whether the findings plausibly represent the participants' original data. Therefore, we had prolonged engagement with participants both during the interviews, and while getting to know their data. These discussions led to a thick description of the data, which would enable other researchers to assess the transferability of our findings (i.e., to make a "transferability judgment"; Korstjens & Moser, 2018). This thick description includes contextual information such as the online study environment, and the food stimuli (i.e., video of food images) that were used in the study.

Further, we ensured dependability and confirmability by providing a transparent description of each step of the research process. These descriptions can be found in the main manuscript, as well as the pre-registration document on the Open Science Framework (https://osf.io/9cb28/).

Finally, BT and RP engaged in a reflexive practice to explore the link between us as the researchers and the research itself. We frequently asked ourselves how we might be influencing the research process, and how we might be influenced in turn. See Online Resource 3 for details of our reflexive engagement with this work.

References

Korstjens, I., & Moser, A. (2018). Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *European Journal of General Practice*, 24(1), 120- 124. https://doi.org/10.1080/13814788.2017.1375092

Appendix C Supplementary materials for Chapter 4

Supplementary material 1: Further participant demographic information

Focus group	Participant ID	Age	Gender	Year of study	Programme of study	Tested positive for COVID-19
1	6	18	Female	1	Psychology	No
1	26	18	Non-binary	1	Linguistics; Psychology	No
1	86	17	Female	1	Zoology	No
1	50	18	Female	1	Anatomy; Psychology	Yes
1	56	20	Female	1	Sociology	No
2	92	18	Female	1	Psychology	No
2	75	19	Female	1	Psychology	No
2	71	18	Female	1	Comparative Literature; Film and TV studies	Yes
3	79	23	Female	1	Psychology	No
3	97	18	Female	1	Psychology	No
3	12	25	Male	1	Sociology; Philosophy	No
3	83	17	Male	2 (advance entry)	Immunology	No
4	15	20	Female	2	Business Management; Digital Media	Yes
4	82	20	Female	2	Psychology	No
4	14	22	Female	2	Microbiology	No
4	53	21	Female	2	Physics	Yes

Table C1 - Participant demographic information

Supplementary material 2: Focus group guide

At the beginning of the focus group, the moderator used variations of the following statement to avoid participants from providing perceived desirable responses:

"In this focus group, I will ask you some questions. There are no right or wrong answers to these questions. We want to hear your experience and your truth, rather than what you think we'd want to hear. You are welcome to talk about your personal experiences as much as you are comfortable with sharing. But also, we'd like this to be a lively discussion. This means that we would like you to speak to us - the facilitators - but also to each other. You may agree or disagree with each other, and this is a safe space to do that."

Part 1. Identifying an anxiety-provoking aspect

Moderator: "I want to ask you to think about an aspect of the pandemic that makes you feel anxious when you think about it^{*}. For example, this may be a situation you found yourself in, or something you're afraid of. I understand that this may be a time of change for some of you. You've started university and you moved away from your house during the coronavirus pandemic. We will now give you about two minutes to think about this aspect and write it on your piece of paper. Write as much as you would like, including details of the aspect. We will not ask you to read your aspect, but we would encourage you to share as much of the contents of your aspect as you feel comfortable."

* This is the first version of this statement that was used only in Focus Group 1. The second version was used in all other focus groups (i.e., "I want to ask you to think about an aspect of the pandemic that makes you feel anxious when you think about it *today*").

Part 2. Experiences of identifying an anxiety-provoking aspect

Please note: The probes listed below may or may not have been appropriate/relevant to ask during specific focus groups. Therefore, they were used at the moderator's discretion, based on the information already provided by the participants.

Question 1: How was your experience of thinking about the aspect that you've chosen?

Probe 1: If you've experienced any thoughts, how would you describe them?

Probe 2: If you've experienced any feelings, how would you describe them?

Probe 3: If you've experienced any physical sensations, how would you describe them?

Probe 4: After thinking about and discussing this aspect, what is going on for you now? Are there any further insights or reactions?

Part 3. Learning and applying the decentering strategy

Moderator: "Now we will move onto our next part. We will introduce to you a way of relating to your experiences of the anxiety-provoking aspect. This will be described in a 5-minute audio recording."

[Decentering audio]

Checking participants' understanding of the decentering strategy

Moderator: "Could I ask one of you to summarise what you understood from the audio recording using your own words? We will have the opportunity to discuss your opinions on it later. This is just to make sure that we are all on the same page."

Probe: Did anyone understand the audio recording differently?

Re-iteration of the main ideas from the audio recording

Moderator: "Again, the main idea from this strategy is to observe the thoughts, feelings and physical sensations that you may have about your aspect. Remember that you don't have to act upon these. Simply observe how these experiences come up and go away on their own."

Application of the decentering strategy

Moderator: "Now, for about 2 minutes, think of your aspect in the way that was described in the audio recording. So, view your thoughts, feelings and physical sensations as they arise and disappear by themselves."

Part 4. Experiences of applying the decentering strategy to the aspect

Question 2: How do you feel applying the strategy affected your experiences?

