Taking a Situated Approach to Assessment and Intervention in Trichotillomania and Social Connection

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Abstract

Trichotillomania (hair pulling disorder) can be a debilitating mental health condition, but current interventions are not without their flaws. Central to developing an effective intervention is to first accurately measure it. Thus, this thesis' first aim was to develop an assessment instrument for trichotillomania, with the intention to build an intervention. Traditional assessment measures for trichotillomania ignore the importance of the situation, can lead to inaccuracies, and may not give a complete picture of pulling for each individual. Chapter 2 addresses these concerns and builds a novel assessment instrument for trichotillomania, based on the theory of grounded cognition. Our results created a detailed pulling profile for each individual that was situation specific and presented promising areas for interventions to focus on. The second aim of this thesis was to develop an intervention for trichotillomania. As part of this intervention, we were interested in social connectedness and social support and what role they may play in hair pulling, given their association with mental health in general. Chapters 3 and 4 therefore develop an assessment instrument for social connectedness and social support, again building from the theory of grounded cognition. Findings from these studies helped to develop our understanding of influential processes for social connectedness and social support, and situational effects. Finally, the Discussion chapter introduces a trichotillomania intervention developed from the previous studies and the wider literature and further discussed the implication of the findings within Chapters 2-4.

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Research Output

Available as preprint:

Chapter 2 – Taylor Browne Lūka, C., Hendry, K., Dutriaux, L., Stevenson, J. L., & Barsalou, L. (2023, May 24). *Developing and Evaluating a Situated Assessment Instrument for Trichotillomania: The SAM² TAI*. PsyArXiv. https://doi.org/10.31234/osf.io/v6qna (Submitted to Journal of Obsessive-Compulsive and Related Disorders)

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Author's Declaration

This thesis contains the work conducted by Courtney Taylor Browne Lūka at the School of Psychology and Neuroscience, University of Glasgow under the supervision of Prof. Lawrence Barsalou, between October 2019 and May 2023. I hereby declare that except where stated, the work included in this thesis is my own and no part of it has been submitted to any other university or degree.

Contributors Statement

For each empirical chapter the contributions of each author in accordance with the Contributor Roles Taxonomy (CrediT) are listed below:

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BI: Bairavi Iswaraan; CTBL: Courtney Taylor Browne Luka; JS: Judith Stevenson; JK: Juliane Kloidt; KH; Katie Hendry; LB: Lawrence Barsalou; LD: Leo Dutriaux

Chapter 2

CTBL: Conceptualisation, Methodology, Investigation, Formal analysis, Data Curation, Visualization, Writing – Original draft, Writing – Review & Editing; KH: Methodology, Investigation, Writing – Review & Editing; LD: Formal analysis, Data curation, Writing – Review & Editing; JS: Conceptualisation, Methodology, Investigation, Writing – Review & Editing, Supervision; LB: Conceptualisation, Investigation, Methodology, Formal Analysis, Writing – Review & Editing, Supervision.

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Abbreviations

BFI	The Big Five Inventory
BSCS	Brief Self-Control Scale
ComB model	Comprehensive Behavioural model
HVIC	Horizontal and Vertical Collectivism and Individualism Scale
PSS	Perceived Stress Scale
MGH-HPS	Massachusetts General Hospital Hair Pulling Scale
MIST-A	Milwaukee Inventory for Subtypes of Trichotillomania – Adult version
MSPSS	Multidimensional Scale of Perceived Social Support
ISEL	Interpersonal Support Evaluation List
SAM²	Situated Assessment Method
TAI	Trichotillomania Assessment Instrument
SCS-R	Social Connectedness Scale - Revised
SES	Socioeconomic status

Chapter 1 General Introduction

1.1 Introduction

Trichotillomania (hair pulling disorder) can be a debilitating mental health condition surrounded by shame and secrecy, with social and economic costs for the individual (Grant et al., 2020; Singh et al., 2016; Wetterneck et al., 2006; Woods et al., 2006). Current interventions have shown some efficacy but are not without their limitations and often suffer from high relapse rates (Farhat et al., 2020; Jafferany et al., 2020; E. B. Lee et al., 2020). Central to developing an effective intervention is to be able to accurately measure trichotillomania. Traditional assessment measures of trichotillomania ignore key elements that can lead to potential inaccuracies and may not give a complete picture of pulling for each individual. This PhD aims to develop an intervention for trichotillomania with the initial focus being on developing a novel assessment method rooted in the theory of grounded cognition, addressed shortly. Increasingly social connectedness and social support have been linked to mental health and have proved beneficial in interventions (Cruwys et al., 2014; Haslam et al., 2015; Saeri et al., 2018; Snyder-Mackler et al., 2020). Considering this, a second focus of the PhD was to develop a novel assessment for social connectedness and social support, in a similar manner to the trichotillomania assessment. This was with intention to incorporate findings about social connectedness and support into a new behavioural intervention tool for trichotillomania.

1.1.1 Thesis Aims and Structure

The first aim of this thesis was to develop two novel assessment instruments for trichotillomania and social connectedness/support from the theory of grounded cognition. The second aim was to establish reliability and validity of our new measures and gain a deeper understanding of trichotillomania and the constructs of social connectedness and social support. Our final aim was to build a behavioural intervention for trichotillomania building from our research into assessing trichotillomania.

Chapter 1 will introduce the topic, outlining the relevant theory and development of the novel assessment method. Chapter 2 presents the development of the trichotillomania assessment instrument. Chapter 3 presents the development of the social connectedness and social support instrument. Chapter 4 further assesses the social connectedness and social support instrument during COVID-19 and associated lockdown measures and further adds an assessment of loneliness. Lastly, Chapter 5 will address these empirical projects in a general discussion, including common themes, theoretical and practical implications, notable findings and ideas for future research. It will also detail the development of a behavioural intervention tool for trichotillomania, developed from the research in this thesis.

1.2 Grounded Cognition and the Situated Action Cycle

Traditional thinking around cognition viewed it as a module in the brain, separated from other modules, such as action and emotion (Hanson, 1986). Cognition could interact with other modules and pass on information but was unaffected by activity in other modules. This perspective has been challenged as it ignores how abstract amodal symbols intrinsic to the cognitive module are mapped into perception and the world (Harnad, 1990). Furthermore, there is evidence to suggest cognition utilises perceptual and motor modalities for representation and processing, and that cognition itself emerges from the brain, body and environment (Barsalou, 2008; Dutriaux et al., 2021; Kemmerer, 2015).

The theory of grounded cognition instead proposes that cognition is non-modular in nature (Barsalou, 2008). From this perspective the ‘classic’ cognitive processes (e.g., attention, memory, language, thought etc.) are grounded by different domains. These domains are: modalities (external perception i.e. vision, audition, gustation etc. and internal perception i.e. proprioception, affect, reward etc.), body (e.g. face, limbs, digestion etc.), physical environment (settings i.e. indoor, outdoor and entities i.e. living things, artefacts etc.) and the social environment (e.g. self, culture, social interaction etc.) (Barsalou, 2008, 2010, 2020). Cognition emerges from interactions of these four domains and thus cannot be studied in isolation but in the context of these domains.

Another key part of grounded cognition is that cognition typically guides effective action in the world. Cognition can be seen to operate as a mediator between perception and action, rather than simply the culmination of bottom-up processing streams from the perceptual modalities (Barsalou, 2020). One proposed conceptualisation of this is the Situated Action Cycle (Barsalou, 2008, 2010, 2020). The Situated Action Cycle accounts for the interactions between perception, cognition, action, environment, affect, and outcomes.

According to the Situated Action Cycle (Figure 1) perceived entities and events in the environment typically initiate the cycle. Once these are perceived their self-relevance is assessed in relation to a person's goals, identity and relevant social norms. Put simply, cognitive processing of an event or entity establishes meaning and relevance for the individual (Barsalou, 2020). Self-relevance then induces affect which can take the form of emotions and/or motivations. If the motivation is strong enough this can lead to actions, such as eye movement and overt bodily actions to executive cognitive functions. Finally, such actions lead to outcomes. Outcomes can be in the external world and also inside the individual (Barsalou, 2020). Outcomes can thus change the external and internal environment which can then trigger further iterations of the cycle. There is evidence that demonstrates motivations and actions in the cycle produce outcomes and can influence how the environment is perceived during self-relevance (Laitin et al., 2019; Lebois et al., 2020; Wilson-Mendenhall et al., 2011).

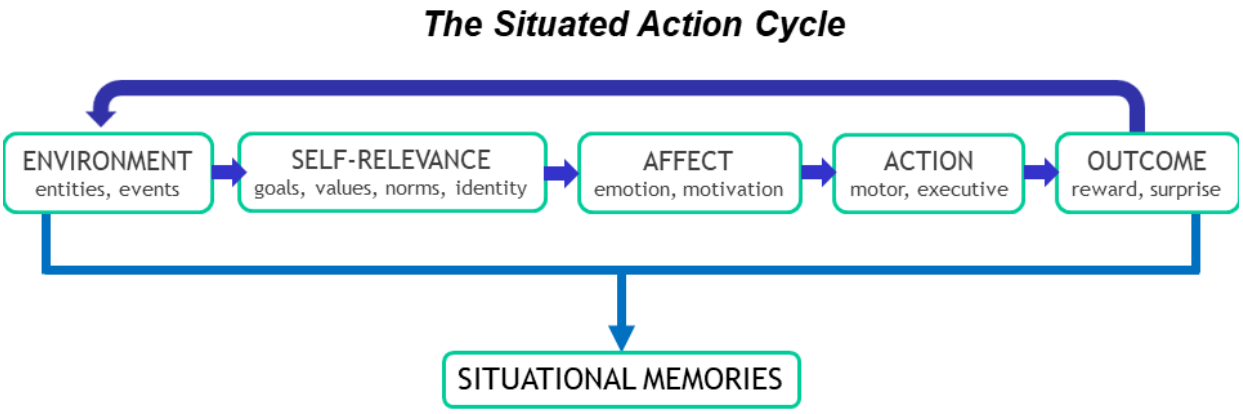


Figure 1. The Situated Action Cycle (Barsalou, 2020; Dutriaux et al., 2021). The five phases of the Situated Action Cycle: environment, self-relevance, affect, action, and outcome. An idealised set of linear phases is shown, with an iterative loop (top). Although presented here in a linear manner phases can happen simultaneously or some may be omitted entirely.

Each iteration of the Situated Action Cycle superimposes information about its operation across memory systems in the brain. These situational memories can be referred to as *situated conceptualisations* (Barsalou, 2009, 2019; Lebois et

al., 2020; Papies, 2017; Wilson-Mendenhall et al., 2011). As people perform behaviours throughout their daily lives, they store representations in their memory of each aspect of the Situated Action Cycle. This means that if a repeated kind of situation occurs and the Situated Action Cycle runs in similar manner each time, an entrenched pattern for implementing the cycle becomes established in memory so it is available for implementation in future similar situations. This concept is what likely underlies conditioning, habit learning and, skill acquisition (Barsalou, 2009, 2016, 2019, 2020).

Looking at human behaviour from the grounded cognition perspective and the Situated Action Cycle, one can see the importance of the situation and situational cues. Goal-directed behaviours consistently performed in specific situations can become associated with features of those situations (Papies, 2017). Situational cues can lead to automatic behavioural responses, can trigger hedonic goals – even when they are in contrast to long-term investment goals, and can lead to prejudiced behaviour despite one's conscious intentions (Papies, 2017). The situation can thus play an important role in understanding human behaviour and individual differences. From the grounded cognition perspective, to understand the individual differences in the target behaviour of interest, accounts of the underlying cognitive and affective processes grounded in situations are essential.

1.3 Importance of situations in psychometrics of behaviour

As established previously, situations are integral to human behaviour and our understanding of why a behaviour may or may not occur. From this perspective it is striking how disconnected psychometrics of behaviour are from the real-life situations in which the measured behaviour occurs. Typical traditional assessment instruments use decontextualised items to assess an individual difference of interest. Take for example the Big Five Inventory-2 (BFI-2) (Soto & John, 2017) a common measure of personality, to assess the personality trait of extraversion an individual answers items such as: "I am someone who is outgoing, sociable." To respond to this item, individuals must abstract over specific situational experiences (e.g., dinner out with friends, at home watching TV, reading a book, going to work etc.) to give a general assessment of how

much they agree with it. The requirement to abstract over situational experiences to provide general assessment is common feature across many assessment instruments, including, but not limited to, the Perceived Stress Scale (Cohen et al., 1983), the Self-Control Scale (Tangney et al., 2004), the Social Connectedness Scale – Revised (R. Lee & Robbins, 1995), the multidimensional scale of perceived social support (Zimet et al., 1988), and the Massachusetts General Hospital Hairpulling Scale (Keuthen et al., 1995).

Traditional assessment instruments typically attempt to capture a single construct that is assumed to be context-independent (e.g., traits such as neuroticism, extraversion, self-control). An individual's overall score on an instrument establishes their position in an ordering of individuals (e.g., their extraversion relative to others). Furthermore, it is assumed that the internal entity relating to this score resides in the individual's own cognitive system (e.g., a trait), which will causally produce a corresponding behaviour. For example, a high level of extraverted behaviour is deemed to result from a strong extraverted trait. Not only do these entities produce behaviour but also, they are assumed to endure indefinitely, influencing behaviour over time in a context-independent manner.

1.3.1 Limitations of traditional assessment measures

There are a variety of issues that can stem from using such traditional methods of assessment to measure individual differences: judgment accuracy, situational variance, and predictive accuracy. The following discussion of these issues is adapted from Dutriaux et al. (2021).

One of the main potential limitations of using such decontextualised assessment instruments is that they can lead to inaccuracies in judgement. For example, if one was to answer the statement "I am someone who is outgoing, sociable" it is difficult to accurately remember how one acted in every situation across one's life or even just in the last week. To answer, one may instead already have an opinion about who they are (e.g., whether they generally are an extraverted person) (Ajzen, 1977; Dutriaux et al., 2021; Gelman & Legare, 2011; Nisbett & Wilson, 1977). One may therefore ignore evidence to the contrary (e.g., at work yesterday they were not sociable or outgoing with their colleagues) and instead

draw inference from theories about oneself. Relying on intuitive theories is not necessarily an inaccurate judgment as it may reflect some actual experience, but it may also reflect a variety of beliefs, goals, and biases (Dutriaux et al., 2021). Further inaccuracies can stem from individuals relying on recent memories that are most easily accessible for the individual, resulting in a biased sample (Tversky & Kahneman, 1973; Wänke et al., 1995). Thus, by relying on intuitive theories and/or the availability heuristic responses to decontextualised items may not be fully accurate.

A second related limitation is that traditional measures ignore situational variability. As evidenced earlier, situations play an integral role in shaping our behaviour in the world. If we again think about our example of extraversion, it is unlikely that one's level of extraversion is constant across all situations. For example, when in a work situation with colleagues one may behave in more introverted manner compared to when having drinks with friends. From the theoretical perspective of interactionism (Endler & Magnusson, 1976; Reynolds et al., 2010), varying levels of extraversion in different situations results from how the individual interacts with the situations over time. Thus, the situation can affect the expression of a behaviour, a factor that traditional psychometric instruments typically ignore. Furthermore, the effect of the situation is not the same for each individual, such that there is an interaction between the individual and the situation (Dutriaux et al., 2021). The exact same situation (e.g., having drinks with friends) may result in one person being highly extraverted, but another may be much more introverted. Therefore, assessing a construct in different situations for each individual is likely to be useful for both establishing insight into the construct and individual differences.

Another issue is that using such instruments often has little predictive value, likely due to the potential judgement inaccuracies and ignoring of situational variety. Indeed, in the personality literature for example, decontextualised measures of personality traits weakly predict behaviour in specific situations (Fleeson & Gallagher, 2009). For example, an individual may score highly in extraversion, likely as they intuitively believe they are extraverted and remember recent situations in which they were. One may then predict that the individual would exhibit extraverted behaviour consistently in situations.

However, when examining an individual's behaviour in the work break room for example, they may not behave in the extraverted manner that was predicted. Instead, an accurate prediction of behaviour in this situation is more likely to occur when one's extraversion is assessed specifically in this situation (Dutriaux et al., 2021).

1.3.2 The Situated Assessment Method (SAM²)

In response to the aforementioned limitations of traditional assessment methods and drawing from the theory of grounded cognition, the Barsalou lab has developed the Situated Assessment Method (SAM²) (Dutriaux et al., 2021). SAM² is a general assessment framework that can be used to measure a variety of diverse constructs, so far it has been used to measure stress, eating, drinking, habits, and sustainable behaviour.

SAM² establishes individual differences in a construct of interest by assessing it on two dimensions of situatedness: situational experience, and the Situated Action Cycle. The following will outline the two dimensions of situatedness in SAM².

1.3.2.1 Situational experience

As established previously traditional measures typically ignore the situation when measuring a construct of interest. In contrast, SAM² assesses the behaviour of interest in a specific situation, thus capturing unique situational variability for each individual. To develop a SAM² instrument for the construct of interest situations where the construct could occur are first identified. When sampling situations the aim is to cover many different areas of everyday life that could reasonably relate to the construct of interest. The sample of situations should allow for the construct to occur in varying degrees and be uniquely different from each other. For example, in the habits version of SAM², 80 common habits were sampled that covered 10 different domains (Dutriaux et al., 2021), such as food and drink, exercise, work and study, etc.. A key principle of situation selection for SAM² is the acknowledgement that not *every* situation will occur for *every* individual. The aim is for the situations to vary widely in the construct of interest at the group and individual level in order to avoid restricted variance.

By measuring a target behaviour across relevant situations, a rich descriptive profile of that behaviour is created, providing a more representative measure of the behaviour than an unsituated judgement, like those of traditional assessment instruments.

1.3.2.2 Situated Action Cycle

The second aim of SAM² instruments is assess different facets of the construct of interest. Often traditional instruments are not theory driven, but rather reflect expert intuition about the construct of interest (Dutriaux et al., 2021). Indeed, within the field of social connection, social support, and loneliness for example, there are concerns over a lack of theory base for assessment and intervention (Dickens et al., 2011; Gardiner et al., 2018; Hare-Duke et al., 2021; Ma et al., 2020). The lack of a clear theoretical framework for assessing the construct of interest can ultimately limit one's understanding of it.

In response to this, the SAM² chooses potentially influencing factors in a theoretically motivated manner. For the purpose of developing SAM² for a target behaviour the Situated Action Cycle is a useful theoretical tool. As described previously the Situated Action Cycle consists of phases that include: the environment, self-relevance, affect, action, and outcomes (Figure 1). The Situated Action Cycle can capture an organised set of processes central to many activities. By measuring factors from all phases of the Situated Action Cycle that may influence the target behaviour, SAM² can produce informative and comprehensive individual difference measures. By assessing the individual difference of interest within the context of Situated Action SAM² can also provide a rich theoretical description of the construct, which may be particularly useful when there is a lack of consensus on definition with the literature.

1.3.3 How SAM² addresses traditional assessment limitations

Using the described SAM² framework to assess the construct of interest it is possible to address the limitations, discussed previously, of decontextualised assessment instruments: judgement accuracy, situational variance, and predictive accuracy (Dutriaux et al., 2021).

Firstly, by assessing a construct in specific situations where it occurs, each situation is able to serve as a retrieval cue, activating relevant memories. By activating relevant memories, an individual is less likely to need to rely on intuitive theories about how they behave and is less likely to be affected by the availability heuristic. If a representative and comprehensive set of situations is evaluated, the aggregate measure of the construct is likely to be reasonably accurate (Dutriaux et al., 2021). Similarly, by measuring the target behaviour in different situations, SAM² can account for and measure situational variability. Furthermore, as the same situations are used for each individual, the situation by individual interactions can also be established. A third benefit of SAM² is that it establishes values of a construct in different situations and so is able to make situation-specific predictions of behaviour, which potentially can be more accurate than traditional measures.

1.4 Situations in Trichotillomania

The initial focus of this thesis was to address the limitations of traditional assessment measures in trichotillomania. Trichotillomania (hair pulling disorder) is a psychological condition, characterised by the repetitive pulling of one's own hair. It is currently classified in the DSM-5 as an obsessive-compulsive and related disorder and is also known as a body-focused repetitive behaviour (BFRB) (American Psychiatric Association, 2013). Hair pulling typically begins at a young age and can emanate from a variety of areas, most commonly the scalp and eyebrows (Duke et al., 2009; Duke, Keeley, Ricketts, et al., 2010; Ghisi et al., 2013) often resulting in a significant amount of hair loss (Woods et al., 2006). Trichotillomania can have a serious negative influence on numerous areas of functioning and the strength of the impact that trichotillomania can cause is thought to be related to the severity of an individual's symptoms (Woods et al., 2006). However, despite the debilitating nature of the disorder, roughly only half of sufferers seek treatment (Woods et al., 2006).

In the adult population prevalence estimates are between 0.6 and 3.9 percent (Grant et al., 2020; Grzesiak et al., 2017; Houghton et al., 2018; Solley & Turner, 2018; Thomson et al., 2022; Woods et al., 2006) with higher rates more commonly found in females. There is speculation that rates could likely be higher than this, in part due to the associated shame and embarrassment leading

to underreporting or not disclosing hair pulling (Grant, 2019; Singh et al., 2016; Weingarden & Renshaw, 2015; Woods et al., 2006).

Trichotillomania is frequently comorbid with other mental health conditions, most commonly obsessive compulsive disorder (OCD), anxiety, attention deficit hyperactivity disorder (ADHD) and post-traumatic stress disorder (PTSD) (Christenson et al., 1991; Grant et al., 2020; Houghton et al., 2016; Keuthen, Curley, et al., 2016; Lochner et al., 2019). Importantly, for those with comorbid conditions trichotillomania was perceived as the most distressing for individuals. Typically, other the mental health conditions are prioritised during treatment, as they often seen as more severe by clinicians, but as trichotillomania is clearly distressing for the individual, it perhaps warrants more attention and focus than is currently often the case.