Probe 1: If you've experienced any thoughts, did it change these thoughts or the way you relate to them?

274

Probe 2: If you've experienced any feelings, did it change these feelings or the way you relate to them?

Probe 3: If you've experienced any physical sensations, did it change these physical sensations or the way you relate to them?

Part 5. Ease of applying the strategy to the aspect

Question 3: How much effort did it take for you to apply the strategy to the aspect?

Probe: Were you able to focus on the aspect that you have chosen?

Part 6. Experiences of understanding and learning the decentering strategy

Question 4: What was your experience of listening to the audio recording?

Probe 1: To what extent did you find the strategy described in the audio recording clear?

Probe 2: How much effort did it take for you to understand and learn the strategy?

Question 5: If you could change one thing about the strategy, what would you change?

Part 7. 'Name the audio recording' exercise

Moderator: We will continue playing around with the strategy a bit more. Now, if you were to give a name or a title to the strategy you've just listened to, what would you call it?

Part 8. Future use

Question 6: To what extent do you find this strategy useful?

Question 7: Do you see yourself applying this strategy in your daily life in the future?

If yes: In what situations do you imagine yourself using this strategy?

If no: What would stop you from using it?

If participants experience problems answering this question, ask: "What challenges, if any, do you expect to experience when applying the strategy in your daily life?"

Part 9. General discussion of mindfulness as a concept

Question 8: What does mindfulness mean to you? Are you familiar with it? Probe 1: What's your experience with mindfulness in your everyday life? Probe 2: How would you compare the strategy we practiced today to your understanding of mindfulness? To ensure participants understand this probe, the moderator will add: "We are interested in the comparison of how you understand mindfulness and the strategy we practiced today."

Part 10. Ending

Moderator: "Is there anything anyone would like to share that we haven't covered already?"

[...]

"Before we finish, I want to emphasise that the strategy we practiced today aims to ease your stress and anxieties about the pandemic. However, you should still remain careful. Please continue to follow the rules set by the government, such as social distancing. Again, this strategy does not replace the rules or decrease their importance. It is a tool to potentially help with the mental health implications of the pandemic - not the physical ones.

Supplementary material 3: Reflexivity

Both BT and RP engaged in a reflexive thought process during data collection and analysis, using the questions outlined by Langdridge (2007).

Reflexivity - BT

1. Why am I carrying out this research?

I have been interested in mindfulness personally since 2012. I have been interested in mindfulness academically since 2017, in the context of my MSc in Psychological Science (2017) and PhD in Psychology (2018-present). For my MSc dissertation project, I studied the effect of brief decentering instructions on salivation to attractive foods (specifically, crisps). While working on this project, I brainstormed many future research ideas, which then became my PhD project.

I am carrying out this research because my personal life experiences informed, and continue to inform, my interest in scientifically examining mindfulness. I have benefitted tremendously from mindfulness in my personal life. However, I am aware that *some* people benefit from it while others don't. By carrying out this research, I want to contribute to our accumulating empirical knowledge on *who* does/does not benefit from mindfulness, *how* they benefit from it, and *what* benefits they experience.

2. What do I hope to achieve with this research?

Quantitative research on mindfulness has been informative, but in my opinion, it does not paint a full picture of the effects and effectiveness of mindfulness. With this research, I hope to contribute a high-quality qualitative account of brief mindfulness to the literature.

In terms of my personal career, I would like to continue conducting qualitative, quantitative, and mixed methods research. This study tremendously expanded my understanding of qualitative research methodologies, which I hope to benefit from in my academic career.

3. What is my relationship with the topic being investigated?

Please see my response to Question 1 on my personal and academic relationship to the topic. Because mindfulness has been in my life for almost a decade, I continually monitor whether and how my personal biases and assumptions influence the research questions that I ask and the kind of research that I conduct. Specifically, I am aware that mindfulness benefits some people only, and much research shows that it is as equally, but not more effective than active control conditions. I therefore approach each research project - including this one - with an open mind, knowing that mindfulness may not be as effective as portrayed in popular media, and participants' experiences may be different than my own.

4. Who am I and how might I influence the research being conducted?

I am a 28-year-old female PhD student. I was born and raised in Ankara, Turkey. I then spent five years in Michigan, USA for my undergraduate studies, and I have been living in Scotland for the last six years.

My experience in qualitative research is based on my research methods training as part of my MSc in Psychological Science (University of Glasgow). I then gained practical experience of conducting qualitative research through a previous project (https://doi.org/10.1016/j.appet.2021.105482). My experience of mindfulness comes from my extensive academic reading on the subject, as well as experiential learning through the Oxford Mindfulness Centre 5-week Mindfulness-Based Cognitive Therapy (MBCT) course that I participated in 2018.

The participants of this study met me as a co-facilitator during the focus groups. Based on our interactions, they may have inferred that RP and I are in a supervisory relationship. As my role during the focus groups was to take notes, participants did not have further information about me (e.g., personal goals, reasons for doing this research). I wrote about this in my reflexivity journal on 26 November 2020:

"I continue to be a bit self-conscious about my place in the group, and whether I am disrupting it by being there (i.e., whether participants feel 'watched'). ... I take notes of speaking turns. Although the "power imbalance" is apparent to them, this does not seem to make them under-share, which is positive. It seems like they do not even realise I am there a few minutes into the focus group."

5. How do I feel about the work?

I feel very satisfied with the quality of this work and am eager to share it with the academic community. I am particularly pleased that we were able to analyse and capture the interactional, conversational nature of the focus groups, rather than treating them as one-to-one interviews (see Online Resource 5). It feels like we have done justice to the richness of the focus group data.

6. How will my subject position influence the analysis?

My first encounter with the data was live, during the focus groups. Because I was taking notes, I could already start analysing the data at that point, both consciously and subconsciously. Later on, when I was analysing the transcripts, I could visualise certain moments from the focus group, as well as the demeanour and body language of specific participants. Therefore, although the transcripts did not 'speak' or capture non-verbal nuances, I often incorporated these unwritten details into my reading of the transcripts and subsequent analysis. I wrote about this in my reflexivity journal on 25 November 2020:

"Being the record keeper also gives me a live, very unique observation experience where I already start analysing the data by jotting down small notes and keywords as the focus group is taking place. I wonder if analysing the data later on will be easier as a result of me being there. Or, my interpretation might be different because I may unconsciously connect some of non-verbal cues that participants displayed during the focus group with the transcript."

7. How might the outside world influence the presentation of findings?

Some readers, including reviewers, may critique the brevity of the instructions and question whether applying the instructions for such a short period of time (1 minute) would have a meaningful effect. Further, readers who are not familiar with qualitative research method may find the sample size too small, although it is well justified by following established qualitative research guidelines. These critiques may in turn shape how we present the findings, for example, by needing to further justify the above points in the manuscript. I welcome any and all constructive criticism, which I believe improves the quality of my work.

8. How might the findings impact on the participants?

Although we did not conduct follow-up interviews with participants, some may be continuing to apply the mindfulness instructions across various domains of their daily lives. Participating may have also tried other mindfulness interventions and mobile apps.

9. How might the findings impact psychology and my career in it?, and

10. How might the findings impact wider understanding of the topic?

The insights from this study may impact how brief mindfulness interventions are designed and investigated in psychological research, perhaps leading to the development of evidence-based and effective brief interventions.

In terms of my career, these findings changed my outlook on mindfulness research such that I started thinking more critically about brief interventions and how they should be studied. The "brief" in "brief mindfulness interventions" refers to the length of the intervention, and not the length with which it should be practiced. I wrote about this in my reflexivity journal on 25 November 2020:

"Brief or not, mindfulness needs to be practiced over time, with naturally-occurring experiences. It can be brief in that, the strategy is brief, but you still need to practice it longitudinally and habitually to reap its benefits".

This insight will inform how I conduct future research, by starting to study brief mindfulness longitudinally and in ecologically valid settings, rather than (only) as a single-session lab study.

Reflexivity - RP

1. Why am I carrying out this research?

In addition to my personal experience with mindfulness, I gained an insight into others' experiences through a self-help group that I co-facilitate at a Scottish mental health charity. At a few meetings, the members would speak about their self-management routine, and some of them included mindfulness in it. This motivated me to gain more systematic and comprehensive understanding of how others experience mindfulness, and study it from a scientific point of view.

I met BT after contacting the University of Glasgow to find a guest speaker for the said charity. After she presented at the self-help group that I facilitate, we started a conversation which led to a collaboration on a project, which became my internship in the summer of 2020. It was my first experience of doing research outside of my university courses. We conducted a study exploring how non-meditators learn and apply brief mindfulness-based instructions to their food cravings. For this study, we utilised qualitative methodologies, which deepened my practical and theoretical knowledge of them. I also found conducting a qualitative study very enjoyable. Working on this project motivated me to study brief mindfulness further as my final year undergraduate dissertation project, in the domain of mental health. Furthermore, the COVID-19 pandemic presented challenging circumstances to people all over the world. Being a part of the student community at the University of Glasgow, I was moved by the struggles some of my peers were experiencing. This sparked a curiosity to explore how these undergraduate students might learn brief mindfulness and whether it would help them manage their anxiety.

2. What do I hope to achieve with this research?

I hope that this research will improve our understanding of undergraduate university students' experiences of learning to apply brief decentering-based instructions. This understanding may improve how mindfulness-based interventions are communicated in the future. Furthermore, it might shed light on other potential aspects of mindfulness, which might facilitate its practice. Moreover, the COVID-19 pandemic led to the stigmatization of some populations,

including university students. This was based on the premise that university students are not following governmental guidelines. While I was doing a literature review for this study, I found many articles that suggested otherwise. I hope that this research will bring additional clarity to the experiences university students are having during the COVID-19 pandemic.