As explored earlier from the perspective of grounded cognition, cognitions leading to the behaviour of hair pulling do not occur in a vacuum. Indeed, as part of the Situated Action Cycle, situations are an important phase the lead to behavioural outcomes. In fact, for trichotillomania it is likely that situations are an incredibly important phase leading to the outcome of hair pulling. A key part of one of the most widely accepted models of hair pulling, the Comprehensive Behavioural Model (ComB) (Mansueto et al., 1997), is the presence of external cues in the environment that may trigger a pulling episode. Indeed, part of habit-reversal training (HRT), the most common psychotherapy for trichotillomania, focuses on encouraging awareness of situations that may precede pulling episodes (Grant, 2019). Despite the awareness of the potential role situations may have in trichotillomania, there has been little research into the exact situations in which individuals pull and the potential variety in these. Currently, from what little research there is, it is suggested hair pulling most commonly occurs when performing sedentary activities. The most commonly cited situations are reading, watching TV and studying (Duke et al., 2009; Ghisi et al., 2013). As there is little detail about the variety of pulling situations, and situations in which pulling is unlikely to occur, Study 1 in Chapter 2 addresses this by conducting a norming study.

Not only are situations likely important for understanding hair pulling, but like with many other psychometric instruments, typical measures of trichotillomania

use decontextualised items to assess levels of hair pulling. Such instruments can lead to the potential biases and ignoring of situational variability described previously. Due to the highly heterogenous nature of trichotillomania and the distressing nature of the condition it is important to develop an assessment tool that can pick up the individual differences. As part of this thesis, we decided to address this issue and build a SAM² trichotillomania assessment instrument (TAI). The SAM² TAI utilised a total of 52 unique situations, 31 pulling and 21 non-pulling, from a variety of domains. Influential processes were developed from the current literature on trichotillomania and the Situated Action Cycle. More detail on the specifics of SAM² TAI will be described in Chapter 2 of this thesis. Using SAM² TAI we were able to establish substantial individual differences and large situational effects and situation by individual interactions. Our research helped to provide evidence for the influential processes involved in hair pulling and thus potential targets for intervention.

1.5 Funding to develop intervention from TLC Foundation for BFRBs

Trichotillomania can have a significant impact on quality of life, particularly if it becomes chronic in nature (Diefenbach et al., 2005). People with trichotillomania commonly report avoiding social events, entertainment, going on vacation and haircuts (Grant et al., 2020; Singh et al., 2016; Snorrason et al., 2015; Wetterneck et al., 2006; Woods et al., 2006). Hair pulling can also impact their relationships, particularly in forming close and intimate relationships with others. Not only can trichotillomania have a social impact, but it can also have an economic impact. Hair pulling can result in avoidance of work and school, potentially limiting income and career advancement (Flessner, Conelea, et al., 2008; Wetterneck et al., 2006). In addition, a lot of time and money is spent on concealing the effects of pulling. Not only can there be significant distress and shame as a result of pulling there can also be physical consequences. Primarily trichotillomania can result in permanent hair loss, but secondly a common symptom is trichophagia (compulsive eating of hair) (Grant & Odlaug, 2008). Trichophagia can lead to hairballs (trichobezoars) in the stomach that can only be removed surgically, and that, if not treated, can cause death (Duke, Keeley, Geffken, et al., 2010).

Considering the potentially damaging consequences of trichotillomania it is essential to develop an effective treatment. The most widely accepted current treatment for trichotillomania is cognitive behavioural therapy with habit reversal training (HRT) (Jafferany et al., 2020; Jafferany & Patel, 2018; E. B. Lee et al., 2020). Despite proven efficacy of HRT, few professionals are trained to use it with trichotillomania, and relapse rates remain high (Farhat et al., 2020; Jafferany et al., 2020). With this in mind and with the implications of our own findings about trichotillomania, discussed in Chapter 2, we wanted to develop an intervention for trichotillomania.

To do so we submitted a proposal to the Trichotillomania Learning Centre Foundation for Body Focused Repetitive Behaviours (TLC Foundation for BFRBs) for funding to develop an intervention tool based on the SAM² TAI. As part of this proposal, we were also interested in the potential impact of social factors in trichotillomania assessment and interventions. As an inherently social species poor social connectedness and poor social support have long been documented as having a negative effect on both mental and physical health (Cruwys et al., 2014; Haslam et al., 2015; Hefner & Eisenberg, 2009; Holt-Lunstad et al., 2010; Saeri et al., 2018; Snyder-Mackler et al., 2020).

There is currently very little direct research looking at the relationship between social connectedness, social support and trichotillomania. However, Falkenstein & Haaga, (2016) did find that perceived social support negatively correlated with trichotillomania symptom severity. In addition, social support is one of the elements of HRT, currently the recommended treatment for hair pulling and often endorsed as a significantly helpful component (Diefenbach et al., 2006). In a recent study, peer support was found to help instil a sense of connectedness within a community which helped individuals to challenge their own beliefs and broaden their sense of identity beyond the physical (Slikboer et al., 2020). Considering the likely impact of social connectedness and social support and the fact that trichotillomania consistently leads to social avoidance we were interested in incorporating social factors into our trichotillomania intervention tool along with our SAM² work on trichotillomania (presented in Chapter 2).

1.6 SAM² social connectedness and social support

As we were interested in incorporating social factors into our trichotillomania intervention we first wanted to explore and better understand social connectedness and social support. As mentioned previously many traditional measures often ignore situational variance and measures of social connectedness and social support were no different. Acknowledging the limitations described previously led to the development of SAM² social connectedness and social support.

Chapter 3 develops our psychometric tool for assessing social connectedness and social support. For this we chose 24 situations that could reasonably occur in a person's life, with an equal number of social and non-social and positive and negative situations. After consulting the literature and theory around social connectedness and social support we developed eight influential processes, four for social connectedness and four for social support, more detail on our SAM² measure for social connectedness and social support can be found in Chapter 3. From our research we were able to uncover differences between social connectedness and social support with evidence to suggest they are distinct but related constructs. Furthermore, we found clear individual differences, the importance of situations, and a situation by individual interaction.

During this thesis, and after our initial development of SAM² for social connectedness and social support, the COVID-19 pandemic hit, and with it associated social distancing and lockdown measures were put in place. As we were already exploring social connectedness and social support, we decided to take advantage of the situation and explore these constructs in more detail. Firstly, we were interested in confirming our findings from Chapter 3 and to assess any potential impact of COVID-19. Due to the increased social isolation associated with COVID-19, of interest was exploring the concept of loneliness and its relationship with social connectedness and social support.

A second aim of the study was to assess the potential impact of modality of communication (online vs. offline), potentially relevant for trichotillomania. As noted previously, trichotillomania can often result in high levels of shame often leading to social avoidance (Grant et al., 2020; Singh et al., 2016; Weingarden &

Renshaw, 2015; Woods et al., 2006). Online communication could therefore mitigate some of the negative effects of social avoidance and perhaps present a means of social connectedness and social support for individuals who do not yet feel comfortable with in-person support.

Indeed, trichotillomania social media peer support groups (PSG), which are typically created and managed by individuals with lived experience of trichotillomania, can offer anonymity and be easily accessible for most individuals who may not be comfortable with 'offline' support (Tan et al., 2021). Furthermore Bruwer & Stein, (2005) found that internet support groups for trichotillomania offered support for individuals. More recently research has found the primary reason for using social media PSGs was to read about other people's experiences of treatments and their condition, and to search for information (Tan et al., 2021), thus making them an avenue for informational support (a key part of social support).

Such online platforms can be a useful tool for support for individuals with trichotillomania, especially if there are high levels of shame about one's condition that hinder social involvement in person. However, online platforms can also lead to negative experiences for individuals, with misinformation and preoccupation with symptoms which could be confronting for some, and also lead to hopelessness and social comparison (Tan et al., 2021). Online communication thus has great potential and could be utilised in interventions, but adequate support structures need to be in place and more research is needed to gain a deeper understanding of how to enhance the positive aspects and limit the negative.

Considering the potential use of online communication for trichotillomania and the current COVID-19 pandemic, with the associated social distancing measures in place, we utilised our SAM^2 social connectedness and social support measure. Due to the time-period of data collection, we changed the situations to 16 that could reasonably happen under lockdown restrictions and with an equal mix of online and offline situations. In addition, we added loneliness as a dependent variable to be able to explore the construct further. We further assessed the potential mitigating impact of living with at least one other person during COVID-19. Description of this version and the results of our study are

documented in Chapter 4. Overall, we largely confirmed our findings in Chapter 3 and found little effect of modality of communication (online vs. offline).

1.7 Developing a behaviour change intervention.

After the development of our SAM² measures we turned our attention to building the trichotillomania intervention that we had secured funding for. Simultaneously whilst developing our SAM² social connectedness and social support measure, another strand outside of my work was developing a stress behaviour change intervention called SITUATE stress. When building SITUATE stress, the plan was to also use it as a trichotillomania intervention and so this played a central role in the development of SITUATE. A design was implemented from the start that allowed it to be used for both stress and trichotillomania, along with potential other domains in the future (e.g., loneliness, sustainable behaviour).

SITUATE trich was adapted from SITUATE stress and informed by our previous research into trichotillomania and social connectedness/support. The Discussion chapter outlines our trichotillomania behavioural intervention tool that we developed from the findings of our previous research.

1.8 The Current Thesis

The intention of this PhD project was to address some of the limitations of current assessment instruments for trichotillomania and to develop a behavioural intervention tool from this. As part of the development of an intervention for trichotillomania we were interested in including social connectedness and social support. Therefore, of further interest was developing our understanding of social connectedness and social support and to again address some of the limitations of the traditional ways of assessing these two constructs. Specifically, this research can contribute to the development of a behavioural intervention for trichotillomania and offer a novel way to assess hair pulling that can account for individual differences, situations, and individual by situation interactions.

Chapter 2 develops our SAM² TAI across three studies. We wanted to first establish norms for pulling to develop the situations as part of SAM² TAI. We then developed our influential processes and assessed them in two separate studies. Our hypotheses were that using SAM² TAI would result in substantial individual differences, situational effects and situation by individual interactions. In addition, we predicted high construct and content validity for our new SAM² measure. As expected, the results established large individual differences in trichotillomania, substantial effects of situation, and situation by individual interactions for hair pulling. Findings can thus help to gain a better understanding of trichotillomania, the potential influences on pulling, and how these are unique for each individual.

Chapter 3 develops our SAM² social connectedness and social support instrument. Utilising 24 unique situations and eight influential processes developed from the literature we were able to investigate the individual differences in social connectedness and social support and the situational and situation by interaction effects. We hypothesised that using our SAM² measure we would establish substantial individual differences, situational effects and situation by individual interactions. In addition, we predicted high construct and content validity for our new SAM² measure. Findings from this can aid in our understanding of the two constructs of social connectedness and social support and how they relate to each other. By furthering our understanding in this manner, we can help to establish how best to utilise them and increase them in the development of interventions.

Chapter 4 builds on the findings from Chapter 3 and takes advantage of COVID-19 and associated social distancing measures. We were able to adapt our SAM² social connectedness and support measure to fit with situations that could reasonably occur during COVID-19 and the associated lockdown measures in the UK. As such we were able to confirm findings about social connectedness and social support from Chapter 3 and also explore the effect of COVID-19, the relationship between social connectedness, support and loneliness, and influence of modality of communication on these constructs. We hypothesised large individual differences; construct validity for social connectedness and social support; relationships between loneliness, social connectedness, and

social support; and an effect of COVID-19. The research can thus help to further our understanding of social connectedness and social support and explore their relationship with loneliness, another important predictor in mental health outcomes.

The Discussion Chapter builds on the findings from Chapters 2-4, addressing the theoretical implications and the potential practical applications of the research. It further specifically outlines a behavioural intervention developed from the research presented in Chapters 2-4. Finally, this chapter discusses the limitations of the research and proposed potential future areas for further study.

1.9 Note to readers

The following empirical chapters of this thesis (Chapters 2-4) were written as separate journal articles. Because the chapters are thematically connected there may be some overlap, particularly in the introduction and description of SAM².

Chapter 2: Developing and evaluating a situated assessment instrument for trichotillomania: The SAM^2 TAI

This chapter is an exact copy of the following preprint manuscript and has subsequently been submitted to Journal of Obsessive-Compulsive and Related Disorders:

Taylor Browne Luka, C., Henry, K., Dutriaux, L., Stevenson, J., & Barsalou, L. (2023*) Developing and evaluating a situated assessment instrument for trichotillomania: The SAM² TAI*. PsyArXiv. https://doi.org/10.31234/osf.io/v6qna

2 Abstract

Trichotillomania (hair pulling disorder) is characterized by the recurrent and repetitive pulling of one's own hair, often resulting in distress for the individual. Being able to accurately measure trichotillomania is essential for understanding hair pulling and developing interventions to decrease pulling. Most current assessment measures are unsituated, asking an individual to assess their pulling by abstracting across unspecified life situations to construct overarching impressions. This abstraction process can potentially lead to inaccurate judgements that ignore important sources of situational variance. We used the Situated Assessment Method (SAM^2) to develop a situated psychometric instrument for assessing trichotillomania: the SAM^2 Trichotillomania Assessment Instrument (SAM^2 TAI). Using the SAM^2 TAI, participants in two studies (n = 117 and n = 99) evaluated 52 situations for pulling frequency and urge strength, along with a set of processes known to influence pulling (e.g., external triggers, reduction of negative emotion, situational control, emotion regulation). As expected, large reliable individual differences emerged across these measures of trichotillomania, together with substantial situational effects and situation by individual interactions. High levels of construct and content validity were also observed, demonstrating that the SAM^2 TAI provides meaningful assessments of constructs associated with trichotillomania. Prediction of trichotillomania at both the group and individual levels supported theoretical models of trichotillomania in the literature, while establishing individual prediction profiles that varied widely. Interestingly, the SAM^2 TAI was only moderately related to a well-established unsituated measure of trichotillomania, the MGH-HPS, indicating that situated and unsituated measures capture different information.

2.1 Introduction

2.1.1 Trichotillomania

Trichotillomania, or hair pulling disorder, is characterized by the recurrent pulling of one's own hair, leading to hair loss despite repeated attempts to stop, and marked functional impairment that is not due to another medical/psychiatric condition (American Psychiatric Association, 2013). Prevalence estimates vary, ranging from 0.6 to 3.9 percent (Grant et al., 2020; Grzesiak et al., 2017; Houghton et al., 2018; Solley & Turner, 2018; Thomson et al., 2022; Woods et al., 2006), although rates may actually be higher due to associated shame and embarrassment that produces underreporting (Grant, 2019). In the adult population, trichotillomania is generally reported to be more common in females than males, with around a 4:1 female:male ratio; in children, this difference is less apparent (Grant, 2019). Recently, in a sample of 10,169 adults, rates of trichotillomania did not differ between males and females, although typically the condition started earlier in females (Grant et al., 2020). The most common sites that individuals pull their hair is the scalp and eyebrows. Individuals can, however, and often do, pull from anywhere on the body (Grant & Chamberlain, 2016; Woods et al., 2006).

An important feature of trichotillomania is its heterogeneity. Not only do pulling sites differ, but so does the style, frequency, and duration of pulling, both between and within individuals (Bottesi et al., 2016). Pulling is sometimes classified as focused or automatic (Flessner, Woods, Franklin, Keuthen, et al., 2008). Focused pulling refers to when an individual intentionally pulls their hair, with awareness of the pulling and any associated urge to do so. Automatic pulling refers to when an individual pulls their hair without awareness that they are doing so. Flessner, Conelea, et al., (2008) proposed four subtypes of trichotillomania: low automatic / low focused; low automatic / high focused; high automatic / low focused; and high automatic / high focused. More recently, (Grant et al., 2021) proposed three subtypes of pullers: sensory sensitive pullers, low awareness pullers, and impulsive / perfectionist pullers. Low awareness pullers were most common (54.2%) but impulsive/ perfectionist pullers reported the most impairment and mood symptoms.

Trichotillomania can have negative consequences both physically and mentally. A potential symptom of trichotillomania is trichophagia (compulsive eating of hair), performed by an estimated 10 to 20 percent of the trichotillomania population (Grant & Odlaug, 2008). Trichophagia can lead to hairballs, known as trichobezoars, in the stomach that can only be removed surgically, and that, if not treated, can cause death (Duke, Keeley, Geffken, et al., 2010). Research has also documented that trichotillomania can hinder interpersonal relationships, lead to avoidance of social interactions, and be accompanied by high levels of shame (Singh et al., 2016; Weingarden & Renshaw, 2015; Wetterneck et al., 2006). Significant distress can also be associated with trichotillomania (Grant et al., 2020), having a detrimental impact on a person's quality of life. Despite the potentially serious consequences of trichotillomania, relatively little research has addressed it, compared to other mental illnesses, making the design of effective treatments all the more difficult. To develop appropriate and well-motivated treatments, it is first important to accurately measure and characterize trichotillomania. Our primary aim here contributing to psychometric tools for doing so.

2.1.2 Methods for assessing trichotillomania

Current methods for measuring trichotillomania can be described as unsituated in nature. Such measures use decontextualized items to assess hair pulling, asking an individual to abstract over situations and establish general impressions of how much they agree with statements about pulling. For example, a widely used psychometric instrument, the Massachusetts General Hospital Hair Pulling Scale (the MGH-HPS; Keuthen et al., 1995) asks individuals to answer seven statements, such as "On an average day, how often did you feel the urge to pull your hair?" To answer this assessment item, an individual must abstract over life situations (e.g., watching TV, sitting in a meeting, driving to work etc.) to provide a general impression of their urges. Other items on the MGH-HPS include, "On an average day, how much control do you have over the urges to pull your hair?" and "On an average day, how often did you make an attempt to stop yourself from actually pulling your hair?" As these examples further illustrate, individuals need not consult their experience of pulling in specific situations. They can simply access or construct general impressions of their overall pulling experience, using whatever information comes to mind.

Using unsituated measures for trichotillomania presents some possible limitations. First, there is the issue of judgement accuracy. Responses could be inaccurate because it is difficult to abstract an accurate judgment across all relevant situations. Instead, individuals may rely on intuitive theories and/or the availability heuristic to make judgments (Ajzen, 1977; Gelman & Legare, 2011; Tversky & Kahneman, 1973). A second issue is that unsituated measures ignore situational variability (Bandura, 1978; Cervone, 2005; Cervone et al., 2001; Fleeson & Jayawickreme, 2021; Mischel & Shoda, 1995). Individuals do not exhibit constant levels of a construct across situations, particularly when it comes to hair pulling. For example, an individual may pull their hair regularly when alone watching TV but may pull rarely when in their work environment. Furthermore, different individuals respond to the same situations differently, such that an individual by situation interaction results. See Dutriaux et al. (2021) for further discussion about the importance of situation effects and their implications for traditional assessment instruments.

2.1.3 An alternative approach to measuring trichotillomania – the Situated Assessment Method (SAM²)

SAM² is a general assessment framework developed to measure diverse behaviors in a situated manner, including habitual behavior, stress, eating, drinking, social connectedness, emotion differentiation, and sustainable behavior. The present work aims to extend this framework to the measure of trichotillomania. To establish individual differences in a behavior of interest, SAM² assesses it on two dimensions of situatedness: (a) situations where the behavior occurs, (b) processes in these situations known to influence the behavior. This method addresses the aforementioned limitations of unsituated assessment measures, capturing not only individual traits but also situational effects and interactions (again, for a detailed treatment, see Dutriaux et al., 2021). To construct a SAM² assessment instrument, one builds it around these two dimensions of situatedness, first identifying relevant situations and then identifying processes that influence the behavior. Thus, to establish a SAM² Trichotillomania Assessment Instrument (the SAM² TAI), we first identified a set of situations where pulling typically occurs and does not occur (to ensure unrestricted variance). We then identified established processes from the scientific and clinical literatures known to influence trichotillomania in these situations. The

following sections describe how we developed these two dimensions of situatedness in the SAM^2 TAI.

2.1.3.1 Establishing situations where pulling does and does not occur

We performed Study 1 to establish pulling and non-pulling situations that the SAM^2 TAI assessed. Essentially, we performed a norming study where 58 participants with trichotillomania were asked to generate pulling and non-pulling

Table 1a. The 31 pulling situations assessed for all participants in Studies 2 and 3 (developed in Study 1), with their domain, generated frequency in Study 1, and their average judgment for frequency, arousal, and valence across the participants who produced them.

			Pulling Situations				Non-Pulling Situations			
Item	Domain	Situation Description	Generated Frequency	Frequency	Arousal	Valence	Generated Frequency	Frequency	Arousal	Valence
Pulling Situations										
28	LeisHome	Watching TV	41	4.63	.44	1.97	1	3.00	1.00	1.00
22	LeisHome	Reading a book	36	3.87	.38	1.81	1	3.00	.00	.00
12	NonLeis	Paying bills	13	3.38	1.57	-2.00	1	3.00	.00	.00
16	LeisOut	Watching a film at the cinema	13	2.85	1.00	2.31	10	2.43	.29	2.00
23	LeisHome	Lying in bed	13	4.64	.67	1.55	1	4.00	.00	2.00
20	FamRel	Using social media (e.g. Facebook, Twitter, Instagram)	12	4.82	.50	1.55				
26	FamRel	Talking on the phone	12	4.00	1.00	0.91	1	3.00	.00	.00
8	UniWork	Writing assignments	9	4.22	.83	0.11	2	3.50	.00	-.50
13	Travel	Flying on a plane	9	1.88	.89	0.13	6	1.40	.00	.00
21	LeisHome	Playing video games	8	4.38	.14	2.29	4	4.67	1.00	3.00
5	NonLeis	Folding/putting away laundry	7	3.71	1.29	-1.00				
6	UniWork	Using the computer	7	5.00	.50	-0.33	4	4.50	.00	.50
10	Travel	Being Stuck in traffic	7	4.33	2.00	-1.00				
14	Health	Plucking body and facial hair	7	4.33	.40	2.17				
19	Health	Resting when ill	6	1.83	.33	-1.50				
11	UniWork	Worrying/stressing about work	5	3.60	.60	0.40				
2	UniWork	Being bored at school/university/work	4	3.33	.25	0.33				
24	LeisOut	Shopping for groceries	4	3.75	2.25	0.75	2	4.00	2.50	.50
27	FamRel	Having an argument with a partner/spouse	4	1.67	1.00	-0.67				
9	Travel	Driving long distances	3	1.67	.33	-1.50				
15	Health	Looking in the mirror	3	4.00	3.00	-1.00				
25	Health	Having trouble sleeping	3	4.00	.00	-1.00				
29	Travel	Waiting at the airport	3	1.67	1.00	-1.00				
1	UniWork	Sitting in a meeting	2	4.50	1.00	-1.00				
4	UniWork	Being tired from work	2	5.00	.00	1.00				
18	Travel	Planning Vacations	2	2.00	.00	.00				
30	NonLeis	Worrying about money	2	4.00	2.50	-1.00				
31	UniWork	Daydreaming	2	3.00	.50	1.00				
3	Health	Sitting on the toilet	1	5.00		.00				
7	NonLies	Cooking in a quiet place	1	3.00	.00	2.00				
17	Health	Worrying about health	1	3.00	.00	-1.00				

Table 1b. The 21 non-pulling situations assessed for all participants in Studies 2 and 3 (developed in Study 1), with their domain, generated frequency in Study 1, and their average judgment for frequency, arousal, and valence across the participants who produced them.