3. What is my relationship with the topic being investigated?

My personal and academic views on this topic repeatedly came up while conducting this research. I tried to notice these automatic reactions and note them down every time I became aware of them, to keep track of my reflexive thoughts.

My previous experiences have most likely influenced these reflexive thought processes. As a Scout leader, a co-facilitator at a Scottish mental health charity, and a part of a multicultural community at the University of Glasgow, I gained experiences of working with people from diverse backgrounds, which often involve different worldviews, and opinions on topics such as mindfulness. Throughout these past experiences, I learned to listen to opinions different from mine with respect and an open mind. Furthermore, at the said Scottish mental health charity, we frequently engage in debriefing with my co-facilitator. During these experiences, I learned how to monitor my automatic reactions to distressing topics and reflect on my approaches used throughout the sessions. Altogether, these experiences taught me how to respect participants' opinions, which might be different from my own, and notice my automatic reactions to them, without getting overwhelmed by them.

4. Who am I and how might I influence the research being conducted?

I am a 23-year-old, female, final year undergraduate student. My age, gender, and educational background most likely influenced how I carried out this research. Most notably, as our participants were undergraduate students, I might have had similar experiences as they described during the focus groups. Even though I noticed that sometimes I had an urge to disclose these similarities and engage with the participants as with my peers, I tried to prevent this from happening. However, I felt uncomfortable in this position, especially at the beginning of the data collection. In my reflexive diary, after the first focus group (25/11/2020) I noted: "I felt like a teacher". This note captures the imbalance of power I perceived during the focus group, that I found uncomfortable.

Nevertheless, we debriefed with BT (who was present at the focus groups) after each focus group, and I often received feedback on my interaction with the participants from her. The debriefing and feedback helped me keep track of the approaches I took during the focus groups.

5. What experience or training do I have in conducting qualitative research?

My undergraduate studies at the University of Glasgow included courses focusing on qualitative research methodologies. These gave me theoretical as well as practical foundations of qualitative research. Furthermore, before starting this research I completed my internship at the Healthy Cognition Lab, conducting a qualitative research project with individual interviews. Even though these experiences gave me a strong foundation for starting the present research, I acquired new knowledge and learned new skills throughout this project.

6. What did the participants know about me (e.g., personal goals, reasons for doing research)?

The participants at the present study were informed that this research is my undergraduate final year dissertation project. Other personal goals and reasons for doing this research were not disclosed to the participants until informal discussion after the focus groups.

7. How do I feel about the work?

I believe that this study is meaningful in portraying the individuals' experiences of learning and applying brief mindfulness. I think that these qualitative accounts are of special importance during the uncertain times of the COVID-19 pandemic, as it points at the differences in the processes that are happening for each individual. It may lead to the development of effective interventions that may alleviate the distress that the COVID-19 pandemic is causing university undergraduate students.

8. How will my subject position influence the analysis?

While conducting the focus groups, I inevitably had personal reactions to the participants. This included liking or disliking them or feeling more connected with some participants. Consequently, feeling a greater connection with some participants may have created a biased perspective. This might have happened, for example, when I felt like their experiences reflected my own (see Question 4). Nevertheless, the thorough discussion of the data with BT, as well as feedback from EKP, safeguarded against any misinterpretations.

9. How might the outside world influence the presentation of findings?

Even though I believe that this research meaningfully contributes to the literature on brief mindfulness, the design, its limitations, and potentially the interpretation of the results might be perceived with criticism. Nevertheless, throughout my undergraduate degree, I learned that constructive criticism when delivered open-mindedly and as a space for discussion, can enhance the quality of the current and future research.

10. How might the findings impact on the participants?

Participating in our study may have offered participants a potential tool to help with the mental health implications of the COVID-19 pandemic. Furthermore, as participants discussed in our study, they may draw on the experience of brief mindfulness in their daily lives and apply it across various domains. Lastly, as some of our participants were undergraduate Psychology students, gaining insight into mindfulness through our study might motivate them to choose it as an area of interest.

11. How might the findings impact psychology and my career in it?

Our findings may inform future studies on how to communicate brief mindfulness-based interventions effectively, and what features may help participants to learn and apply them. Furthermore, questions raised from our study may generate future research on brief mindfulness, and the specific features that bring about its benefits. Our research also highlights the importance of exploring the individual experiences of learning and applying the instructions.

This study is of special importance to me. As I would like to pursue postgraduate studies in counselling psychology and psychotherapy, conducting this qualitative study has deepened my knowledge of mental health. During this study, and in the light of my future career prospects, I honed my skills in viewing individuals holistically within their individual experiences. Furthermore, it shaped my skills in interpretation, non-judgement, and being an observer of others' experiences.

Apart from shaping skills that are meaningful for my future studies and career, this was my undergraduate dissertation project and therefore an endpoint to my undergraduate studies. It is also the biggest piece of work that I have written to this date.

12. How might the findings impact the wider understanding of the topic?

This study offers an insight into individuals' first-person accounts of learning and applying brief mindfulness. Discussing challenges involved in learning and applying brief mindfulness normalises the difficulties that may be experienced while practicing mindfulness. It furthermore highlights the differences in individuals' mindfulness experiences, and that mindfulness, like any other intervention, may work for some, but not for all. 284

Supplementary material 4: Decentering instructions

We would like to ask you to sit comfortably in your chair, and to close your eyes.

We will now introduce you to a specific way of dealing with your thoughts, feelings, and the physical experiences in your body. Once we have explained this, you will practice applying it to the aspect of the COVID-19 pandemic that makes you anxious.

If you apply this specific way of dealing with your experiences to the aspect of the pandemic, then you try to see your thoughts, feelings, and physical sensations as mental events, which come and go. We will use the metaphor of a waterfall to illustrate this.

Try to imagine a waterfall. The constant stream of water is like your stream of experiences, including experiences of the pandemic. It doesn't stop, it goes on continuously, and the water can easily carry you away if you end up in it. Don't try to resist this stream, and don't try to pretend that this waterfall doesn't exist. Simply try to step behind the waterfall. This way, you can look at all the water that is passing by.

You can also deal with the aspect of the pandemic that makes you anxious this way. Observe the experiences that you have in response to this aspect, and look at them come up and go away.

We would like to ask you to apply this perspective to the aspect of the pandemic that you have identified. How can you best do this? If, for example, you have certain thoughts about this aspect, try to notice them and be aware of how they appear and disappear on their own. Realise that these are merely mental events. They are passing phenomena that are being produced by your mind. And because of that, you don't have to do anything about them. These thoughts will always simply go away by themselves.

Just like the water in the waterfall, simply try to observe how your thoughts, feelings, and physical sensations go by, while you try to stay aware of where you are right now - on a chair, in this room. However vivid or intense your experiences of this aspect are, try not to suppress them or to avoid them. Simply note how they come up and disappear again. Just like you don't have to react to the water that you observe, you don't have to react to these experiences. If you apply this way of dealing with your experiences, you could still find yourself being carried away now and again. This simply happens sometimes and is actually very normal. As soon as you notice this, just let it go and try again to adopt the perspective of observing how your thoughts, feelings, and physical sensations in response to this aspect pass by, just like the water.

While you're doing this, it can sometimes be helpful to try to remain aware of the situation in which you currently are. Try, for example, to feel your body resting on the chair, and feel how your feet are resting on the ground.

Soon, we will ask you to think about the aspect of the pandemic that you have identified earlier. We would like you to apply this way of dealing with your experiences to this aspect.

So, try to observe all your thoughts, feelings, and physical sensations about this aspect as passing, without you having to act upon them.

This is the end of this recording. Please open your eyes when you are ready.

Supplementary material 5: Summary findings from the analysis of interactional data

Overview

Where relevant, we used aspects of Conversation Analysis to analyse interactions that took place within the focus groups. The analysis of interactional data was not preregistered.

Summary findings from the analysis of interactional data

The interaction between participants led to key observations on group processes, the study instructions, and group facilitation. Although we did not conduct a full Conversation Analysis (CA), we made sense of these observations in a CA-inspired way.

First, disagreement between participants was rare within all focus groups. When disagreements did happen, they were typically toward the end of the conversation on a particular topic. This relates to the concept of 'adjacency pairs' in CA, where talk happens in responsive pairs (e.g., question and answer). For every first part of the adjacency pair (e.g., assessment), there is a preferred second response (e.g., agreement) and a non-preferred second response (e.g., disagreement). The non-preferred response is often delayed in talk (Sidnell, 2010). In this study, one of the few instances of disagreement took place in FG3, where P97 expressed that applying decentering did not change her experiences, only after other participants have already taken turns:

[sequence start]

When answering, "[...] how do you feel applying this strategy affected your experiences?":

P83: "[...] So that was very useful."

[...]

P79: "[...] became easier and it felt less like, I felt like less anxious about it, like, worried. [...]"

P12: "Kind of building off from what [name of P79] was saying, it did kind of feel like it had like less power or strength. [...]"

P97: "[...] it didn't really change anything for me. Like, I just like, it was more just like, 'nothing can be done', it's my way of stepping back, but I don't know. I feel like the problem is still there."

[sequence end] (FG3, L292-326)

Second, the specific phrasing of the aspect identification instructions may have influenced the type of aspects that participants have identified. In FG1, the moderator asked participants to "think of an aspect of the pandemic that makes you feel anxious when you think about it" (L92-93). Most participants in this group identified resolved issues (e.g., uncertainty around getting into university). In contrast, in all other focus groups, the moderator asked participants to "think about it *today*" (e.g., FG3, L99-100). This led to participants identifying a wider range of ongoing aspects. This is in line with one of the basic premises of CA that the second part of an adjacency pair retrospectively demonstrates its speaker's understanding of the first part of the pair (Sidnell, 2010).