			Pulling Situations				Non-Pulling Situations			
Item	Domain	Situation Description	Generated Frequency	Frequency	Arousal	Valence	Generated Frequency	Frequency	Arousal	Valence
Non-Pulling Situations										
44	LeisOut	Shopping with friends					1	3.00	.00	3.00
48	FamRel	Family outings					1	3.00	1.00	3.00
36	LeisHome	Gardening in garden					2	2.00	3.00	2.50
40	Travel	Going on a family vacation					2	1.00	.00	3.00
52	NonLeis	Doing the ironing					2	.00		
42	LeisHome	Playing with a dog					3	4.67	2.00	2.00
47	Health	Having a haircut					3	2.33	1.00	2.00
39	Travel	Walking to somewhere					4	4.50	1.25	1.25
43	LeisHome	Listening to music					4	5.00	1.00	2.50
45	LeisHome	Petting a cat					4	5.00	1.00	2.33
33	UniWork	Socialising with peers/co-workers					5	3.80	.60	1.20
37	LeisOut	Eating with friends					5	3.25	.25	3.00
46	Health	Brushing your teeth	2	5.00	.50	.00	6	5.00	.00	.40
50	Health	Washing hair					6	4.17	.67	1.00
49	LeisOut	Swimming in a pool					8	2.71	1.50	2.33
32	UniWork	Working with other people					9	4.00	.63	-.13
34	FamRel	Having sex					16	3.40	3.14	2.86
38	LeisOut	Exercising at the gym	1	4.00	.00	-2.00	16	3.33	1.87	1.00
35	NonLeis	Washing the dishes	2	4.50	.00	.00	19	4.12	.31	-1.44
41	Health	Having a shower					21	4.21	1.06	1.20
51	NonLeis	Cleaning the house	10	4.00	1.00	-.22	23	3.60	.68	-.53

Note. For both Table 1a and 1b the domains are as follows: UniWork – activities related to university or work, FamRel – activities related to families or relationships, Travel – travel related activities, Health – health related activities, LeisHom – leisure activities at home, LeisOut – leisure activities outside of the home, and NonLeis - non-leisure activities at home. Generated frequency refers to how commonly the situation was generated by participants for either pulling or non-pulling situations. Frequency was assessed by participants on a scale from 0 (never) to 5 (once or more a day) for how often the situation occurred. Arousal was assessed by participants on a scale from 0 (no bodily arousal) to 4 (intense bodily arousal) for how much bodily arousal they felt during the situation regardless of pulling. Valence was assessed by participants on a scale from -3 (highly unpleasant) to 3 (highly pleasant) for how pleasant they found the situation regardless of pulling.

situations across diverse domains (e.g., work, leisure, health, family). After pooling the 1,302 situations generated, we distilled them down to a unique set of 435 situations and then sampled a representative set of 52 situations to evaluate in the SAM^2 TAI (31 pulling situations, 21 non-pulling situations). Table 1 presents these situations, and Study 1 provides the details of how they were collected.

2.1.3.2 Establishing processes in situations that influence pulling

To understand a behavior, like trichotillomania, in the situations where it occurs, it is useful to establish processes in pulling situations that influence the target behavior. SAM^2 instruments don't simply measure a behavior in relevant situations, they also measure additional processes in these situations known to influence it. Doing so allows SAM^2 instruments to establish both construct and content validity, comprehensively assessing important situational processes related to the target construct of interest (for further detail, see Dutriaux et al. 2021; Barsalou, 2020).

To establish processes likely to influence pulling for individuals with trichotillomania, we turned to the current literature. Of particular interest were three models of hair pulling: the *Comprehensive Behavioral Model*, the *Model of Cognitions and Beliefs,* and the *Emotion Regulation Model*. We address each in turn, describing processes that each suggests are likely to influence pulling and urges. We conclude with the processes extracted from these models for use in the SAM^2 TAI.

The Comprehensive Behavioral Model

The Comprehensive Behavioral Model (ComB) is rooted in behavioral theory, following principles of classical and operant conditioning (Mansueto et al., 1997). The ComB model focuses on conditioned cues, discriminative stimuli, conditioned behaviors, and their consequences. Mansueto et al. propose that encountering a conditioned cue for pulling makes the urge to pull more likely. Such cues include external settings and external implements used to facilitate pulling. Cues can also be internal (i.e., generated by the person), including affective, sensory, and cognitive states. Relevant affective states can be

negative or positive; sensations can be visual, tactile, or physical (e.g., texture of hair, perceived irritation at a site of hair growth); cognitive cues can be a specific thought or a series of thoughts that trigger the urge to pull. These cognitions can also be associated with sensations, affective states, and external cues in complex situational patterns (cf. Barsalou, 2020; Dutriaux et al., 2021). Mansueto et al. posit that cues become classically conditioned with hair pulling, such that they become triggers for hair pulling urges and instrumental behaviors.

In addition to the proposed processes that trigger urges and pulling, other processes can facilitate or inhibit pulling. Similar to cues that initiate pulling, cues that modulate pulling can be external or internal. External factors include the presence of others (usually an inhibitive factor), or the presence of implements that facilitate pulling (e.g., tweezers, mirrors). Internal processes include urges, postures (e.g., one's hands being free), and cognitions. Once the cycle of pulling begins, accompanying behaviors can occur ritualistically before pulling (e.g., choosing a particular site for pulling, preparing implements for pulling), during pulling, or after pulling (e.g., playing with the hair root, eating the hair). These behaviors can then lead to consequences that are reinforcing, including emotional consequences (e.g., pleasure) and relief from unwanted emotions. Aversive consequences can also occur, such as undesired emotional states that appear when pulling terminates. If these aversive consequences also function as cues for the individual, the pulling cycle may continue. Other aversive consequences include interruptions and not having any hairs left to pull.

The ComB model is based on traditional behavioral models, incorporating classically conditioned cues, together with elements of operant conditioning such as discriminative stimuli and consequences. A strong source of support for this theory is effectiveness of the treatments based on it. To date, there have been few clinical trials, but the evidence gathered so far suggests that the ComB offers an effective and flexible treatment for trichotillomania (Bottesi et al., 2020; Carlson et al., 2021; Falkenstein et al., 2016; Flannery et al., 2022).

Model of Cognitions and Beliefs

Using semi-structured in-depth interviews with pullers, Rehm et al. (2015) investigated the role of cognitions and beliefs in trichotillomania. Through

Interpretative Phenomenological Analysis, they identified six superordinate themes of cognitions and beliefs that appeared central to the hair pulling cycle: (1) *negative self-beliefs*, with two subthemes for worthless self and viewing oneself as abnormal; (2) *control beliefs*, with two subthemes for loss of control and the importance of control; (3) *coping beliefs*, with subthemes for low coping efficacy and experiential avoidance; (4) *negative emotional beliefs*, deeming emotions as 'good' or 'bad,' with subthemes for tolerability and acceptability; (5) *permission giving beliefs*, with subthemes for justification, all-or-nothing, and reward; (6) *perfectionism*, relating to perfectionistic standards for hair quality, with subthemes for 'just right' standards and mastery through perfection.

The beliefs and cognitions identified play different roles at different points in the hair pulling cycle, sometimes being antecedent and sometimes providing maintenance. Rehm et al.'s (2015) model starts with negative self-beliefs and/or a perceived lack of control that precipitates hair pulling episodes. These thoughts cause distressing emotions that are appraised as unacceptable. Beliefs about negative emotions perpetuate the individual's low coping efficacy and reluctance to use alternative coping strategies. Through diminished self-efficacy, individuals enter a permission-giving narrative that justifies hair pulling, with pulling behaviors functioning as emotion regulation. Upon completion of a hair pulling episode, negative self-beliefs return and may induce further pulling episodes.

Emotion Regulation Model

Emotion regulation refers to how a person experiences and expresses emotion, along with how they influence its presence and timing (Roberts et al., 2013). The Emotion Regulation Model for hair pulling focuses on negative reinforcement, where the function of hair pulling is presumed to alleviate or relieve negative emotion, with the relief then reinforcing and perpetuating hair pulling behavior. When an uncomfortable emotional experience occurs, it triggers a pulling episode that results in relief, which in turn rewards pulling.

Research suggests that individuals with trichotillomania can also be vulnerable to emotion regulation deficits (Roberts et al., 2013). Further evidence suggests

that these deficits can play a role in trichotillomania (Curley et al., 2016; Diefenbach et al., 2008; Roberts et al., 2013; Shusterman et al., 2009). Additionally, emotion regulation may play a more important role in focused pulling than in automatic pulling (Arabatzoudis et al., 2017; Siwiec & McBride, 2016), although a recent study found that emotion dysregulation had little impact on symptom severity as measured by the MGH-HPS (Lochner et al., 2021).

Processes that influence pulling included in the SAM² TAI

To measure processes that influence pulling behavior in pulling situations, the SAM² TAI included 13 processes extracted from the three models just reviewed. Table 2 presents these processes, together with their labels and the scales used to measure them. Consistent with the ComB model, we included processes for triggers (external cues and internal cues), behavior (automatic vs. focused pulling, ritualized behavior), and reward (reduction in negative emotion, how good pulling feels, long-term consequences). Consistent with the Cognitions and Beliefs Model, we included processes for negative self-beliefs (internal triggers, self-valence), negative emotion (self-valence, arousal), control beliefs (external control, internal control), poor coping (experiential avoidance), justifying outcomes (reduction in negative emotion, how good pulling feels, long-term consequences), and perfectionism (perfectionistic standards, ritualized behavior). Consistent with the Emotion Regulation Model, we included processes for emotional states (self-valence, arousal), emotion regulation (internal control), and pulling as emotion regulation (reduction in negative emotion).

Because the processes important for each of the three models overlap, most of the included processes were not specific to one model. Instead, our aim was to capture all relevant processes across models to establish a comprehensive set that could potentially predict an individual's pulling behavior at a high level.

Finally, as Table 2 further illustrates, different processes were included in Studies 2 and 3. When analyzing the results for Study 2, it became clear that some of the original 13 processes were highly correlated with each other. To simplify the assessment procedure in Study 3, each set of highly correlated processes in Study 2 was collapsed onto a single process in Study 3, resulting in a total of 8 distilled processes assessed. Further detail is provided later.

Table 2. Scales, inter-rater agreement, and test reliability for the 2 dependent variables and for the 13 influential processes in Study 2 and the 8 distilled processes in Study 3.

Measure	Rating Question	Scale	Agreement (ICC2)	Test reliability (ICC3k)
Frequency (Study 2/3)	How frequently do you pull in this situation?	0 - 10 (never, half the time, all the time)	.41/.43	.94/.94
Urge (Study 2/3)	How strong is the urge to pull in this situation (independent of actual pulling)?	0 - 10 (not strong at all, moderately strong, very strong)	.42/.41	.94/.94
Triggers				
Study 2				
External Cue	How much do specific things and people in this situation trigger the urge to pull?	0 - 10 (not at all, somewhat, completely)	.23	.95
Internal Cue	How much do specific thoughts and feelings experienced in the situation trigger the urge to pull?	0 - 10 (not at all, somewhat, completely)	.33	.96
Study 3	In this situation, how much does the external situation and the internal states you experience in it trigger pulling?	0 - 10 (not at all, somewhat, completely)	.30	.96
Valence				
Study 2				
Self -Valence	How negatively vs. positively do you feel about yourself in this situation?	-5 - 5 (very negatively, neutral, very positive)	.25	.93
Experiential Avoidance	How willing are you to experience and be there with what you are feeling in the situation?	0 - 10 (not at all willing, somewhat willing, very willing)	.19	.90
Study 3	How negatively vs. positively do you feel about yourself in this situation?	-5 - 5 (very negative, neutral, very positive)	.29	.94
Arousal (Study 2/3)	How much bodily arousal do you experience in this situation?	0 - 10 (none, moderate, intense)	.15/.13	.96/.96
Control				
Study 2				
Situational Control	How much are you able to effectively make changes in this situation?	0 - 10 (not at all able, somewhat able, very able)	.25	.95
Internal Control	How much can you control any emotional response that you have in this situation?	0 - 10 (no control, moderate control, complete control)	.22	.95
Study 3	How much can you effectively control the situation and your emotional response in it?	0 - 10 (no control, moderate control, complete control)	.24	.95
Hair-Pulling Subtype				
Study 2				
Hair-Pulling Subtype	How automatic vs. focused is your pulling in this situation?	-5 - 5 (completely automatic, both, completely focused)	.05	.96
Perfectionistic Standards	How much of a perfectionist are you about any pulling that you perform in this situation?	0 - 10 (not at all a perfectionist, somewhat of a perfectionist, complete perfectionist)	.07	.98
Study 3	How automatic vs. focused does your pulling in this situation tend to be?	-5 - 5 (completely automatic, both, completely focused)	.05	.96
Ritualised Behaviour (Study 2/3)	How much do perform ritualised behaviours before and/or after pulling in this situation?	0 - 10 (never, sometimes, always)	.07/.15	.99/.98
Reduction				
Study 2				
Reduction in negative emotion	How much does pulling in this situation reduce any negative emotion that you are feeling?	0 - 10 (not at all, somewhat, completely)	.05	.99
How good pulling feels	How good does it feel physically to carry out the act of pulling in this situation?	-5 - 5 (extremely bad, neutral, extremely good)	.09	.98
Study 3	How good does it physically feel to pull in this situation, and how much does pulling reduce negative emotion?	0 - 10 (none at all, some, a lot)	.20	.97
Long-Term Consequences (Study 2/3)	How likely is it that any pulling in this situation produces long-term consequences that you will regret later?	0 - 10 (not at all, somewhat, completely)	.05/.08	.99/.99

Note. Intraclass correlations were computed using the ICC function in the R Psych package. The values on the left that assessed interrater agreement in a measure across situation used the ICC2 measure for random effects, such that these values are likely to generalise across samples of participants from the same population. Test reliability, estimated by ICC3k, for each measure is shown on the far right (i.e., Cronbach's alpha). The first two measures correspond to the dependent variables which were the same in Study 2 and 3. The following eight measures correspond to the eight distilled measures in Study 3. For the processes that were distilled in Study 3 the measures from Study 2 that they were distilled from are shown. For instance, Triggers in Study 3 is distilled from External cue and Internal cue in Study 2 because a high correlation was observed in this study.

2.1.4 Overview and hypotheses for Studies 2 and 3

Earlier we provided an overview of Study 1 that established pulling norms and sampled situations from them for use in the SAM^2 TAI. Here we provide an overview of the critical Studies 2 and 3, along with their associated hypotheses.

2.1.4.1 Overview

In Study 2, 117 hair pullers evaluated the 52 situations in Table 1 on the 15 measures listed in Table 2, including two dependent variables (pulling frequency and urge strength) and 13 processes proposed to influence them in models of trichotillomania. In Study 3, 99 hair pullers evaluated the 52 situations in Table 1 again on the same two dependent variables, as well as the 8 distilled processes that influence pulling as extracted from Study 2, also shown in Table 2.

Participants performed their judgments in blocks, where they evaluated a single process (e.g., pulling frequency) on the 52 situations in a random order. In Study 2, participants first evaluated the two dependent variables (pulling frequency,

urge strength), and then evaluated the 13 processes that influence pulling (with the 15 blocks in a fixed order). In Study 3, participants evaluated the same two dependent variables but in a random order, followed by the 8 distilled processes that influence pulling also in a random order. After completing the 15 or 10 blocks of SAM^2 judgments, participants filled out several unsituated individual difference measures, including the Big 5, the MGH-HPS, a self-control measure, and a measure of trichotillomania subtypes.

2.1.4.2 Hypotheses

The primary aim of Studies 2 and 3 was to assess the SAM^2 TAI's psychometric properties related to individual differences, test reliability, construct validity, and content validity. Another primary aim was to see what we could learn about trichotillomania from evaluating individuals who experience it using the SAM^2 TAI. A secondary aim was to compare the SAM^2 TAI with a traditional unsituated psychometric instrument for assessing trichotillomania (the MGH-HPS). A final aim was to investigate how both measures of trichotillomania are related to personality traits, self-control, and automatic versus focused pulling.

Because Studies 2 and 3 were exploratory, we did not pre-register hypotheses. Nevertheless, we did have tentative hypotheses about results that we expected to see. We were also interested in performing several exploratory analyses.

Hypothesis 1: Large individual differences in trichotillomania. We predicted that individuals would exhibit considerable variability in pulling frequency and urge strength across the 52 situations (Table 1).

Hypothesis 2a: Substantial situational effects. We predicted that the different situations would have a large impact on pulling frequency and urge strength, with levels of these measures varying considerably across situations.

Hypothesis 2b: Substantial situation by individual interactions. We further predicted that there would be a large situation by individual interactions, as the pulling frequency and urge strength would depend, not only on the situation, but also on the individual. In other words, individuals would differ considerably in their levels of pulling and urges within the same situation.

Hypothesis 3: High construct and content validity for SAM² measures of trichotillomania. We predicted that influential processes in models of trichotillomania would be highly related to pulling frequency and urge strength, thereby demonstrating construct validity (i.e., the processes in Table 2). We further predicted that these processes would comprehensively predict frequency of pulling and urges, thereby explaining large amounts of variance and demonstrating high content validity.

Hypothesis 4: Low correlations between situated and unsituated measures. We predicted that the SAM² measures for pulling frequency and urge strength would exhibit low correlations with the unsituated MGH-HPS, indicating that situated and unsituated measures capture different information about trichotillomania.

Discovery: We explored correlations of the SAM² measures for pulling frequency and urge strength with unsituated measures for the Big Five personality traits, self-control, and automatic versus focused pulling, but had no specific predictions.

2.2 Study 1

To develop the SAM² TAI, we first needed to identify relevant situations where pulling typically does and does not occur. Pulling episodes are commonly reported as occurring when performing sedentary activities (e.g. reading) (Duke et al., 2009; Ghisi et al., 2013) or when experiencing negative emotion (e.g. public speaking; Christenson et al., 1993). Duke et al., (2009) found that the most frequently mentioned pulling situations were reading and watching television. More specifically, for females, studying and watching television were most common, whereas for males, looking in the mirror and being in the bathroom were most common.

Although these examples of pulling situations are informative and insightful, they do not reflect a thorough assessment of pulling and non-pulling situations. Because the literature only offered relatively informal observations about these situations, we conducted a norming study to establish pulling and non-pulling

situations in the trichotillomania population. From the norms established, we then sampled situations to use in the SAM² TAI.

2.2.1 Methods

We recruited 58 participants who self-reported trichotillomania (F = 50, M = 7, and 1 other; mean age = 30.35, SD = 10.64) from online Facebook peer support groups for trichotillomania. Participants were asked where they were originally from, 58.62% (n = 34) reported that they were from the United States, 22.41% (n = 13) were from the United Kingdom, 2 were from Canada. The other countries reported as originating from were: Bermuda, Mexico, New Zealand, Nigeria, Norway, Uganda, Vietnam and Zimbabwe, and 1 who wished not disclose their country of origin. The majority of participants were in full-time employment (n = 24), followed by students (n = 12), part-time employment (n = 7), homemakers (n = 4), self-employed (n = 3), retired (n = 3), out of employment (n = 2), unable to work (n = 2) and 1 who wished not to disclose their employment. 18 participants had an undergraduate degree, 15 had secondary school level qualifications, 13 had college level education, 6 had a graduate degree, 4 had no formal qualifications and 2 had a doctorate degree. Of the sample 70.69% (n = 41) self-identified as both automatic and focused pullers, 18.97% as automatic pullers, and 10.34% as focused pullers. Participants were each paid £3 in Amazon vouchers for completing the study (non-UK participants received the equivalent in USD, CAD, or EUR). Participants were provided with information about the survey on Qualtrics and then asked to provide consent.

Participants received detailed instructions on how to generate pulling and non-pulling situations. For each situation that came to mind, they were asked to describe it using the format of *verb + descriptor*, with examples provided (e.g. *having breakfast in a café*, as opposed to *breakfast in a café*).

Participants were then randomly presented with the following seven domains one at a time: (1) activities related to work/university, (2), activities related to family / relationships, (3) travel-related activities, (4), health-related activities, (5) leisure activities at home, (6), leisure activities outside the home, and (7) non-leisure activities at home. As participants received each domain, they were asked to provide at least two (at most four) situations in which they pulled their

hair. For each situation they generated, they then evaluated its frequency, its valence, and their arousal during the situation. Frequency was evaluated using the query, *Activity frequency (regardless of hairpulling),* with a drop-down menu of values for 5 - Once or more a day, 4 - Once or more week, 3 - Once or more a month, 2 - Once or more a year, 1 - Less than once a year, 0 - Never. Valence was evaluated using the query, *Activity pleasantness (regardless of hairpulling),* with a drop-down menu of values for 3 - Highly pleasant, 2 - Moderately pleasant, 1 - Slightly pleasant, 0 – Neutral, -1 - Slightly unpleasant, -2 - Moderately unpleasant , -3 - Highly unpleasant. Arousal was evaluated using the query, *Arousal (regardless of hairpulling),* with a drop-down menu of values for 0 - No bodily arousal, 1 - Mild bodily arousal, 2 – Clear bodily arousal, 3 - Considerable bodily arousal, 4 – Intense bodily arousal.

Participants were then presented with one of the seven domains again (at random) but instead asked to think of situations in which they would *not* pull their hair. Again, participants performed this process for all seven domains in a random order, with frequency, valence, and arousal responses collected for each. Finally, demographic information (age, gender, employment, location, and educational level) was collected, and participants were debriefed and paid.

2.2.2 Analysis and results

All descriptions of situations that participants produced were collated in two spreadsheets, one for pulling situations across domains and one for non-pulling situations. In each spreadsheet, different descriptions that captured the same basic situation were collapsed into a single unique situation with a name that best captured the set. From a total of 700 pulling situations generated across the 58 participants, a total of 234 unique situations resulted. From a total of 602 non-pulling situations, a total of 201 unique resulted. The 700 original descriptions for pulling situations can be found in SM_1, organized into groups for the 234 unique pulling situations. The 602 original descriptions for non-pulling situations can be found in SM_2, organized into groups for the 201 unique non-pulling situations.