Finally, certain aspects of the focus group facilitation process may have been associated with certain properties of the interaction that took place. For instance, the way in which the moderator negotiated the next speaking turn was meaningful. In CA, in any instance of potential turn completion, the current speaker may continue speaking, the current speaker may select the next speaker, or the next speaker may self-select (Sidnell, 2010). In FG1, the moderator predominantly nominated the next speaker, including during the icebreaker. This focus group then followed a Researcher-Participant-Researcher-Participant turn-taking structure, rather than a more interactive conversation. In contrast, in all other focus groups, the moderator allowed participants to selfselect their turn (e.g., "[...] anyone who wants to start it... you...can"; FG2, L105), and the icebreakers were structured such that each participant nominated the next participant to introduce themselves. Allowing participants to interact with each other early on led to conversations where participants selfselected their turns spontaneously, and responded to each other without waiting for moderator input.
References

Sidnell, J. (2010). *Conversation Analysis: An Introduction*. John Wiley & Sons, Incorporated.

http://ebookcentral.proquest.com/lib/gla/detail.action?docID=534006

Supplementary material 6: Trustworthiness

We established trustworthiness through extensive documentation, selfreflection, and critical discussions. In this document, we address the quality criteria and trustworthiness strategies outlined by Korstjens & Moser (2018), as relevant to the present study.

Credibility

Here, we outline the practices that we engaged with to endure credibility (i.e., truth-value; research findings represent plausible information that is drawn from participants' original data and interpreted accurately).

Prolonged engagement

BT and RP were fully present during the focus groups, where RP engaged with the participants through predetermined questions and spontaneous probes. Participants were encouraged to share examples or elaborate otherwise on the statements that they made. This was to understand participants' experiences at a deeper level.

BT and RP also engaged with the data extensively during the analysis stage to develop a comprehensive understanding of it. During this iterative process, the researchers read and re-read the data, analysed, theorised, and revised.

Triangulation

We applied investigator triangulation, meaning both BT and RP were involved in the organisational aspects of the study, as well as decisions regarding coding, analysis and interpretation of the data. The researchers analysed the data independently at first. They met weekly to critically review and discuss each other's coding, considered different interpretations of the data, and reached a consensus. The researchers frequently challenged each other's interpretations and prior assumptions during these meetings, which helped ensure the final interpretation was robust.

Transferability

Thick description of the research process

Transferability (i.e., the degree to which findings from the present study can be transferred to other settings/contexts) can only be judged by the readers of our work. To facilitate readers' transferability judgment, we provided a thick

description of the study context, including where the research was carried out, sampling size and strategy, inclusion/exclusion criteria, demographic characteristics of the sample, focus group guide, and focus group procedures. In other words, we described the context in which participants' experiences took place in rich detail. See especially the Method section within the main text for this information.

Confirmability

To ensure confirmability (i.e., the degree to which findings of the present study could be confirmed by other researchers), we provided a transparent description of each step of the research process. These descriptions are not presented as a separate audit trail, but can be found in the main manuscript, as well as the pre-registration document on the Open Science Framework (OSF; https://osf.io/pagjm/). This OSF link provides open access to all research materials, including the full dataset. It also documents decisions made during the iterative research process, for example, changes to participant inclusion/exclusion criteria and changes made to the focus group guide (see original and updated versions of the pre-registration document).

Reflexivity

BT and RP engaged in reflexive practice throughout the study to explore the link between themselves (i.e., the researchers) and the research itself. They frequently asked themselves how they might be influencing the research process through their explicit and implicit assumptions, preconceptions, and values; how they might be influenced in turn; and how all this affected their research decisions in the present study. See Online Resource 2 for details of BT and RP's in-depth reflexive engagement with this work.

References

Korstjens, I., & Moser, A. (2018). Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *European Journal of General Practice*, 24(1), 120-124. https://doi.org/10.1080/13814788.2017.1375092

Appendix D Supplementary materials for Chapter 5

Supplementary material 1: Additional quantitative analyses informed by qualitative survey findings

Analyses with the dataset where participants understood the decentering and control instructions

Background

The findings reported here are based on analyses of data from participants who indicated in their qualitative survey responses that they correctly understood and applied their assigned instructions (decentering (N = 94) or control (N = 153); total N = 247). We conducted a moderated multiple linear regression with condition, imagery (combined, pre-task, or post-task), and the condition*imagery interaction as predictors, pre-task anxiety as a covariate, and post-task anxiety as the outcome variable. All continuous variables were standardised, and dummy coding was used for the categorical predictor (i.e., condition), where the control condition is the reference group.

Analyses using the combined imagery score

Post-task state anxiety was lower in the decentering condition compared to the control condition. The interaction effect of condition and imagery on post-task state anxiety was not significant, but in the expected inverse direction as indicated through a negative beta coefficient. See Table D1 for a summary of the full multiple regression model.