To construct the SAM^2 TAI, we sampled 52 of these situations, shown in Table 1. Based on the data in SM_1 and SM_2, 31 of these situations were designated as

typical pulling situations, and 21 were designated as typical non-pulling situations. These particular situations were selected because they represented their respective domains well, while being uniquely different from other selected situations. As Table 1 illustrates, all seven domains were well represented.

Specific pulling situations were also selected because they seemed like plausible situations where pullers would pull, but not necessarily where everyone would pull, and certainly not at the same frequency (thereby likely to exhibit individual differences). Additionally, to further cover a broad range of situations, both frequently generated situations and rarely generated situations were included. Because some situations were generated as both pulling and non-pulling situations, pulling situations were generally chosen that did not appear often as non-pulling situations, and vice versa. For example, *cleaning the house* was designated as a non-pulling situation because it was generated 23 times for non-pulling compared to 10 times for pulling. We also ensured that all the situations were clear and unambiguous and that, ideally, every participant would find some situations where they clearly do and do not pull.

2.3 Studies 2 and 3

The 52 situations sampled from the norms collected in Study 1 were incorporated into the SAM^2 TAI evaluated in Studies 2 and 3. In both studies, the SAM^2 TAI contained the same two dependent variables for pulling frequency and urge strength but contained different numbers of processes known to influence pulling. Study 2 contained the 13 original processes in Table 2 developed from examining models of trichotillomania in the literature. Study 3 contained 8 distilled processes after combining processes in Study 2 that were highly correlated. Both studies further assessed relations between the SAM^2 TAI and unsituated individual difference measures. Of primary interest in both studies was assessing SAM^2 TAI's psychometric properties related to individual differences, test reliability, construct validity, and content validity. Both studies assessed the predictions presented earlier related to these psychometric properties.

There were two main aims for conducting Study 3 following on from Study 2. Firstly, we were aiming to replicate the basic pattern of results that we found in Study 2. Secondly, we wanted to improve on the set of predictors used in the SAM² TAI. Study 2 used 13 predictors that, in some cases, were highly correlated. The associated collinearity presented difficulties with some analyses. In addition, participants having to rate 52 situations for all 13 predictors resulted in the study taking a long time to complete. Study 3 therefore, distilled the initial 13 predictors into 8 critical predictors, making them less redundant and less work for participants to evaluate.

Because the methods and analyses used for Studies 2 and 3 were essentially the same, except for the specific processes assessed, the methods for both studies have been combined next into a single methods section; similarly, the results for both studies have been combined into a single results section.

2.4 Method

2.4.1 Participants

Study 2 recruited 124 participants from social media support groups for trichotillomania and from the TLC Foundation for BFRBs (www.bfrb.org). Study 3 recruited 99 participants from only social media support groups. For both studies, available funds for paying participants determined the number of participants sampled. Participants were required to be 18 or older, fluent English speakers, and to self-report having trichotillomania.

Several diagnostic checks were conducted prior to running the main analyses to identify participants who either responded mechanically (giving a constant response) or randomly. Seven participants were excluded from Study 2 as a result of these checks, leaving a total of 117 participants (F = 105, M = 7, other = 5, mean age = 29. 38, SD = 8.77) with a mean hair pulling severity score of 16.30 (SD = 5.84) on the Massachusetts General Hospital Scale (MGH-HPS) (Keuthen et al., 1995) with possible values from 0 to 28. No participants were excluded from Study 3 (n = 99, F = 90, M = 8, other = 1, mean age = 28.59, SD = 8.33), with a mean hair pulling severity score of 16.27 (SD = 4.66). For both studies,

participants were paid £7 in Amazon vouchers (or the equivalent in USD, CAD or EUR).

2.4.2 Design

Studies 2 and 3 both used a multilevel design, where all participants at the individual level evaluated the same 52 situations at the situation level (Table 1). Both studies assessed the same two dependent variables (pulling frequency and urge strength) and processes known to influence them (13 in Study 2, 8 in Study 3; Table 2). Additionally, all participants completed four unsituated individual difference measures described below.

2.4.3 Materials

2.4.3.1 SAM² Trichotillomania Assessment Instrument (SAM² TAI)

The SAM² TAI used the 52 situations in Table 1, together with the 15 judgment scales in Table 2 for Study 2, or the 10 judgment scales in Table 2 for Study 3.

The 13 processes in Study 2 that influence trichotillomania were distilled into 8 processes in Study 3 as follows. Essentially, we identified processes that were highly correlated in Study 2 and then combined them into a single process in Study 3. Because external and internal cues were highly correlated (r = 0.66), we distilled them into a single process that combined both types of cues. Because (negative) self-valence and experiential avoidance were highly correlated (r = 0.66), we distilled them into a single process that captured valence. Because situational control and internal control were highly correlated (r = 0.69), we distilled them into a single process that combined both types of control. Because hair pulling subtype and perfectionist standards were correlated (r = 0.37), we distilled them into a single process that focused on pulling subtype. Because reduction in negative emotion and how good pulling feels were highly correlated (r = 0.49), we distilled them into a single process that combined both.

2.4.3.2 The Big Five Inventory (BFI, John & Srivastava, 1999).

The BFI is a 44-item self-reporting inventory that measures an individual on the Big Five Factors of personality (Goldberg, 1993): extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. The 44 items are short statements of characteristics that may or may not apply to an individual, participants are asked to score these using a five-point scale, from 1 – Disagree strongly to 5 – Agree strongly. It has high internal consistency for each of the five factors (α = 0.79 to 0.86) (Srivastava et al., 2003) and good test-retest reliability for each of the five factors (r = 0.79 to 0.83) (Arterberry et al., 2014; Gosling et al., 2003).

2.4.3.3 Brief Self-Control Scale (BSCS; Tangney et al., 2004)

The BSCS is a 13 item self-report scale assessing dispositional self-regulatory behaviors. Items are rated on a five-point scale, from 1 – Not at all like me, to 5 – Very much like me. The scale has high reliability (alpha = 0.83 to 0.85) and high test-retest reliability (0.87) (Tangney et al., 2004).

2.4.3.4 The Massachusetts General Hospital Hair Pulling Scale (MGH-HPS, Keuthen et al., 1995)

The MGH-HPS is a seven item self-report questionnaire that measures severity of hair pulling over the past week. The 7 questions are split into three categories: (1) rating of the urges to pull, 2) rating of the actual hair pulling, and (3) rating of the consequences of pulling. The items are scored using a five-point scale from 0 to 4, where 0 refers to low severity and 4 high severity. It has high internal consistency (coefficient alpha = 0.89, α = 0.87) and test-retest reliability (r = 0.97; Hajcak et al., 2006; Singh et al., 2016).

2.4.3.5 The Milwaukee Inventory for Subtypes of Trichotillomania – Adult version (MIST-A, Flessner, Woods, Franklin, Cashin, et al., 2008)

The MIST-A is a 15 item self-report questionnaire that assesses an individual's level of focused and automatic pulling. Ten items assess focused pulling, five items assess automatic pulling, and it produces two separate scores for focused versus automatic pulling. Participants rate items on a ten-point scale, from 0 (not true for any of my pulling) to 9 (true for all of my pulling). The test has

good internal consistency (α=.77 for the focused scale, α=.73 for the automatic scale; Flessner, Woods, Franklin, Cashin, et al., 2008)

2.4.4 Procedure

All participants performed the study online using the Qualtrics platform, after being referred there by a link on social media or a website. Participants first received an information sheet about the study and then provided informed consent. Ethics approval was granted by the College of Science and Engineering Ethics Committee at the University of Glasgow (application 300180053).

Participants evaluated the 52 situations (Table 1) in blocks for the two dependent variables, urge and frequency, and then for the 13 processes in Study 2, or for the 8 distilled processes in Study 3 (Table 2). For Study 2, the 15 measures were presented in six blocks: (1) urge strength and pulling frequency, (2) external and internal cues, (3) valence, arousal, and experiential avoidance, (4) situational and internal control, (5) subtype, perfectionistic standards, and ritualized behavior, (6) how pulling feels, reduction in negative emotion, and long-term consequences. Instructions at the start of each block provided a detailed description of the measure to be evaluated. The 15 blocks were presented in the fixed order above, with each of the 52 situations randomized within each block uniquely for each participant. For Study 3, the two dependent variables were presented in two initial blocks ordered randomly, followed by the eight distilled processes in Table 2 also ordered randomly. As for Study 2, the 52 situations were randomized within each block uniquely for each participant.

For both studies, the SAM² blocks were followed by the brief collection of demographic information for nationality, gender, age, and education level. To assess explicit awareness of processes that influence pulling, participants were then asked how much they believed each of the 13/8 processes influence how much they pull (results not included here). Finally, the four unsituated individual difference measures followed: the Big Five Inventory, the Brief Self-Control Scale, the Massachusetts General Hospital Hair pulling Scale, and the Milwaukee Inventory of Subtypes of Trichotillomania (adult version).

At the conclusion of the study, participants were debriefed, thanked for their participation, and paid. Including breaks, participants took approximately 100 minutes to complete Study 2 and approximately 55 minutes to complete Study 3.

2.5 Results

2.5.1 Hypothesis 1: Large individual differences in trichotillomania

We predicted that individuals would exhibit considerable variability in trait levels of pulling frequency and urge strength (when averaged across situations). Figure 2 shows each participant's mean judgment across the 52 situations for each dependent variable (pulling frequency, urge strength), along with the mean

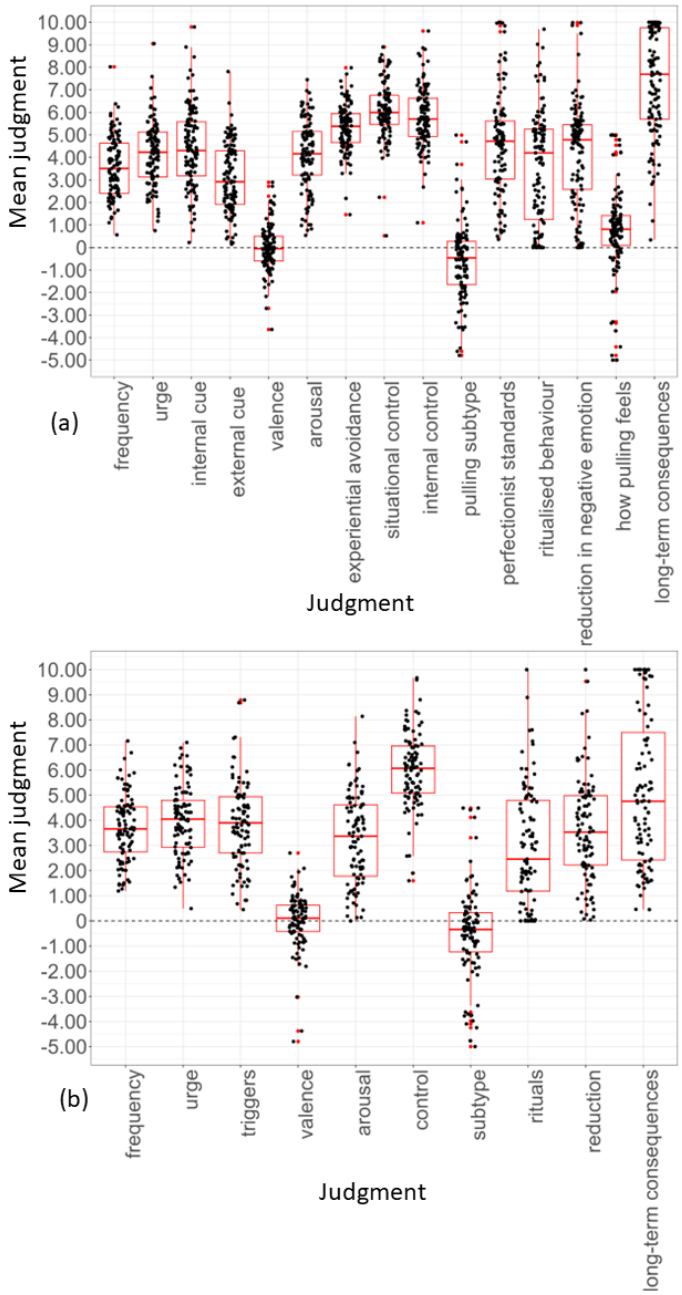


Figure 2. Box and whisker plots for pulling frequency, urge strength, and the 8/13 influential processes in Study 2 (a) and in Study 3 (b). Each point in a distribution represents the average judgment for a single participant across the 52 situations. Each box and whisker plot shows the median for a measure and its interquartile range.

evaluation for each of the 13 influential processes in Study 2 and for each of the 8 influential processes in Study 3. Each plot shows the distribution of trait-level values for a measure across the individuals sampled. In both studies, median levels of about 3.5 for pulling frequency and of about 4 for urge strength indicate that many individuals typically experienced low to moderate levels of pulling and urges in these situations. These median values were accompanied by substantial individual differences, as predicted. Across both studies, trait-level values of pulling frequency ranged from about 0.5 to 8, and trait-level values of urge strength ranged from about 0.5 to 9. Across the same 52 situations, some individuals exhibited very low levels of pulling frequency and urge strength, whereas others exhibited very high levels.

Interestingly, roughly half the individuals in each study tended to be focused pullers across situations (with a mean value for subtype greater than 0), whereas the other half tended to be automatic pullers (with a mean value less than 0). Although some individuals exhibited extreme levels of focused or automatic pulling, others with values near 0 tended to exhibit a mixture of both.

The intraclass correlations for agreement in Table 2 further demonstrate large individual differences in pulling frequency and urge strength. In this context, the intraclass correlation estimates the agreement between individuals in their judgements for a measure across the 52 situations, in essence, capturing the average pairwise correlation between individuals. As can be seen, pulling frequency and urge strength both exhibited agreement a little above 0.40 in both studies. These low to moderate values indicate large individual differences in how individuals experience pulling and urges across the same 52 situations. Large individual differences are also evident for the influential processes in each study, with values ranging from 0.05 to 0.33.

As we just saw in Figure 2, the SAM^2 TAI establishes large individual differences for trait-level measures of pulling frequency and urge strength. Of interest next is the reliability of these measures. To establish test reliability, we used Cronbach's alpha (specifically ICC3k; Shrout & Fleiss, 1979). Table 2 presents these results on the far right. As can be seen, satisfactory alphas were observed well above the acceptable range of 0.70 to 0.80, averaging around 0.95. Similar

levels occurred for the influential process in both studies, demonstrating that the SAM[2] TAI exhibits excellent test reliability for all its measures.

2.5.2 Hypothesis 2a and 2b: Substantial situational effects and situation by individual interactions

We predicted that specific situations would have a substantial impact on an individual's pulling frequency and urge strength, with levels varying situation by situation. We further predicted that there would be a large situation by individual interaction for each measure, as the levels of each would depend not only on the situation, but also on the individual.

Figures 3a and 3b present strong support for these hypotheses. In each visualization, a row represents a participant's judgments of pulling frequency in Study 2 or Study 3. A column in each figure represents the judgments for 1 of the 52 situations. Each cell represents a participant's judgment of pulling frequency in the respective situation. The redder a cell, the higher the pulling frequency; the bluer the cell, the lower the pulling frequency. Highly similar results were obtained for urge strength, but because the two dependent variables correlated .85 and .88 in Studies 2 and 3, respectively, we only show the results for pulling frequency here.

As Figure 3 illustrates, substantial situation effects are present. Some situations exhibit a consistently high (red) pulling frequency across participants, whereas other situations exhibit relatively low (blue) levels. Figure 3 also visualizes the trait-levels of pulling for individuals shown earlier in Figure 2, reflected here in the overall redness/blueness of a participant's row.

Finally, Figures 3a and 3b demonstrate substantial situation by individual interactions. Specifically, individuals varied widely in the pattern of pulling frequency they exhibited across the same 52 situations (further reflected in the different clusters of individuals shown on the left). Different participants (and clusters of participants) exhibited highly different patterns. The intraclass correlations in Table 2 for frequency quantify the magnitude of these interactions. Specifically, the average correlation between participants (rows) in their judgments of pulling frequency across situations (columns) was only .41 in

Study 2 and .43 in Study 3. Participants interacted with situations considerably in their patterns pulling across the same 52 situations. Again, the SAM^2 TAI

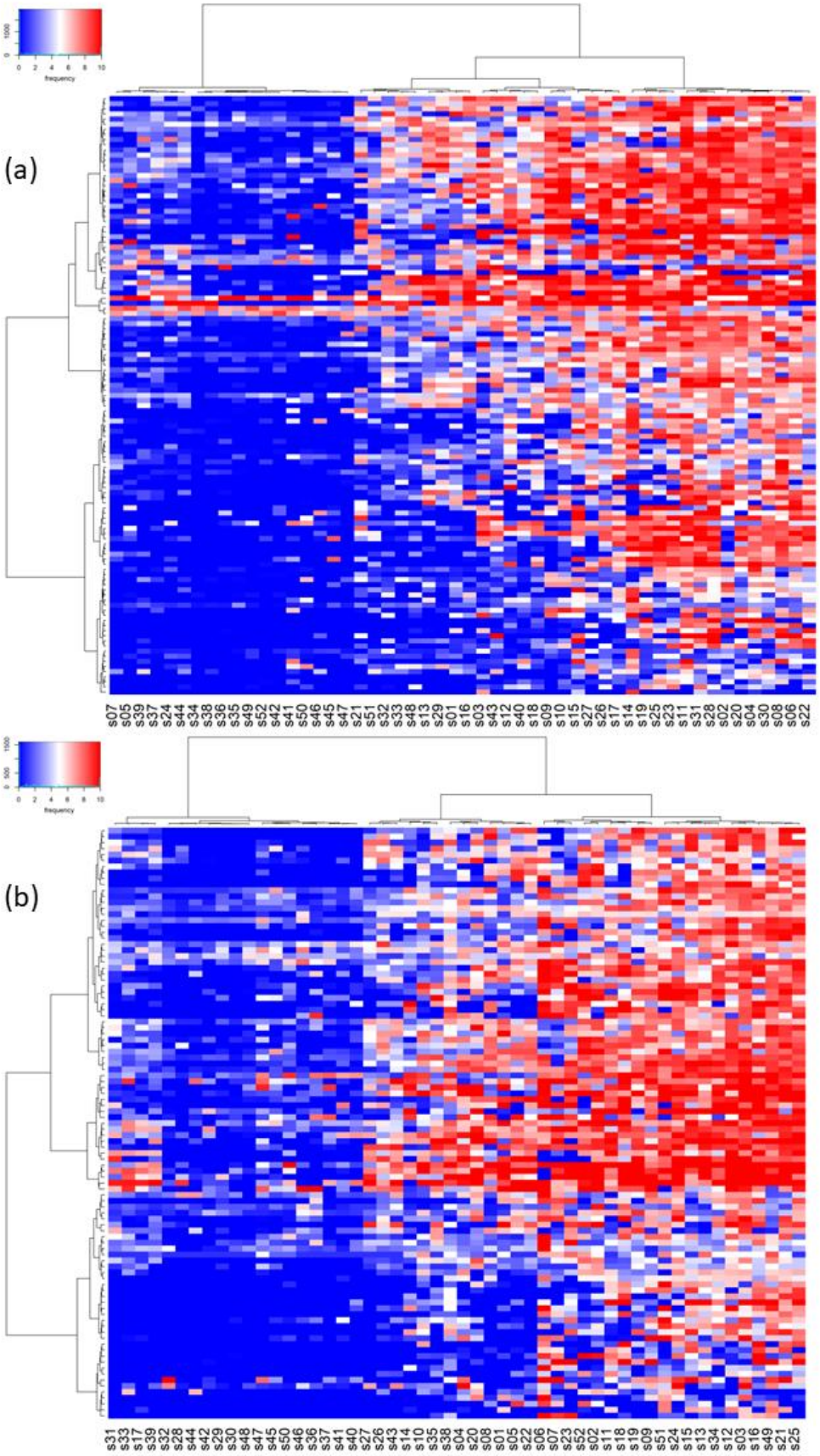


Figure 3. Visualizations of the pulling frequency judgments for for the 117 participants in Study 2 (a) and the 99 participants in Study 3 (b) across the 52 situations. The 52 frequency judgments for each participant are presented in a single row. The number below each column corresponds to the number of the corresponding situation in Table 1. As a cell becomes increasingly red, the frequency judgment increasingly approached 10 (on a scale of 0 to 10; Table 2). As a cell becomes increasingly blue, the frequency judgment increasingly approached 0. As a cell becomes increasingly white, the frequency judgment increasingly approached 5. On the left, a hierarchical clustering dendrogram establishes groups of participants having similar vectors of values across situations (from hierarchical clustering with the Ward D measure). Across the top, a hierarchical clustering dendrogram establishes groups of situations having similar vectors of values across participants (again from hierarchical clustering with the Ward D measure).

captured these large individual differences.

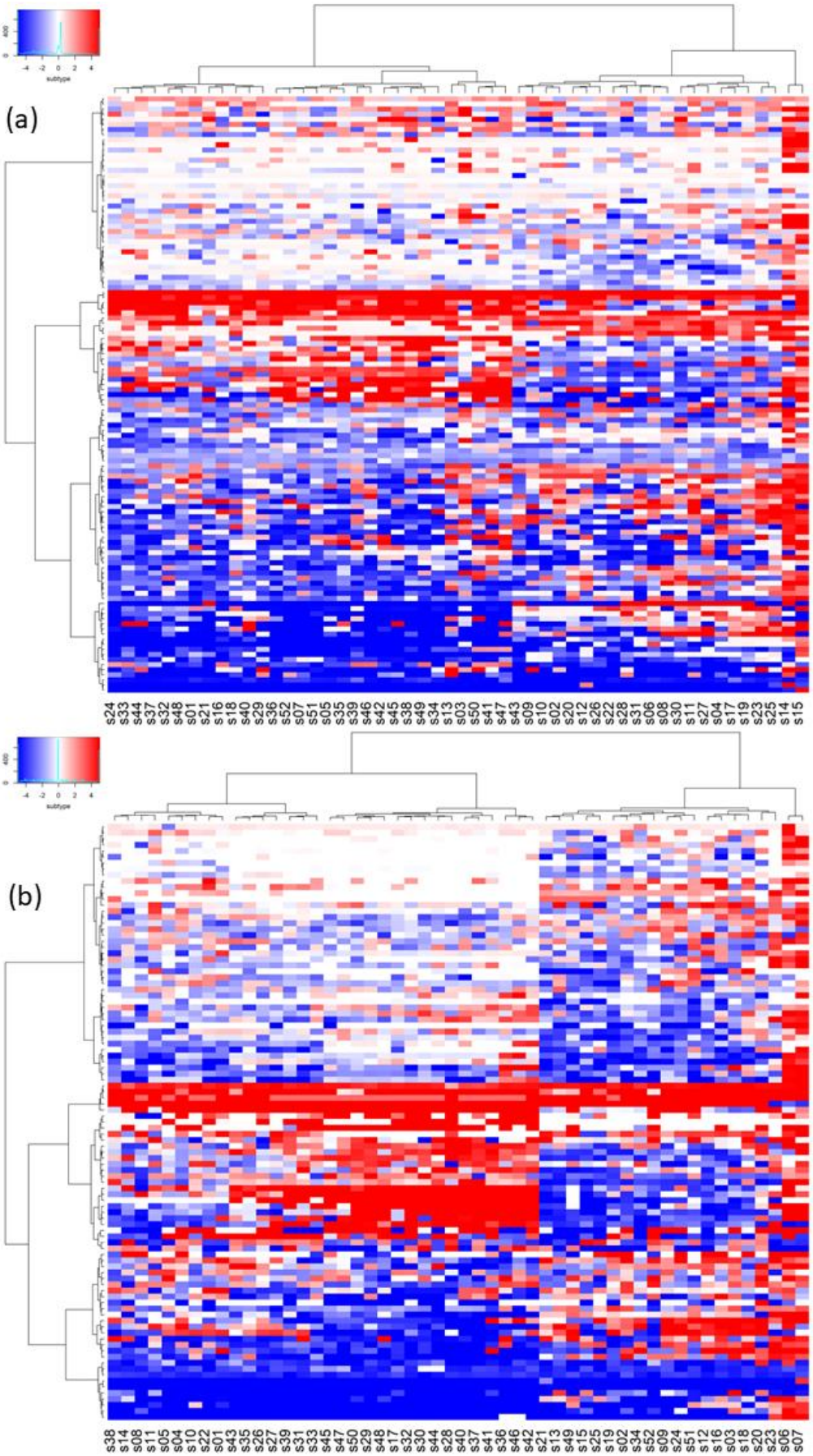


Figure 4. Visualizations of the hairpulling subtype judgments for the 117 participants in Study 2 (a) and the 99 participants in Study 3 (b) across the 52 situations. The 52 subtype judgments for each participant are presented in a single row. The number below each column corresponds to the number of the corresponding situation in Table 1. As a cell becomes increasingly red, the subtype judgment increasingly approached 5 (focused pulling, on a scale of -5 to 5; Table 2). As a cell becomes increasingly blue, the subtype judgment increasingly approached -5 (automatic pulling). As a cell becomes increasingly white, the subtype judgment increasingly approached 0 (mixed pulling). On the left, a hierarchical clustering dendrogram establishes groups of participants having similar vectors of values across situations (from hierarchical clustering with the Ward D measure). Across the top, a hierarchical clustering dendrogram establishes groups of situations having similar vectors of values across participants (again from hierarchical clustering with the Ward D measure).

In an exploratory analysis, we further assessed situation effects for the subtype measure. Of interest was how consistent individuals were across situations in focused versus automatic pulling, and how much individual patterns differed across situations. Figure 4 visualizes the hairpulling subtype judgments for the 117 participants in Study 2 (a) and for the 99 participants in Study 3 (b) across the 52 situations. As values become redder, individuals pulled in a more focused manner; as values become bluer, they pulled in a more automatic manner.

As Figure 4 illustrates, only a small minority of individuals solely performed a single type of pulling across the 52 situations. Most individuals performed both types of pulling in different situations, with the specific situations where each type of pulling occurred varying considerably between individuals (a large individual by situation interaction, with an ICC2 of only 0.05 in both studies). As Figure 4 further illustrates, three clusters of individuals emerged for the subtype measure. A top cluster in both panels exhibited mixed pulling (both automatic and focused). A smaller middle cluster predominantly exhibited focused pulling (although not always) and a cluster towards the bottom predominantly exhibited automatic pulling (although again not always). Not only do these patterns demonstrate that there are no clear automatic and focused pullers, but it also shows how much situations affect the type of pulling an individual performs, and also that situational effects differ for each individual.

2.5.3 Hypothesis 3: High construct and content validity for SAM^2 TAI measures of trichotillomania

We next assessed construct validity at the individual level. For each individual, we first computed a composite measure of pulling frequency and urge strength (i.e., for each situation, the average of an individual's frequency and urge judgments). Because these two measures correlated very highly (r = 0.85 in Study 2; r = 0.88 in Study 3), they captured highly similar information. Combining them simplified later analyses and created a robust dependent variable that reflected both pulling frequency and urge strength.

For each individual, we then correlated their composite measure of pulling across the 52 situations with each of their judgments for the 13 influential processes across situations in Study 2, or with each of their judgments for the 8

influential processes across situations in Study 3. The resulting vector of 13/8 correlations constituted a prediction profile for each individual. If the SAM^2 TAI

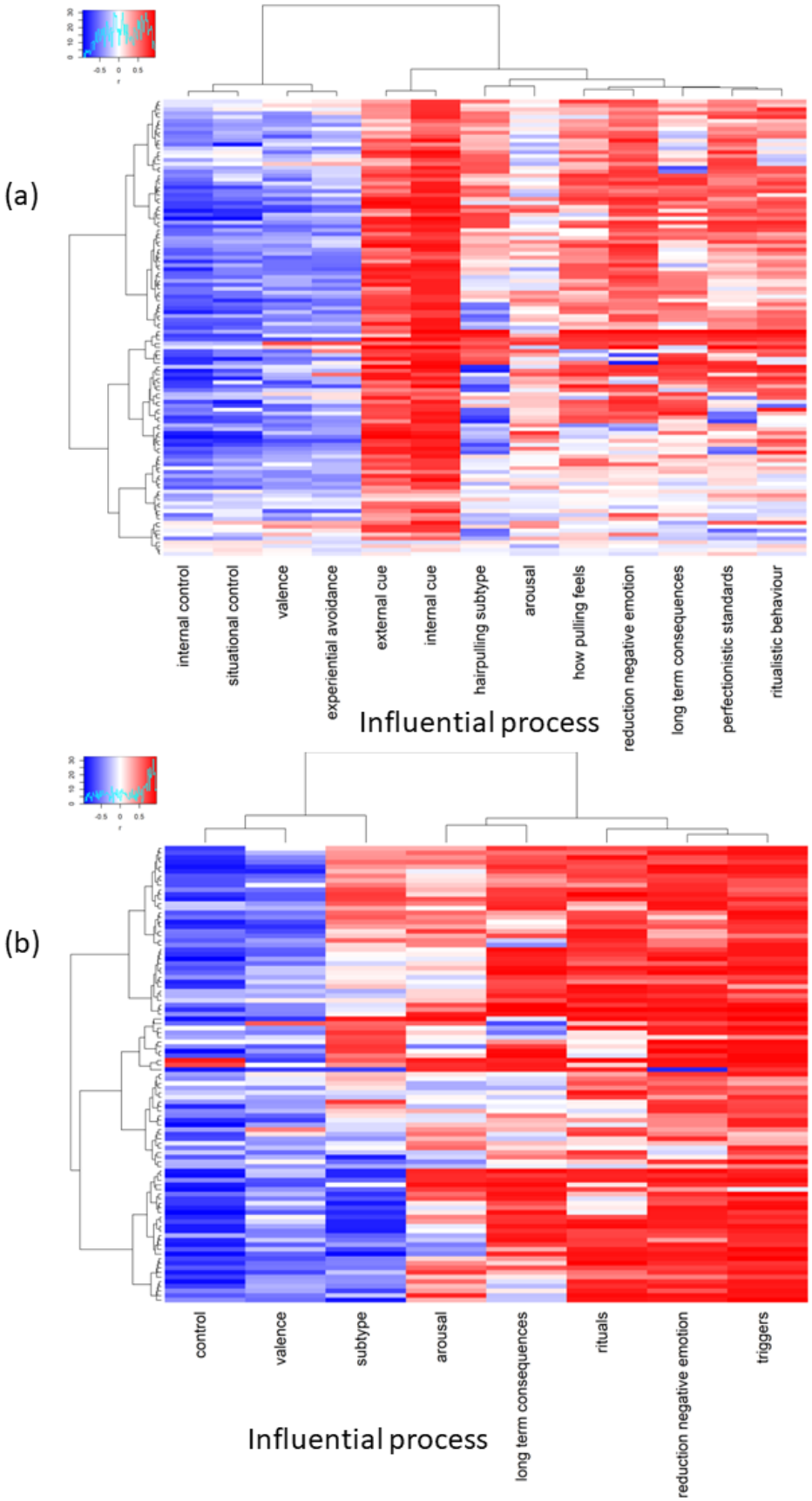


Figure 5. Individual prediction profiles in Studies 2 and 3. Visualizations of the correlations between the the composite measure of pulling and the 13 influential process in Study 2 (a) and the 8 distilled processes in Study 3 (b). The 13/8 correlations for each of the 117/99 participants appear in a single row. As a cell becomes increasingly red, the correlation was increasingly positive. As a cell becomes increasingly blue, the correlation was increasingly negative. As a cell becomes increasingly white, the correlation increasingly approached 0. On the left, a hierarchical clustering dendrogram establishes groups of participants having similar prediction profiles (from hierarchical clustering with the Ward D measure). Across the top, a hierarchical clustering dendrogram establishes groups of processes having similar profiles across participants.

exhibits construct validity, the correlations within these prediction profiles should tend to be high. The composite measure of pulling should correlate highly with processes known to influence pulling.

Figures 5a and 5b visualize the individual prediction profiles obtained in this analysis. Each row in Figure 5a represents the 13 correlations for an individual in Study 2; each row in Figure 5b represents the 8 correlations for an individual in Study 3. Each column represents the correlations for a single influential process across individuals. Each cell in a row visualizes the magnitude of a correlation for an individual between the composite measure of pulling and a specific influential process. As a cell becomes redder, the correlation approaches +1; as a cell becomes bluer, the correlation approaches -1; as a cell becomes whiter, its correlation approaches 0. Table 3 summarizes these correlations quantitatively for each study, presenting the median and interquartile range of the correlations for each influential process across participants.

Table 3. The median value (interquartile range) of the individual correlations between the compositive measure of pulling frequency and urge strength with the 13 influential processes in Study 2 and the 8 distilled processes in Study 3.

(a) Study 2

	External cues	Internal cues	Valence	Arousal	Experiential avoidance	Situational control	Internal control	Hairpulling subtype	Perfectionist standards	Ritualistic behaviour	How pulling feels	Reduction negative emotion	Long-term consequences
Frequency/Urge	.62 (.43, .76)	.79 (.69, .85)	-.35 (-.48. -.18)	.07 (-.08, .28)	-.29 (-.43, -.12)	-.38 (-.58, -.19)-	-.53 (-.67, -.34)	.13 (-.22, .41)	.36 (.09, .56)	.37 (.11, .61)	.30 (.07, .60)	.55 (.14, .69)	.18 (.01, .56)

(b) Study 3

	Cues	Valence	Arousal	Control	Subtype	Rituals	Reduction	Long-term consequences
Frequency/Urge	.79 (.69, .87)	-.39 (-.56, -.23)	.22 (-.03, .53)	-.64 (-.08, -.43)	.02 (-.46, .41)	.70 (.31, .82)	.77 (.56, .84)	.63 (.09, .81)

Figures 5a and 5b, together with Table 3, capture the general pattern of prediction at individual level. Consistently, across both studies, internal and external cues (just *triggers* in Study 3) predicted pulling the strongest (median r = 0.62, 0.79, 0.79, respectively). Reduction in negative emotion also predicted pulling in both studies strongly (median r = 0.55 and 0.77 in Studies 2 and 3, respectively). In Study 2, internal control (-0.53) also predicted pulling well, followed by situational control (-0.38), ritualistic behaviors (.37), perfectionist standards (0.36), valence (-0.35), how pulling feels (0.30), experiential avoidance (-0.29), and long-term consequences (0.18). In Study 3, rituals (0.70), control (-0.64), and long-term consequences (0.63) all predicted pulling well, followed by valence (-0.39) and arousal (0.22). Pulling subtype tended not to predict pulling well in either study (median r = 0.13, 0.02).

These results establish strong construct validity for the SAM^2 composite measure of pulling. Processes established in the literature that influence pulling predict pulling well in the SAM^2 TAI at the individual level.

Not only do systematic patterns emerge at the group level, but large individual differences remain at the individual level. From Figure 5 we can see three groups emerging for both studies, with hair pulling subtype seeming to be one of the key processes that differs for individuals. In Study 3, for example, there is group of individuals towards the bottom who tend to exhibit automatic pulling, lower arousal and high long-term consequences. In the middle, there appears to be a more focused cluster of individuals with low correlations for arousal and long-term consequences. Finally, there is then a third group towards the top who are also focused but have high arousal and long-term consequences. Interestingly, for all three groups, triggers, control, and reduction in negative emotion are equally important. A similar pattern emerges in Study 2, although the highly focused, low arousal group appears to have higher long-term consequences than in Study 3.

Finally, we assessed content validity of the SAM^2 TAI. Specifically, we hypothesized that the influential process would explain a relatively large amount of variance in the composite measure of pulling, demonstrating comprehensive coverage. To assess content validity at the group level for the composite measure, we established the amount of variance that a multi-level mixed effect model explained in it. For each study, the influential processes were modelled as fixed effects. Due to the high correlations between 5 pairs of processes in Study 2 (noted earlier), a single component was constructed for each pair using principal component analysis. Three original processes were left unchanged, resulting in a total of eight fixed factors included to predict the composite measure of pulling. For Study 3, all eight of the original processes were included as fixed factors, given no problems with collinearity. For both studies, random intercepts and slopes were included for participants and situations. Across models, the variance explained was around 65% in Study 2 and 70% in Study 3. These results indicate that the SAM^2 TAI exhibits high content validity, with the influential processes comprehensively explaining variance in the composite measure of pulling.

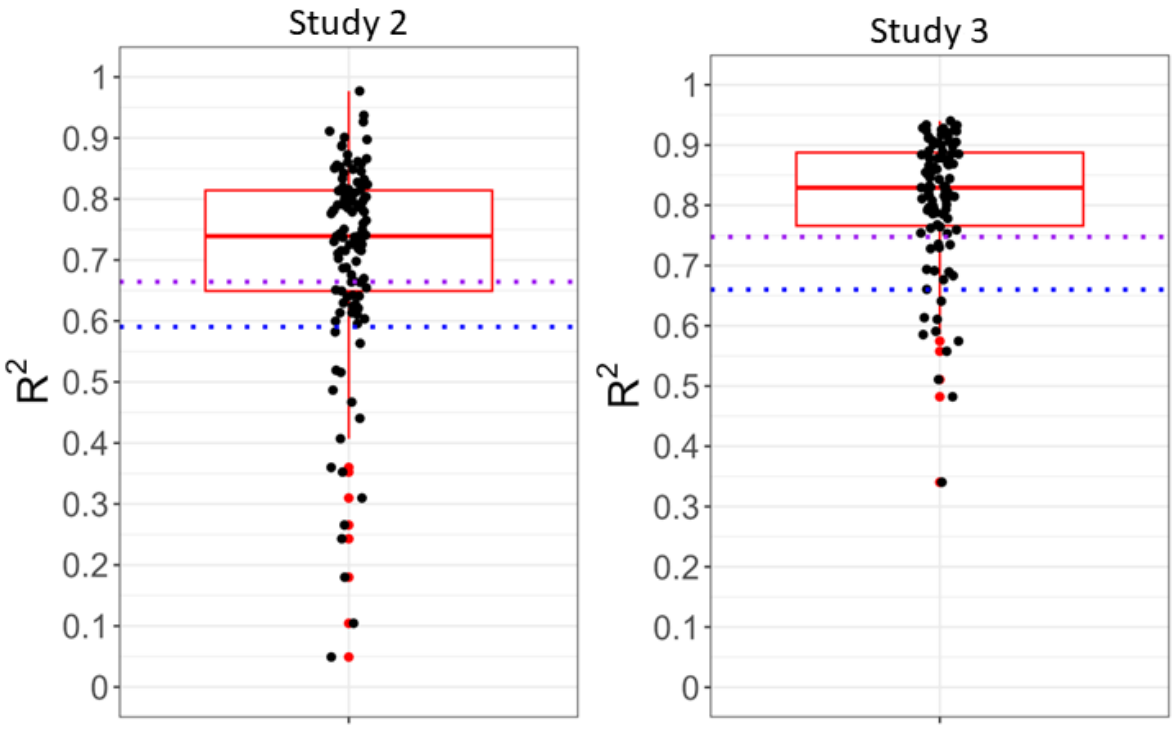


Figure 6. R^2 plotted as percentages for the individual regressions. Each dot is the R^2 for a participant's individual regression, where each regression predicts the individual's composite measure of pulling (with no interactions or random effects). The box and whisker plot shows the median and inter-quartile range for each measure. The R^2 for the same main-effects-only individual model with no random effects or interactions when run at the group level is plotted as the lower dashed purple line. The R^2 for a group-level model with random intercepts and interactions is plotted as the upper dashed blue line.

At the individual level, the variance explained was even higher, indicating that explained variance at the group level was attenuated by individual differences. Each point in Figure 6 presents the variance explained in a simple linear regression for an individual with no random effects or interactions. The same processes modelled as fixed effects in the group-level regressions for Studies 2 and 3 were similarly modelled here as fixed effects to predict the composite measure of pulling. As Figure 6 illustrates, the median individual variance explained was 74% for Study 2 and 83% for Study 3. These high levels of explained variance at the individual level again indicate that the influential processes comprehensively explained the composite measure of pulling in the SAM^2 TAI.

2.5.4 Hypothesis 4: low correlations between situated and unsituated measures of trichotillomania.

We predicted that there would be low correlations of the SAM² measures for pulling frequency and urge strength with the unsituated Massachusetts General Hospital Hair Pulling Scale (MGH-HPS, Keuthen et al., 1995). Table 4 presents the relevant correlations.

Table 4. Pearson correlations of the SAM² measures for pulling frequency and urge strength with unsituated individual difference measures.

	2.	3.	4.	5.	6.	7.	8.	9.	10.	11. Automatic score
Study 2										
1. SAM² Frequency	.85+++	.33+++	-.12	-.06	-.26	.21	-.06	-.21	.05	.13
2. SAM² Urge		.31+++	-.16	-.02	-.25	.32*	-.07	-.25	.20	.10
3. MGH-HPS			-.08	-.01	-.07	.21	.00	-.19	.09	.18
4. Big 5 Extraversion				.18	.19	-.22	.06	.07	-.05	.14
5. Big 5 Agreeableness					.13	-.14	.22	.16	.06	.11
6. Big 5 Conscientiousness						-.06	.13	.64*	-.04	.11
7. Big 5 Neuroticism							.11	-.21	.21	.24
8. Big 5 Openness								.09	.04	.06
9.Brief Self Control Scale									-.14	.02
10. Focused score										.14
Study 3										
1. SAM² Frequency	.88+++	.23+	-.19	-.05	-.05	.38*	-.11	-.11	.44*	.29
2. SAM² Urge		.24+	-.16	-.04	.00	.36*	-.11	-.08	.39*	.18
3. MGH-HPS			-.02	-.13	-.17	.08	.04	-.20	.10	.15
4. Big 5 Extraversion				.08	.03	-.36*	.43*	-.05	-.02	.07
5. Big 5 Agreeableness					.27	-.28	.05	.30	.01	-.05
6. Big 5 Conscientiousness						-.27	.06	.72*	-.05	.03
7. Big 5 Neuroticism							-.20	-.23	.25	-.07
8. Big 5 Openness								-.04	-.07	.17
9.Brief Self Control Scale									-.05	-.05
10. Focused score										-.09

Note. The alpha level for all predicted correlations (one-tailed) was set at .05, where + indicates $p < .05$, ++ indicates $p < .01$, +++ indicates $p < .001$. The alpha level for all other non-predicted correlations (two-tailed) was Bonferroni adjusted for 52 correlations at the .05 threshold, where * indicates $p < .05$.

As can be seen, the correlation between the SAM² measures and the MGH-HPS were relatively low, but nevertheless significant for both studies *(r* = .23 to .33). These correlations are noticeably lower than the correlations between the SAM² measures for pulling frequency and urge strength with each other (*r* = .85 in Study 2, *r* = .88 in Study 3).

2.5.5 Discovery: Correlations between SAM² TAI measures and individual difference measures.

For discovery, we explored correlations of the SAM² measures for pulling frequency and urge strength with measures for the Big 5 personality traits, self-control, and focused versus automatic pulling, but had no specific correlations.

Table 4 presents the relevant (non-predicted) correlations. For Study 2, only the SAM² measure for urge strength correlated significantly with neuroticism (0.32); there were no other significant correlations. For Study 3, both SAM² measures for

frequency and urges correlated significantly with neuroticism (0.38, 0.36) and focused pulling (0.44, 0.39). Interestingly, all these correlations were higher for the SAM² measures than for the MGH-HPS measure (and also for Study 3 relative to Study 2).

2.6 Discussion

Using the Situated Assessment Method (SAM²; Dutriaux et al., 2021), we developed a situated approach to assessing trichotillomania. Rather than assessing hair pulling with unsituated test items—as in many psychometric instruments—we assessed it in specific situations where hair pulling is likely to occur. Additionally, we assessed processes known to influence pulling frequency and urge strength in these situations. Using this approach, we established a rich descriptive profile of pulling for each individual across pulling and non-pulling situations.

2.6.1 Summary of results

Individual differences. Using the SAM² TAI, we established trait levels of pulling frequency and urge strength for each individual (i.e., their mean judgement for each construct across the 52 pulling and non-pulling situations). The median trait-level value for both pulling frequency and urge strength was around 3.5 to 4 (on a scale of 0-10), in both Studies 2 and 3, indicating moderate levels in our samples (Figure 2). More important was how much these trait judgements varied across individuals, indicating substantial individual differences. Some individuals exhibited very low levels of pulling frequency and urge strength, whilst others experienced very high levels across the same situations. When Cronbach's alpha was used to assess test reliability, these trait-level measures exhibited excellent levels around .95.