(post-task state anxiety ~ pre-task state anxiety + condition ^ combined imagery)						
Variable	Standardized beta (ß)	Standard error	95% CI	t	p	
Intercept	0.22	0.05	0.12, 0.31	4.35	< .001**	
Pre-task anxiety	0.51	0.04	0.42, 0.60	11.49	< .001**	
Condition:						
Control	Reference					
Decentering	-0.59	0.08	-0.75, -0.43	-7.19	< .001**	
Combined Imagery	0.37	0.05	0.27, 0.48	6.98	< .001**	
Combined imagery x Decentering	-0.10	0.08	-0.26, 0.06	-1.21	.226	

 Table D1 - Summary of the multiple regression model for the dataset with participants who correctly understood and applied the instructions, using the combined imagery score

(post-task state anxiety ~ pre-task state anxiety + condition * combined imagery)

^{**}*p* < .01. Model statistics: *F*(4, 242) = 104.76, *p* < .001, adjusted R² = 0.63

Analyses using the pre-task or post-task imagery scores

See Table D2 for a summary of the multiple regression model using the pre-task imagery score as a predictor, and Table D3 for the model using the post-task imagery score as a predictor. These findings are similar to the main analyses in direction and significance. Notably, as with the main analyses, the interaction effect was significant when using the post-task imagery score. In other words, decentering reduced the association between imagery and anxiety compared to the control condition.

Table D2 - Summary of the multiple regression model for the dataset with participants	who
correctly understood and applied the instructions, using the pre-task imagery score	

Variable	Standardized beta (ß)	Standard error	95% CI	t	р
Intercept	0.26	0.05	0.16, 0.37	4.95	< .001**
Pre-task anxiety	0.56	0.05	0.46, 0.66	10.95	< .001**
Condition:					
Control	Reference				
Decentering	-0.69	0.08	-0.86, -0.52	-8.00	< .001**
Pre-task imagery	0.22	0.06	0.10, 0.33	3.75	< .001**
Pre-task imagery x Decentering	-0.05	0.09	-0.23, 0.12	-0.60	.551

(post-task state anxiety ~ pre-task state anxiety + condition * pre-task imagery)

 $^{**}p$ < .01. Model statistics: *F*(4, 242) = 81.58, *p* < .001, adjusted R² = 0.57

Table D3 - Summary of the multiple regression model for the dataset with participants who correctly understood and applied the instructions, using the post-task imagery score

Variable	Standardized beta (B)	Standard error	95% CI	t	p
Intercept	0.17	0.05	0.08, 0.27	3.52	< .001**
Pre-task anxiety	0.57	0.04	0.49, 0.65	14.49	< .001**
Condition:					
Control	Reference				
Decentering	-0.51	0.08	-0.67, -0.35	-6.28	< .001**
Post-task imagery	0.42	0.05	0.32, 0.53	8.08	< .001**
Post-task imagery x Decentering	-0.17	0.08	-0.33, -0.01	-2.15	.032*

(post-task state anxiety ~ pre-task state anxiety + condition * post-task imagery)

p < .05, p < .01. Model statistics: $F(4, 242) = 116.22, p < .001, adjusted R^2 = 0.65$

Analyses with the dataset where participants misunderstood the decentering instructions

Background

The findings reported here are based on analyses of data from participants who indicated in their qualitative survey responses that they misunderstood the decentering instructions (N = 43). In these analyses, combined data was used for the control condition (i.e., both understood and misunderstood; N = 157), as only four participants misunderstood the normal viewing instructions (total N = 200). Again, we conducted a moderated multiple linear regression with condition, imagery (combined, pre-task, or post-task), and the condition*imagery interaction as predictors, pre-task anxiety as a covariate, and post-task anxiety as the outcome variable. All continuous variables were standardised, and dummy coding was used for the categorical predictor (i.e., condition), where the control condition is the reference group.

Results

See Table D4 for a summary of the multiple regression model using the combined imagery score as a predictor, Table D5 for the model using the pre-task imagery score, and Table D6 for the model using the post-task imagery score. Notably, in the analyses using the post-task imagery score, the interaction between imagery of pandemic-related worries and condition was no longer significant. In other words, decentering did not reduce the association between imagery and anxiety for participants who misunderstood the decentering instructions.

(post-task state anxiety ~ pre-task state anxiety + condition * combined imagery) Standardized Standard Variable 95% CI t р beta (B) error Intercept 0.09 0.05 0.01, 0.18 1.77 .078 Pre-task 0.54 0.05 0.44, 0.64 < .001** 11.08 anxiety Condition: Control Reference Decentering -0.42 0.11 -0.64, -0.21 -3.92 < .001** Combined < .001** 0.36 0.05 0.26, 0.47 6.79 Imagery Combined -0.08 0.11 -0.30, 0.13 -0.75 .452 imagery x Decentering

 Table D4 - Summary of the multiple regression model for the dataset with participants who

 correctly understood and applied the instructions, using the combined imagery score

**p < .01. Model statistics: $F(4, 195) = 83.40, p < .001, adjusted R^2 = 0.62$

Table D5 - Summary of the multiple regression model for the dataset with participants who correctly understood and applied the instructions, using the pre-task imagery score