Situation effects and situation by individual interactions. Not only did the SAM² TAI establish large individual differences, it also established large differences between situations (Figures 3a and 3b). As expected, some situations exhibited relatively high levels of pulling frequency and urge strength, whereas others exhibited relatively low levels. More importantly, large situation by individual interactions emerged for both pulling frequency and urge strength,

indicating that individuals experienced the same 52 situations quite differently with respect to pulling and urges. This interaction is also supported by the finding in Study 1 that some situations were generated by some individuals as pulling situations while others generated them as non-pulling situations. On average, across the two studies, pulling frequency for one individual across situations only correlated around .42 with pulling frequency another individual on average. A similar level of .42 emerged for urge strength (Table 2). All these results indicate that both situation effects and situation by individual interactions are important to evaluate when assessing individual levels of pulling frequency and urge strength.

As these results indicate, the SAM² TAI provides rich data about each individual's unique pulling experience, not only capturing their overall trait-level of pulling but also how their pulling varies across situations. Because different individuals experience different levels of pulling and urges across the same situations, the situation itself isn't the sole cause of their pulling experience. Instead, each individual's unique cognitive-affective system also plays a major role, reflecting the kinds of processes proposed in the three models of trichotillomania addressed earlier.

Construct validity. The SAM² TAI exhibited high levels of construct validity. Specifically, the SAM² composite measure of pulling correlated well with processes known to influence pulling in the literature (Figure 5, Table 3). Some of these processes correlated quite highly with pulling, including external cues, internal cues, and reduction in negative emotion. Other processes correlated moderately to weakly with pulling, including self-valence, the abilities to control situations and emotions, ritualized pulling behavior, perfectionist standards, long-term consequences, and arousal. In general, the SAM² composite measure of pulling captured diverse sources of influence known to affect pulling, thereby establishing its construct validity.

Perhaps one finding that deserves some explanation is the positive correlation between the long-term consequences of pulling and the SAM² composite measure. It might seem surprising that pulling increases as the negative long-term consequences of pulling increase as well. Instead, it might seem that people would pull less as the long-term consequences of pulling become

increasingly severe. What this relationship might indicate instead is that the more people pull, the worse the long-term consequences become. Rather than long-term consequences causing pulling to decrease, increased pulling causes long-term consequences to increase. Because our correlational data do not justify causal conclusions, these possibilities constitute a potential topic for future research.

Content validity. The SAM^2 TAI also exhibited high levels of content validity. Specifically, the influential processes that the SAM^2 TAI assessed explained high levels of variance in the composite measure of pulling (i.e., the average of pulling frequency and urge strength). At the group level, the influential processes explained on around 65 to 70 percent of the variance. At the individual level, the influential processes explained an even higher 74 to 83 percent. Higher explanation at the individual level most likely resulted from large individual differences attenuating prediction at the group level. These results indicate that the influential processes in the SAM^2 TAI explain the construct of hair pulling comprehensively.

Individual differences. The SAM^2 TAI correlated significantly with the unsituated MGH-HPS but only at moderate levels ($r = 0.24$ to 0.33), indicating that the situated and unsituated measurements captured related but different information. Of further interest was the relationship between the SAM^2 TAI and other unsituated individual difference measures. For both studies, urge strength correlated positively with neuroticism; for Study 3, pulling frequency correlated positively with neuroticism as well. This is perhaps not surprising, given that neuroticism correlated with trichotillomania consistently (Grant & Chamberlain, 2021b; Hagh-Shenas et al., 2015; Keuthen et al., 2015; Keuthen, Tung, et al., 2016).

2.6.2 Implications for models of hair pulling

When examining the correlational results for each individual (Figure 5), evidence for current models for air pulling emerged. Support for the Comprehensive Behavioral Model emerged most strongly (ComB; Mansueto et al., 1997), as reflected in the strong positive correlations for triggering cues for almost every participant. Furthermore, for many participants, but not all, ritualistic behavior

also demonstrated strong positive correlations with frequency and urges. Consistent with the reward part of the ComB model, reduction in negative emotion, how good pulling feels, and long-term consequences all exhibited strong positive correlations for the majority of participants.

In support for the Model of Cognitions and Beliefs (Rehm et al., 2015), negative self-beliefs and negative appraisal of negative emotions were captured by influential processes here for internal cues and self-valence (negative self-beliefs). In Figure 5, self-valence often negatively correlated with pulling, and internal cues often correlated positively. Also central to Rehm et al.'s model is poor coping through experiential avoidance. In Study 2, Figure 5 shows a negative relationship for experiential avoidance with frequency and urges for many individuals, though for a minority there is a positive correlation (where experiential avoidance increases as values become more negative). Control in the hair pulling cycle also plays a central role in this model. In our results we can again see that for many individuals, low levels of control, particularly internal control, were associated with increased pulling. Similar to the ComB model the positive correlations of frequency and urges with reduction in negative emotion, how good pulling feels, and long-term consequences also support the cognitions and beliefs model as supporting the importance of justifying outcomes. Finally, the model also discusses the importance of perfectionistic standards in the hair pulling cycle. Figure 4 offers mixed support for this factor, with it being quite important for some individuals but not important for others, in particular, more automatic pullers.

Finally, evidence also supports the emotion regulation model of hair pulling. Perhaps the strongest evidence comes from the importance of internal cues (which could be one's emotional state), internal control (evidence of emotion regulation – or lack of), and reduction in negative emotion. Although these influential processes have a strong relationship with pulling and thus offer support for the emotion regulation model, one could also argue that this model ignores a lot of other clearly important processes in the pulling cycle. Indeed, all three models receive support here, but no one alone accounts for all the influential processes in pulling observed here. Perhaps hair pulling could be

better conceptualized by the Situated Action Cycle (Barsalou, 2020; Dutriaux et al., 2021).

From the Situated Action Cycle, perceived entities and events in the environment typically initiate the cycle, such as external cues for pulling. Once these cues are perceived, their self-relevance is assessed in relation to their goals, values, social norms, and identity. For hair pulling, self-relevance takes the form of internal cues, how good pulling feels, reduction in negative emotion, and self-valence. These states of self-relevance then induce affect which can take the form of emotions or motivations, including the urge to pull, self-valence, arousal, internal control, and experiential avoidance. If motivation to pull is sufficiently strong, this can induce actions such as actual hair pulling (frequency of pulling), situational control, subtype behavior (automatic vs. focused), perfectionistic standards, and ritualized behavior. Finally, actions lead to outcomes, including how good pulling feels, reduction in negative emotion, and long-term consequences. As this brief summary illustrates, the Situated Action Cycle offers a natural way to integrate the three models of hair pulling.

2.6.3 Hair pulling subtypes

As the distribution of trait level values for subtype in Figure 2 illustrates, the SAM^2 TAI captured individual differences in focused versus automatic pulling. Whereas some individuals exhibited high levels of focused pulling across situations (high positive values), other individuals exhibited high levels of automatic pulling (low negative values).

When looking at the correlations between subtype and the composite measure of pulling in Figure 5, similar differences emerged. For some individuals, the more focused their pulling, the more they pulled. For other individuals, the more automatic their pulling, the more they pulled. Figure 4 suggests a striking heterogeneity of pulling types, with individuals exhibiting various mixtures of automatic and focused pulling across situations. From both visualizations, it is difficult to conclude that there are two distinct types of pullers, or even three. Instead, it appears that most individuals pull in both styles, with some individuals pulling more commonly in an automatic manner, and some more commonly in a focused manner, but also with a group who endorsed mixed

pulling across situations. Interestingly, high levels of pulling can emerge across situations when pulling is either focused or automatic.

The existence of subtypes, together with their number and associated characteristics, continues to be an important issue in the trichotillomania literature (Flessner, Conelea, et al., 2008; Grant et al., 2021). Based on the results observed here, however, it's not clear how compelling these typologies are. When examining Figures 4 and 5, strong well-differentiated clusters of pulling subtypes do not emerge. Instead, there simply seems to be tremendous variability in the processes associated with pulling for different individuals, together with situational effects and situation by individual interactions.

If the type of pulling someone exhibits is related to the efficacy of treatment, then continuing to establish subtypes is important (McGuire et al., 2020). As our findings suggest, however, the most important differences may exist at the level of individuals, not at the level of subtypes. If so, then trying to fit individuals into pulling subtypes may not be all that useful or beneficial for designing effective interventions. Within potential subtypes, large individual variation may affect treatment outcomes significantly. For this reason, it may be more useful for treatment to focus on the individual and tailor treatment to what influences that individual's pulling most.

2.6.4 Implications for treatment

Of interest is the potential use of these findings for treating trichotillomania. The current most widely accepted form of treatment is cognitive behavioral therapy with habit reversal training (HRT) (Jafferany et al., 2020; Jafferany & Patel, 2018; E. B. Lee et al., 2020). Success is emerging with the use of HRT for trichotillomania although relapse rates remain high (Farhat et al., 2020). More recently, development and testing of ComB treatment (based on the ComB model of hair pulling) has offered promising results. ComB treatment based on the ComB theory, which as can be seen in our results, does a reasonable job of explaining hair pulling. Indeed, there is emerging evidence for the promising effect of ComB treatments (Bottesi et al., 2020; Carlson et al., 2021; Flannery et al., 2022). As noted earlier, however, the ComB model does not account for

important elements of the hair pulling cycle. As a result, ComB treatment may not target all the important processes that contribute to pulling.

Perhaps an intervention could be developed from our SAM² TAI that considers all potential influential processes from the perspective of the Situated Action Cycle. It could also be useful to utilize the SAM² TAI as part of the behavioral intervention. Filling out the SAM² TAI initially would allow an individual and the clinician to identify the individual's unique pulling profile. This, in turn, could inform a precision treatment, providing the individual with skills directly relevant to their pulling. Furthermore, the SAM² TAI could be used to help identify situations where pulling occurs in an individual's life (a key part of HRT and ComB treatment) and identify within these situations what influential processes are most salient for their pulling. Such a targeted treatment for the individual could have significant benefits and is an avenue worth exploring in future research.

2.6.5 Limitations

Perhaps the primary limitation of this study is the correlational nature of its design and results. Although these results are informative and provide a rich description of individual differences in trichotillomania, they do not establish causality. We cannot conclude what may cause someone to pull their hair but can only conclude that certain factors are associated with pulling. We cannot be sure, for example, that removing external triggers in an environment will reduce pulling frequency and urge strength, even though they are closely related to one another. Exploring these relationships further with causal methods would be a useful avenue for research, especially to develop effective treatments. Nonetheless, even if a process doesn't cause pulling, its relationship to pulling can still be useful in treatment for a variety of reasons. For example, knowing the external cues are strongly associated with an increase in urges to pull and actual pulling, offers a potential target for managing pulling. The external cues may not cause the pulling but tackling them may still be a useful way to manage pulling.

Another potential limitation could stem from the sample used to generate the situations. The majority of these participants were from the United States or the

United Kingdom which greatly limited the diversity of the participants. This may mean that the measure is less appropriate for other cultures and may thus be missing situations more relevant to their culture. Exploring this further by gathering situations from a more diverse sample would be a useful avenue for future research to explore.

2.6.6 Conclusion

The Situated Assessment Method (SAM^2) offers a novel approach to assessing the important condition of trichotillomania. By assessing hair pulling in situations, it becomes possible to establish rich descriptive profiles of pulling for individuals, and to further examine how individuals vary in their situational profiles of pulling. The SAM^2 TAI developed here exhibits high levels of test reliability, construct validity, and content validity. By evaluating processes extracted from existing models of trichotillomania, it became possible to establish the processes associated with pulling at both the group and individual levels. Establishing such relationships can play an important role in defining trichotillomania and in determining effective treatments for treating it.

Chapter 3: Developing the Situated Assessment Method (SAM²) to assess social connectedness and social support

This chapter is an exact copy of the following preprint manuscript and has subsequently been submitted to Journal of Personality Assessment:

Taylor Browne Luka, C., Iswaraan, B., & Barsalou, L. (2023*) Developing the Situated Assessment Method (SAM²) to assess social connectedness and social support*. PsyArXiv. https://doi.org/10.31234/osf.io/m3d65

3 Abstract

Social connectedness and social support play central roles in human cultures and have consistently been linked to mental and physical health. Accurately measuring these constructs is essential for understanding them and for developing interventions to increase them. Most current assessment instruments are unsituated, given that they ask an individual to assess their social connectedness and social support by abstracting across unspecified life situations to establish general impressions. To include situations in the assessment process, we developed a situated psychometric instrument based on the Situated Assessment Method (SAM^2) to assess social connectedness and social support. Using this instrument, 189 individuals evaluated 24 different situations for social connectedness and social support, and also evaluated 8 predictors of these constructs established in the scientific and clinical literatures. As expected, we observed large reliable individual differences in both social connectedness and social support, along with substantial situational effects and situation by individual interactions. Additionally, we established high construct and content validity for both measures, demonstrating that they offer meaningful assessments of their underlying constructs. Interestingly, both SAM^2 measures were only moderately related to well-established unsituated measures of social connectedness and social support, indicating that situated and unsituated measures capture different information.

3.1 Introduction

3.1.1 Social Connectedness and Social Support

Humans are an inherently social species, with our social environment shaping health outcomes, both physically and mentally (Snyder-Mackler et al., 2020). Because we rely heavily on each other, a lack of strong social connections and support can have detrimental effects on our health and well-being, leading to increased depression (Cruwys et al., 2014), poor mental health (Saeri et al., 2018), and shorter lifespans (Haslam et al., 2015; Holt-Lunstad et al., 2010). For these reasons, it is of considerable social importance to gain greater understanding of social connectedness and social support and to measure them accurately.

Social connectedness can be measured and conceptualized in a variety of ways. One common way in the literature is through 'objective' measures that establishes whether one is living alone versus with someone else, frequency of social participation, number of friends on Facebook etc. (Bailey et al., 2018; Grieve & Kemp, 2015; Hodge et al., 2013). Alternatively, social connectedness can be assessed subjectively with cognitive measures such as self-reported social belonging (Haslam et al., 2015; Saeri et al., 2018). Due to some of the inconsistencies associated with linking objective measures with health outcomes (Hodge et al., 2013), together and with greater consistency in findings related to subjective measures, the work developed here focuses on measuring subjective social connectedness. Specifically, we will adopt Haslam et al.'s (2015, p. 1) definition, where social connectedness is "the sense of belonging and subjective psychological bond that people feel in relation to individuals and groups of others."

As with social connectedness, social support can also be measured in various ways. Social support can be defined as the aid received from others during times of need. Within the literature, three constructs for different forms of social support have emerged: social embeddedness (connections that individuals have to significant others in their social environments); perceived social support (cognitive appraisal of being reliably connected to others, perceived availability and adequacy of supportive ties); and enacted support (actions that others

perform when they render assistance to a focal person; Barrera, 1986). Within the literature, despite the numerous ways social support has been measured, the most common approach has been to assess perceived social support (Gariépy et al., 2016). For this reason, we will focus on perceived social support as well.

3.1.2 Traditional methods for assessing social connectedness and support subjectively

As accumulating evidence establishes the importance of social connection and support for good health, it is important to have instruments that accurately measure these constructs. Valid and reliable measures of social connectedness and social support would enable us to accurately assess an individual's current social connectedness and support and then use them to help predict an individual's mental and physical health. Such measures could also be used to evaluate the need for health interventions and their impact over time.

Current methods of measuring social connectedness and support can be described as unsituated in nature. Such measures use decontextualized items to assess social connectedness and social support, asking an individual to abstract over situations to establish a general assessment of how much they agree with a statement. For example, a commonly used measure for social connectedness (the Social Connectedness Scale – Revised [SCS-R]; R. Lee & Robbins, 1995) asks individuals to answer 20 statements, such as "I feel close to people". To answer this the individual must abstract over their life and situations they have experienced to give a general assessment of whether they feel close to people or not. Similar items are used when measuring social support. For example, two commonly used measures of social support (the Multidimensional Scale of Perceived Social Support [MSPSS]; Zimet et al., 1988) and the Interpersonal Support Evaluation List [ISEL]; Cohen & Hoberman, 1983) ask individuals to answer statements such as "I often meet and talk with family or friends". As can be seen, individuals need not consult their experience in specific situations. They can simply access or construct general impressions of their overall experience.

Using unsituated measures for social connectedness and social support presents some limitations. First, there is the issue of judgement accuracy. Responses

could be potentially inaccurate because it is difficult to abstract a judgment over all relevant situations. Instead, individuals may rely on intuitive theories and/or the availability heuristic to make these judgments. A second issue is that unsituated measures ignore situational variability. Individuals do not exhibit constant levels of a construct across situations. For example, an individual might be extraverted while dining with their family but introverted while dining with co-workers. Furthermore, different individuals respond to the same situations differently, such that an individual by situation interaction results. For more detailed insight into the limitations of traditional unsituated assessment instruments, see Dutriaux et al. (2021).

3.1.3 An alternative approach to measuring social connectedness and social support: The Situated Assessment Method (SAM²)

SAM² is a general assessment framework developed to measure diverse constructs such as stress, trichotillomania, eating habits, and sustainable behavior. To establish individual differences in a construct of interest, SAM² assesses it on two dimensions of situatedness: (a) situational experience, (b) the Situated Action Cycle. This method addresses the aforementioned limitations of unsituated assessment measures; for a detailed explanation of how, see Dutriaux et al. (2021).

To establish SAM² measures for social connectedness and social support, we first identified a set of situations where social connectedness/social support occur to varying degrees (to ensure there would be large variance). We then identified scientifically established factors known to influence social connectedness and social support in the literature.

3.1.3.1 Situation selection.

To assess situational experience of social connectedness and social support, we sampled 24 situations across 6 domains of human activity (presented in Table 5). These situations were selected because they cover important situations in their respective domains, while being uniquely different from each other, covering a broad range of everyday situations that can be experienced in the general population. Furthermore, these situations consisted of an even mixture of

positive social, negative social, positive non-social, and negative non-social situations. These situations also included some in which individuals do not necessarily experience aspects of social connectedness or social support, thereby establishing both unrestricted variance and individual differences.

Table 5. The 24 situations that were assessed by all participants, varying across domains, sociality, and valence.

Situation	Domain	Situation	Social	Valence
1	Health	You're feeling very stressed out, and a friend helps you feel better	Social	Positive
2	Health	You're depressed, and your friends don't want to be around you	Social	Negative
3	Health	Your yearly routing check-up indicates that you're in good health	Non-social	Positive
4	Health	You discover a lump on your arm	Non-social	Negative
5	Leisure	Having an enjoyable dinner with friends	Social	Positive
6	Leisure	Going to a party where you don't know anyone	Social	Negative
7	Leisure	Reading a good novel in the evening	Non-social	Positive
8	Leisure	The Wi-Fi cuts out in the middle while you are watching a movie	Non-social	Negative
9	Family	Attending a family reunion	Social	Positive
10	Family	Having to take sides in a family dispute	Social	Negative
11	Family	Watching videos of family birthdays at home by yourself	Non-social	Positive
12	Family	Visiting a family member's grave alone	Non-social	Negative
13	Relationship	Feeling close enough to a friend to tell them an important secret	Social	Positive
14	Relationship	A romantic relationship breaks up	Social	Negative
15	Relationship	Enjoying the peace and quiet after your friends have left	Non-social	Positive
16	Relationship	Feeling lonely on a Friday night	Non-social	Negative
17	Achievement	Successfully completing a group project	Social	Positive
18	Achievement	Receiving negative feedback on your work from a supervisor	Social	Negative
19	Achievement	Solving a difficult problem in your work by yourself	Non-social	Positive
20	Achievement	Having difficulty with meeting a challenging deadline without help	Non-social	Negative
21	Identity	An old friend you haven't seen in a while says you're looking great	Social	Positive
22	Identity	A friend criticises you on social media	Social	Negative
23	Identity	You feel comfortable with the kind of person you've become	Non-social	Positive
24	Identity	You worry about your personal flaws	Non-social	Negative

3.1.3.2 Assessing factors that influence social connectedness and social support.

To establish factors that potentially influence an individual's feelings of social connectedness and social support, we turned to the current literature on these constructs.

In the literature to date, there has been little consensus on what subjective social connectedness is and how best to measure it. For our conceptualization we chose to focus on a recent thematic synthesis of 28 studies assessing individual experiences of social connectedness (Hare-Duke et al., 2019), which attempted to establish factors that influence social connectedness. Five dimensions of social connectedness emerged from this review: *identity and common bond* (shared traits experienced with others), *closeness* (the level of mutual dependence with others), *valued relationships* (a relationship with high importance), *involvement* (level of engagement with other individuals in social activities) and *cared for and accepted* (feelings of care and support from others). Problematically, however the dimension *cared for and accepted* is often

also seen as an aspect of social support (Z. Chen et al., 2017; Martínez-Martí & Ruch, 2017), and so is not a unique element of social connectedness—indeed it seems more important for social support. To assess the unique dimensions of social connectedness and support to establish each of the two constructs as independently as possible, we did not include *cared for and accepted* in social connectedness in the SAM^2 instrument developed here. Later analyses will address whether elements of social support contribute to social connectedness and vice-versa.

To establish factors that influence social support, we focused our literature search on measures of perceived social support. Four factors have consistently emerged for it in the literature (House, 1981; Langford et al., 1997; Muñoz-Laboy et al., 2013): *emotional support* (primarily in the form of empathy, concern, love, trust, and care), *appraisal support* (useful feedback about how one handles a particular situation), *informational support* (information and advice provided by others that is helpful to aid one during a difficult time), and *instrumental support* (provision of relevant goods and services). We included all four factors in the SAM^2 instrument developed here.

Thus, based on the literature reviewed above, we included eight predictive measures in our SAM^2 instrument, (as summarized in Table 6), with four related to social connectedness and four to social support.

Table 6. Scales, inter-rater agreement, and test reliability for both dependent variables and the eight predictors.