Variable	Standardized beta (ß)	Standard error	95% CI	t	p
Intercept	0.11	0.05	0.00, 0.21	2.05	.042*
Pre-task anxiety	0.60	0.05	0.49, 0.70	10.86	< .001**
Condition:					
Control	Reference				
Decentering	-0.51	0.12	-0.73, -0.28	-4.39	< .001**
Pre-task imagery	0.21	0.06	0.09, 0.32	3.47	< .001**
Pre-task imagery x Decentering	-0.06	0.12	-0.29, 0.18	-0.49	.628

(post-task state anxiety ~ pre-task state anxiety + condition * pre-task imagery)

 ${}^{*}p < .05, \, {}^{**}p < .01.$ Model statistics: $F(4, \, 195) = 63.24, \, p < .001,$ adjusted $\mathsf{R}^2 = 0.56$

 Table D6 - Summary of the multiple regression model for the dataset with participants who correctly understood and applied the instructions, using the post-task imagery score

Variable	Standardized beta (B)	Standard error	95% CI	t	p
Intercept	0.06	0.05	-0.03, 0.15	1.29	.197
Pre-task anxiety	0.59	0.04	0.50, 0.67	13.52	< .001**
Condition:					
Control	Reference				
Decentering	-0.34	0.11	-0.55, -0.13	-3.16	.002**
Post-task imagery	0.41	0.05	0.31, 0.50	8.21	< .001**
Post-task imagery x Decentering	-0.14	0.10	-0.34, 0.07	-1.33	.185

(post-task state anxiety ~ pre-task state anxiety + condition * post-task imagery)

^{**}p < .01. Model statistics: *F*(4, 195) = 96.15, *p* < .001, adjusted R² = 0.66

Supplementary material 2: Control and decentering instructions

Control instructions

We would like to ask you to sit comfortably in your chair, and if it feels comfortable, to close your eyes.

We will now provide you with some further instructions, which you will practice later on. This is simply some general guidance, and there is no need to overthink it.

When we ask you to apply the instructions to your worry, try to simply think in a normal way. This means that you're free to follow up on any thoughts, feelings and physical experiences in your body that come up.

Any experiences that you may have are completely fine, and you're free to follow up on these if you wish.

It's fine for you to get carried away with whatever comes up. However vivid or intense your experiences are, try not to suppress them or to avoid them.

Soon, we will ask you to apply this to the worry about the pandemic that you have identified earlier. Think in a normal way, without avoiding or suppressing anything. It's fine to follow up or get lost in any thoughts or experiences that you may have. So, allow this aspect of the pandemic to guide your thoughts, feelings and bodily experiences. Give your experiences space to develop, and let your thoughts develop freely.

This is the end of this recording. If you had closed your eyes, please open them when you are ready.

Decentering instructions

We would like to ask you to sit comfortably in your chair, and if it feels comfortable, to close your eyes.

We will now introduce to you a specific way of dealing with your thoughts, feelings, and the physical experiences in your body. Once we have explained this, you will practice applying it to your worry about the pandemic.

If you apply this specific way of dealing with your worry, then you try to see your thoughts, feelings, and physical sensations as mental events, which come and go. We will use the metaphor of a waterfall to illustrate this.

Try to imagine a waterfall. The constant stream of water is like your stream of experiences, including experiences of the pandemic. It doesn't stop, it goes on continuously, and the water can easily carry you away if you end up in it. Don't try to resist this stream, and don't try to pretend that this waterfall doesn't exist. Simply try to step behind the waterfall. This way, you can look at all the water that is passing by.

You can also deal with your thoughts about the pandemic this way. We understand that the source of your worry may be beyond your control. So, simply observe your worry about the pandemic, and look at the thoughts that make you anxious come and go.

We would like to ask you to apply this perspective to your worry about the pandemic that you have described. How can you best do this? If, for example, you have certain thoughts about the pandemic that make you worry, try to notice them and be aware of how they appear and disappear on their own. Realise that these are merely mental events. They are passing phenomena that are being produced by your mind. And because of that, you don't have to do anything about them. These thoughts about the pandemic will always simply go away by themselves.

Just like the water in the waterfall, simply try to observe how your thoughts, feelings, and physical sensations go by, while you try to stay aware of where you are right now - on a chair, in this room.

However vivid or intense your experiences of this worry are, try not to suppress them or to avoid them. Simply note how they come up and disappear again. Just like you don't have to react to the water that you observe, you don't have to react to these experiences.

If you apply this way of dealing with your thoughts to your worry about the pandemic, you could still find yourself being carried away now and again. This simply happens sometimes and is actually very normal. As soon as you notice this, just let it go and try to again adopt the perspective of observing how your thoughts, feelings, and physical sensations in response to the pandemic pass by, like the water.

While you're doing this, it can sometimes be helpful to try to remain aware of the situation in which you currently are. Try, for example, to feel your body resting on the chair, and feel how your feet are resting on the ground.

Soon, we will ask you to apply this way of dealing with your thoughts to the worry about the pandemic that you have identified earlier. So, try to observe all your thoughts, feelings, and physical sensations as passing, without you having to act upon them.

This is the end of this recording. If you had closed your eyes, please open them when you are ready.

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