Measure	Rating Question	Scale Label	Agreement between individuals	Test reliability of overall participant scores
Social Connectedness	When this situation occurs, how much social connectedness do you experience?	0-10 (completely unconnected, moderately connected, strongly connected)	.33	.87
Social Support	When this situation occurs, how much social support do you experience?	0-10 (no support, moderate support, extensive support)	.17	.92
Social Engagement	When this situation occurs, how socially engaged do you feel?	0-10 (completely unengaged, moderately engaged, strongly engaged)	.32	.90
Valued Relationship	When this situation occurs, how much do you experience a having valued relationship with others?	0-10 (no valued relationship, moderate valued relationship, highly valued relationship)	.27	.93
Shared Identity	When this situation occurs, how much of a shared identity do you experience with others?	0-10 (no shared identity, moderate shared identity, highly shared identity)	.24	.92
Closeness	When this situation occurs, how much closeness do you experience with others?	0-10 (no closeness, moderate closeness, intense closeness)	.35	.90
Emotional	When this situation occurs, how much emotional support do you receive from others?	0-10 (no emotional support, moderate emotional support, extensive emotional support)	.18	.93
Informational	When this situation occurs, how much helpful advice and useful information do you receive from others?	0-10 (no helpful advice, moderate helpful advice, extensive helpful advice)	.16	.92
Instrumental	When this situation occurs, how much relevant goods and services are available to you from others?	0-10 (no goods and services, moderate goods and services, extensive goods and services)	.12	.94
Feedback	When this situation occurs, how much useful feedback do you receive from others about how you're handling it?	0-10 (no useful feedback, moderate useful feedback, extensive useful feedback)	.15	.93

Note. The ICC function in the R Psych package was used to compute agreement between individuals and test reliability. The values shown are the ICC2 measure for random effects, such that they are likely to generalize across different samples of participants from the same population. For each SAM^2 measure, the right column presents coefficient alpha (ICC3k), which estimates the stability of individual scores across assessment occasions (i.e., test reliability; Shrout & Fleiss, 1979). Values of alpha are shown for scores that were aggregated across the 24 situations in Table 1 (computed with the ICC function in the R Psych package). ICC3k estimates fixed-effect values, assuming that the test instrument contains the same 24 situations across test occasions.

3.1.4 Current Study and Hypotheses

The current study assessed people's situated experiences of social connectedness and social support. The main goal was to assess, predict, and understand social connectedness and social support with the newly developed SAM^2 measures, assessing their psychometric properties and construct validity. A secondary aim was to compare traditional unsituated assessment tools with these new measures. A third aim was to investigate how these measures were related to personality traits, cultural orientation, feelings of loneliness, and perceived social networks.

Data for study were collected on two separate occasions. All the predictions in the hypotheses below were observed in the first step of data collection. Although a few findings were not predicted, most were. We subsequently predicted that we would observe all the results from the first step data collection in the second step and in all the data from steps one and two combined (to maximize power). Predictions for the second step and the combined steps were preregistered on OSF (osf.io/8wf5t).

Hypothesis 1: Large individual differences in social connectedness and social support. We predicted that individuals would exhibit considerable variability in their average levels of social connectedness and social support across the 24 situations.

Hypothesis 2a: Substantial situational effects. We predicted that the situation would have a large impact on levels of social connectedness and social support, with levels varying situation by situation.

Hypothesis 2b: Substantial situation by individual interaction. We further predicted there would be a large situation by individual interaction, as the levels of social connectedness and social support depended heavily not only on the situation but also on the individual.

Hypothesis 3a: High construct and content validity for social connectedness. We predicted that each of the four predictors of social connectedness would be highly related to social connectedness and would explain much of its variance.

Hypothesis 3b: High construct and content validity for social support. We initially predicted that each of the four predictors associated with social support would be strongly related to social support and explain much of its variance. This result was largely confirmed in the first data collection step. We also observed an additional unpredicted result, however, that some predictors of social connectedness explained variance in social support. For the second data collection step, we therefore kept our original hypothesis that the social support predictors would explain much variance in social support but added the further prediction that some social connectedness predictors would also explain variance in social support.

Hypothesis 4: Low correlations between situated and unsituated measures. We predicted that the SAM² measures of social connectedness and support would exhibit low correlations with unsituated measures for social connectedness and social support, indicating that situated and unsituated measures capture different variance in these constructs.

3.1.4.1 Discovery

We also explored correlations of the SAM² measures for social connectedness and social support with unsituated measures for Big Five personality traits, individualism, collectivism, loneliness, and social networks (both quantity and quality of social connections).

For the social network measures, we expected that they would be positively related to the SAM² measures, but as they were not central to our research goals, we only included them as discovery.

Finally, we explored how the SAM² measures for social connectedness, social support and their eight predictors vary across situations of various types. Specifically, we assessed how all the SAM² measures varied across social versus non-social situations and across positive versus negative situations, again with no specific predictions.

3.2 Methods

3.2.1 Participants

In the first step of data collection, 83 participants were recruited from the online Prolific platform to perform the study. To replicate these initial results and increase power, an additional 107 participants were later recruited from Prolific (for a total of 190 participants sampled). At both steps of data collection, available funds for paying participants determined the number of participants sampled. Participants were required to be over 18 years of age, residents of the United Kingdom, fluent English speakers, and to have attained a minimum 95% approval rate in at least 10 other Prolific studies.

Several diagnostic checks were conducted prior to running the main analyses to identify participants who responded randomly or mechanically on the survey, or who did not perform it as instructed. One participant was excluded for responding mechanically to the large majority of questions (giving a constant response). This resulted in a total of 189 participants (F = 135, M = 50, and 4 non-specified, mean age = 36.08, SD = 13.83). Participants in the first data collection step were paid £4; participants in the second step were paid £5 due to previously underestimating the time required.

3.2.2 Design

In a multilevel design, all participants assessed the same 24 situations in Table 5 across two dependent variables (social connectedness and social support) and eight predictors (closeness, shared identity, valued relationship, social engagement, emotional, informational, instrumental, and feedback). Additionally, all participants completed seven unsituated individual difference measures described in more detail later.

3.2.3 Materials

3.2.3.1 The SAM^2 psychometric instrument

To cover a broad range of situations, we included situations from six distinct domains with an even mixture of positive social, negative social, positive non-

social, negative non-social situations (see Table 5). These situations included some in which individuals did not necessarily experience aspects of social connectedness or social support, thereby establishing unrestricted variance and individual differences. Each situation was rated on a 10-point scale with one decimal place precision, in which higher scores reflected higher levels of the assessed measure.

The measures assessed for the SAM^2 model, shown in Table 6, included the two dependent variables (social connectedness and social support). Four potential predictors of social connectedness were also collected: closeness, shared Identity, valued relationship, and social engagement connectedness (based on Hare-Duke et al., 2019). Finally, four potential predictors of social support were collected: emotional support, informational support, instrumental support, and feedback support (based on House, 1981; Langford et al., 1997; Muñoz-Laboy et al., 2013).

3.2.3.2 Unsituated individual difference instruments

Three previously established unsituated instruments for assessing social connectedness and social support were included to examine their relationship with the corresponding measures in the SAM^2 instrument. Four additional instruments were included to assess the relations of personality, cultural orientation, perceived loneliness, and social networks with the SAM^2 instrument. All these instruments are described next in turn.

Social Connectedness Scale-Revised (SCS-R; (R. Lee & Robbins, 1995). The SCS-R is a self-report questionnaire designed to measure perceived interpersonal closeness experienced with others. The SCS-R consists of 20 items such as, “I feel close to people”. Scores on this scale range from 1 (strongly disagree) to 6 (strongly agree). The SCS-R has shown test reliability ($\alpha = 0.91$) and high test-retest reliability ($r = 0.96$; Lee et al., 2001).

Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al.,1988). The MSPSS is a self-report scale consisting of 12 items, rated from 1 (very strongly disagree) to 7 (very strongly agree). This scale was designed to assess perceived levels of social support across three subsets: friends, family, and

significant others. Items on this scale include, “I can talk about my problems with my friends”. The MSPSS has high test reliability for each of its three subscales (α = 0.91-0.95; Ekbäck et al., 2013).

Interpersonal Support Evaluation List (ISEL; Cohen & Hoberman, 1983).The ISEL is a 40-item self-report scale designed to measure perceived levels of social support from others across four subsets: tangible support (provision of material goods and/or services, and monetary aid), appraisal support (provision of advice and suggestions useful in problem-solving), belonging support (having a companion to engage in shared activities), and self-esteem support (provision of feelings of validation). Each subscale consists of 10 items such as, “I often meet and talk with family or friends”. The ISEL has demonstrated high test reliability overall (α=0.86; Aftyka et al., 2019), but the internal consistency for each subscale varies and so they are not recommended for individual analyses.

Horizontal and Vertical Collectivism and Individualism Scale (HVIC; Triandis & Gelfand, 1998). The HVIC is a brief 16-item self-report questionnaire, refined from factor loadings of the original 32 items (Singelis et al., 1995). This scale is designed to measure an individual’s cultural orientation across four dimensions: vertical collectivism, horizontal collectivism, vertical individualism, and horizontal individualism. Commonly, the four factors can further be sub-divided into two factors: collectivism and individualism (Györkös et al., 2013). This scale has shown reasonable test reliability across its sub-scales (α = .64-.83; Györkös et al.,2013).

Big Five Inventory (BFI, John & Srivastava, 1999). The BFI is a self-report questionnaire that assesses an individual on each of the Big Five personality traits (Goldberg, 1993). Its 44 items are short statements that refer to the traits of extraversion, conscientiousness, neuroticism, agreeableness. and openness to experience. The BFI yields satisfactory test reliability for each of the five factors (α = 0.79-0.86; Srivastava et al., 2003) and good test-retest reliability for each of the five factors (r = 0.79-0.83; Arterberry et al., 2014; Gosling et al., 2003).

Loneliness Measures Loneliness was measured by the UCLA 3-item Loneliness Scale (Hughes et al., 2004) containing 3 items such as “how often do you feel isolated from others?”. Items for this scale can be rated on a scale of 1-3 (hardly

ever, sometimes, often), scores are summed, with a higher score indicating higher levels of loneliness. It exhibits reasonable test-retest reliability (α = 0.70; Cornwell & Waite, 2009). We also assessed loneliness with one additional item that directly measures perceived loneliness, "How often do you feel lonely?". Scores on this scale range from (0)-Never to (4)-Always, where higher scores demonstrate higher levels of perceived loneliness.

Social Network Measures. An additional 12-questions were designed to assess an individual's personal networks across three subsets: family members, close friends/partners, and co-workers/fellow students. Each subset was assessed with the same four items that assessed the quantity and the quality of interactions with the respective individuals (for a total of 12 items, 6 for quantity and 6 for quality).

Specifically, two questions assessed the quantity of interactions with a subset: "How many [family members, close friends/partners, co-workers/fellow students] have you interacted with regularly in the past year, where regularly means at least once a month?" and "On the average, across these particular [family members, close friends/partners, co-workers/fellow students], how many times do you interact each month?". Participants could respond to these questions with any numeric value. To calculate the overall quantity for a subset, the mean of the two values for each subset was calculated.

To assess the quality of the interactions, the following two questions were asked for each subset: "On the average, across all these interactions, how would you rate the quality of the interactions?" and "In this group of [family members, close friends/partners, co-workers/fellow students], how central, on average, are you to the interactions among them versus how peripheral?". To these latter two questions, participants could respond on a sliding scale from 0 (extremely bad/extremely peripheral) to 10 (extremely good/extremely central). The mean of these two questions was used to assess the overall quality of interactions for each subset.

3.2.4 Procedure

All participants performed the study online using the Qualtrics platform, after being referred there by Prolific. Participants received an information sheet about the study and provided informed consent. Ethical approval was granted from the College of Science and Engineering Ethics Committee at the University of Glasgow (300190229, 29th April 2020).

Participants were first presented with three unsituated instruments that assessed social connectedness (SCS-R) and social support (MSPSS, ISEL). Judgements of cultural orientation using the HVIC were collected next.

Participants then evaluated the 24 situations (Table 5) in 10 blocks for social connectedness, social support, social engagement, valued relationship, shared identity, closeness, emotional support, informational support, instrumental support, and feedback support. The two dependent variables were presented first in a random order for each participant. These were followed by the eight predictor blocks, also presented randomly. Participants were asked to rate each situation (presented in a random order within each block) on each SAM[2] measure using a 10-point slider scale (shown in Table 6).

Following the ten blocks of judgments, participants first responded to the demographic questions and then to the Big 5 inventory (John & Srivastava, 1999b). Participants then responded to the 12 items that assessed network size, interaction frequency, interaction quality and network centrality. Finally, participants responded to the 4 items on the Loneliness Scale (Cornwell & Waite, 2009). At the conclusion of the survey, participants were debriefed, thanked for their participation, and redirected to Prolific for payment. Participants took approximately 40 minutes to complete the study.

3.3 Results

3.3.1 Hypothesis 1: Large individual differences in social connectedness and social support

We predicted that individuals would exhibit considerable variability in levels of social connectedness and social support across situations. Figure 7 shows each

participant's mean judgements across the 24 situations for social connectedness, social support, and the eight predictors. These distributions represent trait levels of these 12 measures within the population for these kinds of situations. Median levels around 5 for both social connectedness and social support indicate that many individuals typically experience them at moderate levels, accompanied by large individual differences. For social connectedness,

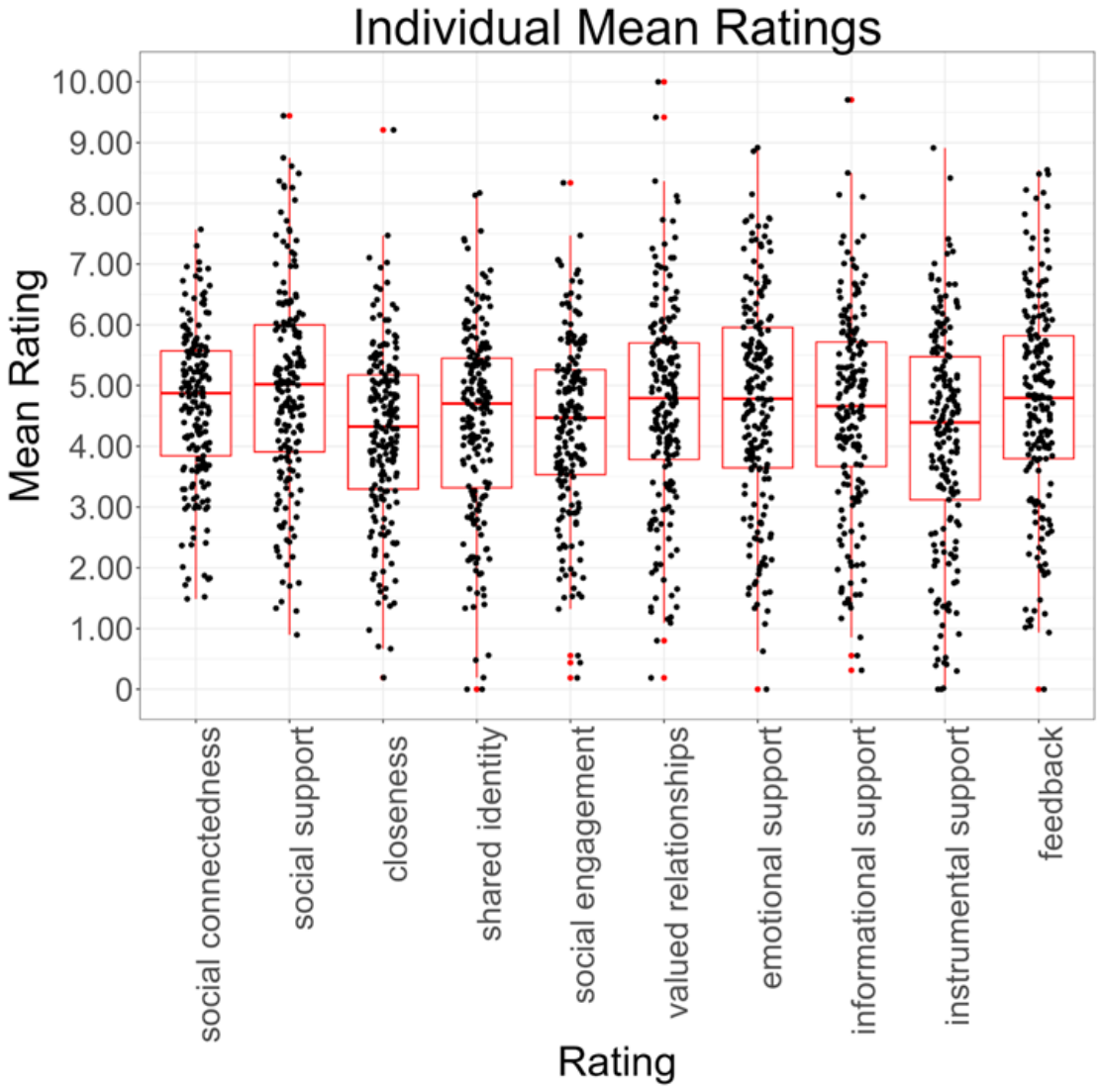


Figure 7. Box and whisker plots for social connectedness, social support, and the 8 predictors. Each point in a distribution represents the average for a single participant across the 24 situations. Each box and whisker plot shows the median for a measure and its interquartile range.

individual trait levels ranged from around 1.5 to 7.5; for social support, individual trait levels ranged from around 1 to 9. Across the same 24 situations, some individuals experienced very low levels of social connectedness and support, whereas others experienced very high levels.

The intraclass correlations in Table 6 further document large individual differences in judgments of social connectedness and support. In this context, an intraclass correlation establishes agreement between individuals in their judgments for each measure across the 24 situations, capturing the average pairwise correlation between participants. As can be seen, social connectedness exhibited agreement of only .33, and social support exhibited even lower agreement of .17. These relatively low values again indicate large individual differences, this time in how different individuals experience social connectedness and support in different situations.

The distributions of means for the eight SAM^2 predictors in Figure 7 offer further evidence for large individual differences. The relatively low-intraclass correlations for these measures in Table 6 further indicate that participants perceived these measures quite differently across situations.

As we just saw, SAM^2 establishes an overall trait-level measure of social connectedness and social support for each individual across the 24 situations. Of interest is how reliable these trait-level measures are. To assess test reliability, we used Cronbach's alpha (specifically ICC3k; Shrout & Fleiss, 1979), with the results shown in Table 6. As can be seen, satisfactory alphas occur well above the acceptable levels of .70 to .80, averaging around .90. Similar levels occur for the eight predictors, demonstrating that these SAM^2 measures also exhibit acceptable test reliability.

3.3.2 Hypotheses 2a and 2b: Substantial situational effects and situation by individual interactions

We predicted that the situation would have a substantial impact on an individual's levels of social connectedness and social support, with these levels varying situation by situation. We further predicted there would be a large situation by individual interaction for each measure, as levels of social connectedness and social support would depend heavily, not only the situation, but also on the individual.

Figures 8a and 8b strongly support these hypotheses. In each visualization, a row represents a participant's judgments for a measure (social connectedness in

Figure 8a; social support in Figure 8b). A column in each figure represents judgments for 1 of the 24 situations. Each cell represents a participant's

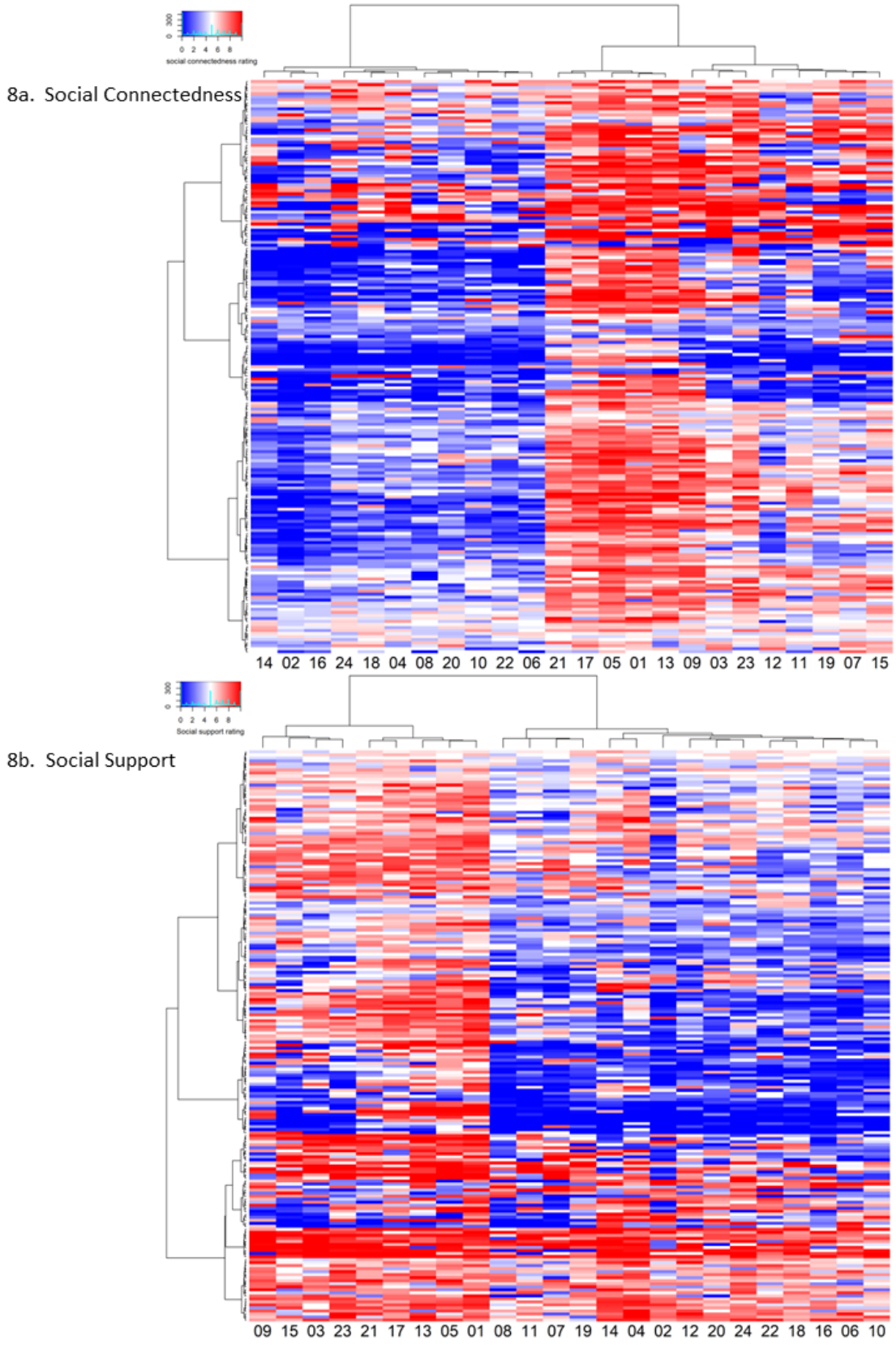


Figure 8. Visualizations of the social connectedness judgments (8a) and social support judgments (8b) for the 189 participants (rows) across the 24 situations (columns).
The 24 regularity judgments for each of the 189 participants are presented in a single row. The number below each column corresponds to the number of the corresponding situation in Table 5. As a cell becomes increasingly red, the judgment increasingly approached 10 (on a scale of 0 to 10; Table 6). As a cell becomes increasingly blue, the regularity judgment increasingly approached 0. As a cell becomes increasingly white, the regularity judgment increasingly approached 5. On the left, a hierarchical clustering dendrogram establishes groups of participants having similar vectors of values across situations (from hierarchical clustering with the Ward D measure). Across the top, a hierarchical clustering dendrogram establishes groups of situations having similar vectors of values across participants (again from hierarchical clustering with the Ward D measure).

judgment in a particular situation. The redder a cell, the higher judgment; the bluer the cell, the lower the judgment.

As can be seen, substantial situation effects are present. For both social connection and social support, some situations exhibit much higher (redder) levels than others, whereas others exhibit much lower (bluer) levels. A participant's social connectedness or social support is not constant across the situations but varies considerably. As can also be seen, however, trait-level differences for individuals are also present, as reflected in the average redness/blueness of a row.

Finally, Figures 8a and 8b both demonstrate substantial situation by individual interactions. As can be seen, individuals varied widely in the pattern of social connectedness or support they exhibited across the 24 situations (further reflected in the different clusters of individuals). The intraclass correlations in Table 6 for social connectedness and support quantify the magnitude of these interactions. Specifically, the average correlation between participants (rows) in their judgments of social connectedness across situations (columns) was only .33; the average correlation was an even lower .17 for social support. Participants differed considerably in how they experienced social connectedness and social support across situations.

Figure 8 Visualisations of the social connectedness and social support judgements

3.3.3 Hypotheses 3a and 3b: High construct and content validity for social connectedness and social support

To assess construct validity for the SAM^2 measures of social connectedness and social support at the group level, we assessed whether the predictors of each construct loaded on a common factor in a two-factor solution (from an exploratory factor analysis with a promax rotation). As the two-factor model in Figure 9 illustrates, the four predictors for social connectedness all loaded highly on a single factor, as did the four predictors for social support. Because the predictors of each core construct load highly on separate factors, they establish construct validity for the respective core construct. Interestingly, though, the two factors correlated strongly with each other in this oblique factor analysis (.8), indicating that they capture highly similar constructs.

Further evidence for construct validity at the group level comes from multilevel mixed-effect modelling. We ran two models, one predicting social connectedness and one predicting social support. Both models included all eight predictors as main effects, together with random intercepts for participants and situations, and with random slopes for individual predictors tested maximally (Barr et al., 2013a). For more detail on the regression pipeline, see the supplementary material – SM_1. All eight predictors were included in each model to assess whether some predictors cross over and predict both constructs, not just their own. Because we observed this pattern in step one of data collection for social support, we hypothesized that we would observe it again in the combined data analysis reported here.

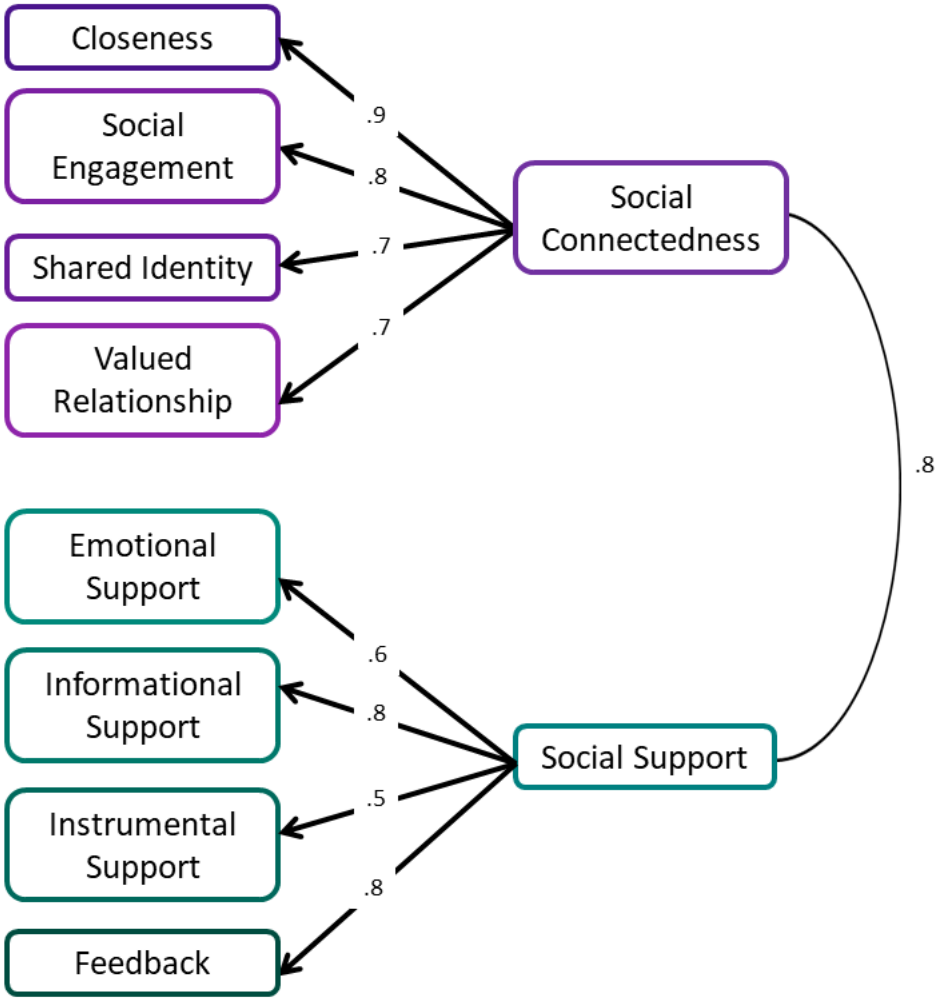


Figure 9. The two-factor solution from an exploratory factor analysis of the eight SAM2 predictors for social connectedness and social support using an oblique (promax) rotation.

Figures 10a and 10b present the standardized regression coefficients from these analyses (with their SEs) for main effects that were significant after maximal testing (i.e., assessing each coefficient's generalizability with its random

slopes). Consistent with Hypothesis 3a, the four predictors for social connectedness (in purple) all predicted social connectedness significantly, with social engagement being the strongest. For hypothesis 3b, we similarly found that the four predictors for social support predictors (in green) all predicted social support significantly, with emotional support being the strongest. Interestingly, however, as predicted, three of the social connectedness predictors also significantly predicted social support, with closeness being the second strongest predictor overall. Unexpectedly, instrumental support explained significant variance in social connectedness, although less than any of its hypothesized predictors. These overall findings provide further support for construct validity of the SAM² measures, but also further demonstrate the close relationship between social connectedness and social support.

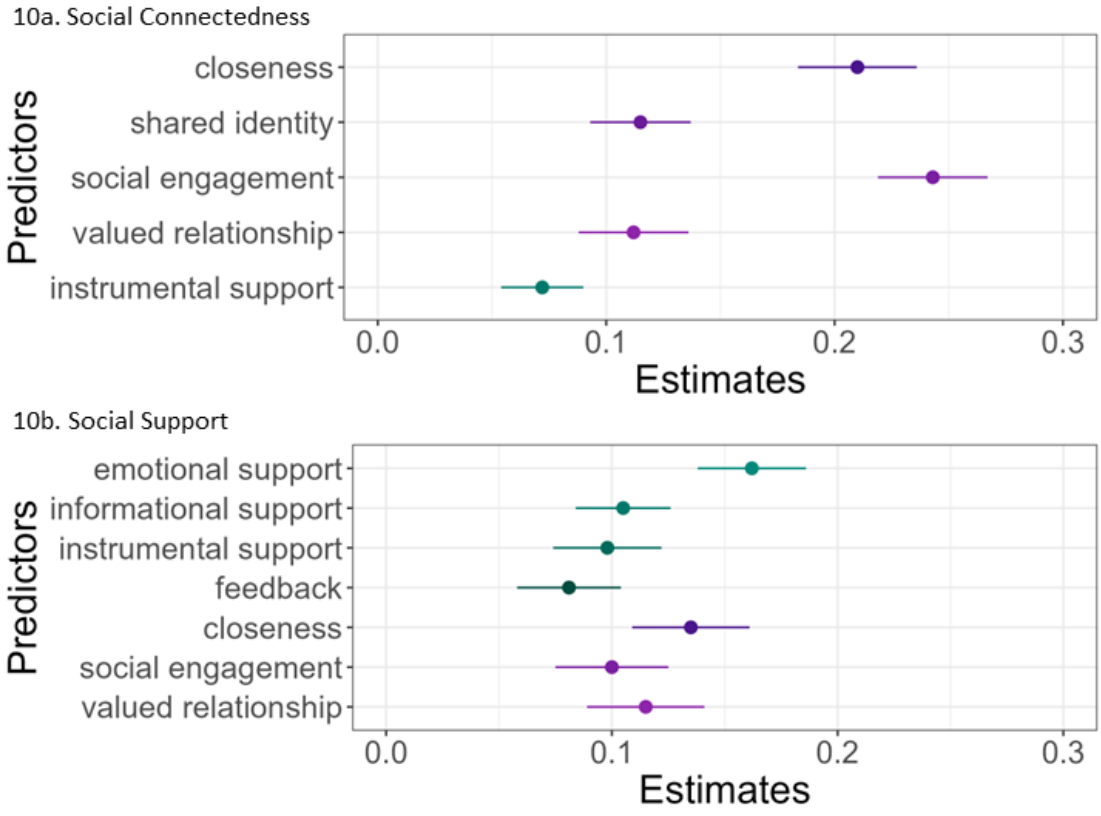


Figure 10. Estimated regression coefficients at the group level for the prediction of social connectedness (10a) and social support (10b). All coefficients are standardized and were established in regression models that included random intercepts, random slopes, and just the main effects. SM_1 provides details of the regression analysis procedure.

We next assessed construct validity at the individual level. For each individual, we computed the correlations between the eight predictors and social connectedness, and then computed the correlations between the eight predictors and social support. If construct validity holds at the individual level,

then the four predictors of social connectedness should tend to exhibit high correlations with social connectedness across individuals, and the four predictors of social support should tend to exhibit high correlations with social support.

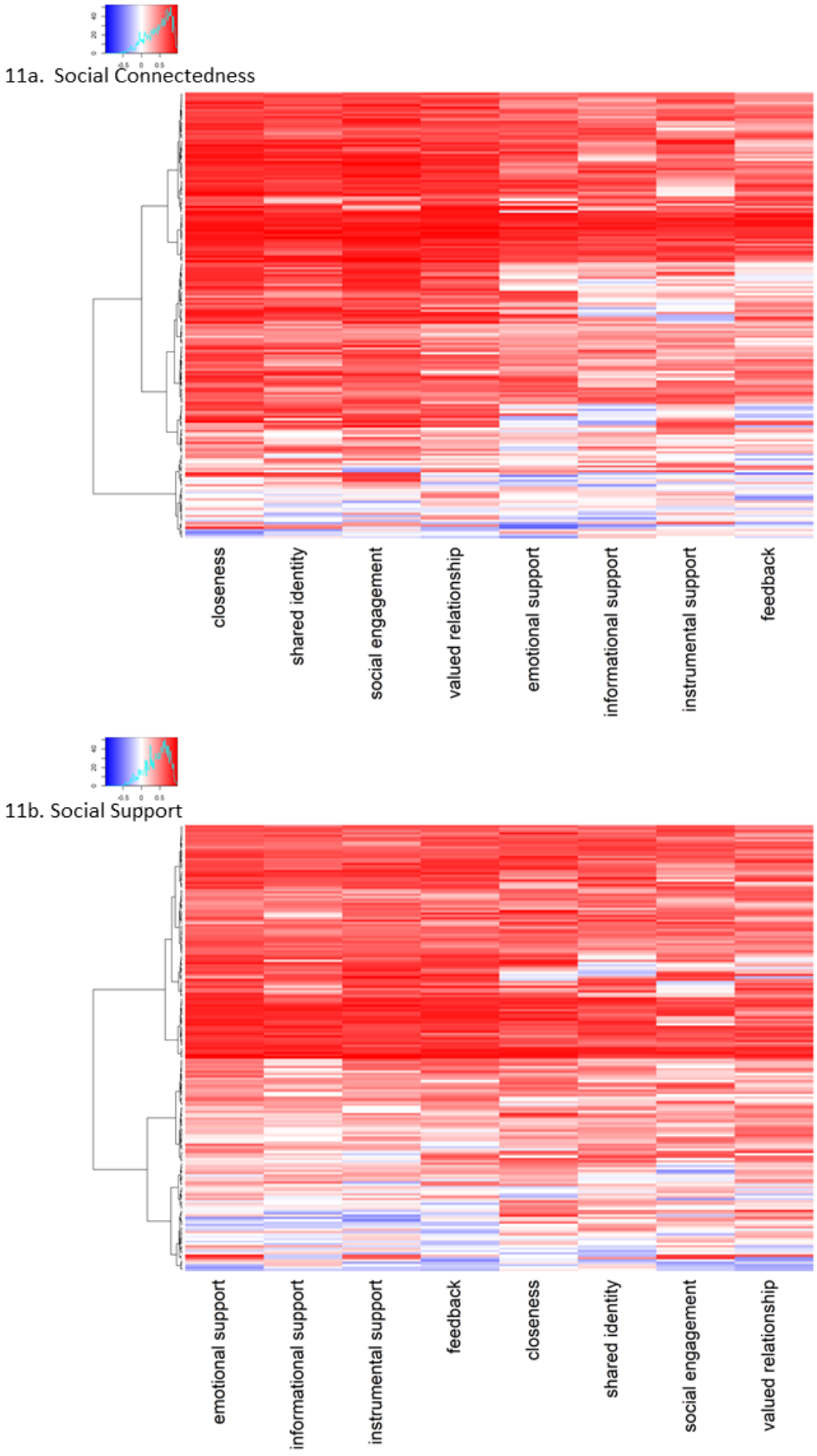


Figure 11. Visualizations of the correlations between the eight predictors and social connectedness (11a) and social support (11b). The 8 correlations for each of the 189 participants appear in a single row. As a cell becomes increasingly red, the correlation was increasingly positive. As a cell becomes increasingly blue, the correlation was increasingly negative. As a cell becomes increasingly white, the correlation increasingly approached 0. On the left, a hierarchical clustering dendrogram establishes groups of participants having similar prediction vectors (from hierarchical clustering with the Ward D measure).

Figures 11a and 11b visualize these correlations with each row representing an individual and each column representing the correlation with a predictor. As a cell becomes redder, the correlation approaches +1; as a cell becomes bluer, it approaches -1; as it becomes whiter is approaches 0. Table 7 summarizes these correlations, presenting the 25th, 50th, and 75th quartiles for each correlation across participants.

Table 7. Summary of the individual correlations between social connectedness, social support and the eight predictors.

	Closeness	Shared Identity	Social Engagement	Valued Relationships	Emotional Support	Informational Support	Instrumental Support	Feedback
Social Connectedness	.71 (.49—.82)	.64 (.38—.78)	.70 (.45—.82)	.64 (.38-.78)	.44 (.17—.68)	.35 (.13—.58)	.41 (.14—.61)	.36 (.10—.58)
Social Support	.51 (.27—.67)	.48 (.21—.63)	.40 (.16—.64)	.44 (.24-.61)	.54 (.27—.73)	.44 (.15—.66)	.53 (.23—.71)	.53 (.22—.73)

Note. For each dependent variable, the median correlation across participants is presented, followed by the interquartile range in parentheses. The median is the correlation at the 50th percentile, the first value in parentheses is the correlation at the 25th percentile, and the second value in parentheses is the correlation at the 75th percentile.

Figures 11a and 11b, together with Table 7, illustrate that the general pattern of prediction at individual level conformed to the pattern at the group level. For social connectedness, the most important predictors were its four predictors established from the literature. Also similar to the group level results, however, all eight predictors play comparable roles in predicting social support. As these results indicate, the SAM² measures of social connectedness and social support exhibit construct validity at both the group and individual levels, with the caveat that all eight predictors are clearly related to both constructs.

Finally, we assessed content validity of the SAM² measures for social connectedness and social support. Specifically, we hypothesized that the predictors for each construct would explain a relatively large amount of variance in it, demonstrating comprehensive coverage. To assess content validity at the group level, we established the amount of variance that the multi-level mixed effect modelling presented earlier explained in social connectedness and social support. Across different models, this modelling generally explained around 55% of the variance in social connectedness and around 50% of the variance in social support.

At the individual level, the variance explained was considerably higher, indicating that the variance explained at the group level was attenuated by large individual differences. Each point in Figure 12 represents the variance

explained in a simple linear regression for an individual, where the eight predictors were used to predict either social connection or social support across situations with no random effects or interactions. As can be seen, the median individual variance explained was 80.75% for social connectedness and 75.36% for social support. These high levels of explained variance indicate that the eight predictors comprehensively explain the constructs of social connectedness and social support at the individual level.

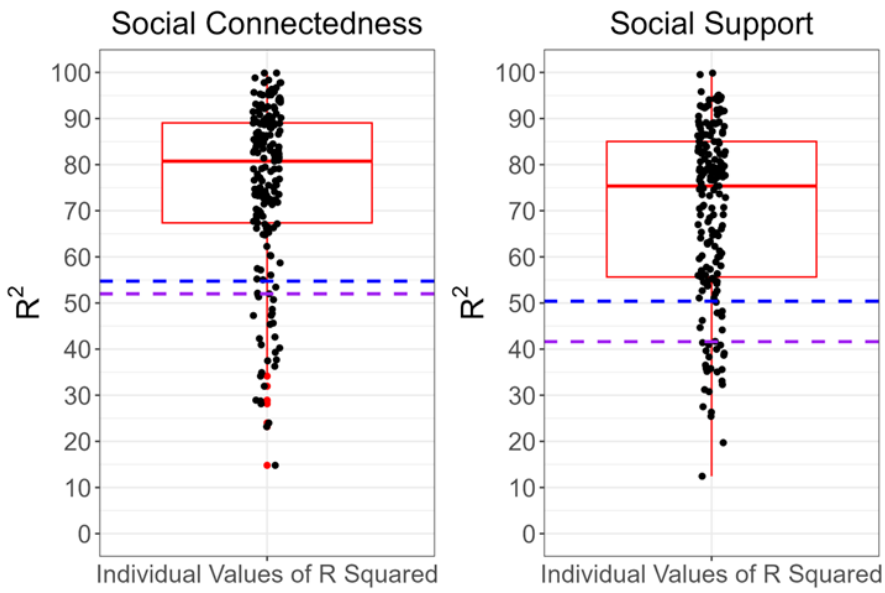


Figure 12. R^2 plotted as percentages for the individual regressions. Each dot is the R^2 for a participant's individual regression, where each regression predicts the individual's judgments of social connectedness or support from their judgments of social engagement, valued relations, shared identity, closeness, emotional support, informational support, instrumental support and feedback (with no interactions or random effects). Each box and whisker plot shows the median and inter-quartile range for the respective measure. The R^2 for the same main-effects-only individual model with no random effects or interactions when run at the group level is plotted as the lower dashed purple line. The R^2 for a group-level model with random intercepts is plotted as the upper dashed blue line.

3.3.4 Hypothesis 4: Low correlations between situated and unsituated measures.

We predicted that there would be low correlations of the SAM² measures for social connectedness and social support with their unsituated counterparts. Table 8 presents the relevant correlations.

As can be seen, correlations of the SAM² measures with their unsituated counterparts are higher than expected. The SAM² social connectedness measure correlated .55 with the unsituated social connectedness measure (SCS-R). The SAM² social support measure correlated .40 and .50, respectively with the unsituated social support measures (MSPSS and ISEL). These correlations are all

lower than correlation between the two SAM² measures, .72. As Table 8 illustrates, all these correlations were highly significant at $p<.001$.

3.3.5 Discovery

This study's preregistration noted that we had no hypotheses about results obtained from discovery analyses. These analyses focused on exploring correlations of the SAM² measures for social connectedness and support with measures for the Big 5 personality traits, individualism, collectivism, loneliness, social network quantity, and social network quality.

Table 8 presents the relevant correlations. As can be seen, SAM² social connectedness correlated weakly with UCLA loneliness (r = -.19) and had a significant moderate positive correlation with extraversion (r = .46) and collectivism (r = .37). Social support similarly correlated weakly with UCLA loneliness (r = -.19) and had significant positive correlations with extraversion (r = .44) and collectivism (r = .38).

Table 8. Pearson correlations between SAM² social connectedness and social support and the unsituated individual difference measures.

		2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.Collectivism
1.	SAM² Social Connectedness	.72+++	.55+++	.35+++	.43+++	.18	.30*	.07	.36*	.11	.42*	-.19	-.07	.46*	.20	.15	-.23	.09	.03	.37*
2.	SAM² Social Support		.54+++	.40+++	.50+++	.13	.32*	.15	.33*	.06	.45*	-.19	-.10	.44*	.23	.11	-.20	.10	-.02	.38*
3.	SCS-R			.56*	.72*	.15	.38*	.17	.39*	.07	.34*	-.55*	-.36*	.69*	.39*	.33*	-.49*	.11	-.07	.51*
4.	MSPSS				.71*	.10	.57*	.26*	.43*	.11	.29*	-.36*	-.26	.33*	.22	.14	-.06	.16	-.11	.41*
5.	ISEL					.16	.53*	.23	.46*	.07	.33*	-.59*	-.39*	.46*	.31*	.24	-.31*	.12	-.09	.40*
6.	Quantity Family						.19	.11	.10	.10	.13	-.11	-.01	.13	.06	.10	-.07	.01	.04	.13
7.	Quality Family							.15	.39*	.08	.28*	-.31*	-.23	.29*	.24	.29*	-.21	.07	.02	.33*
8.	Quantity Friends								.26*	.32*	.09	-.02	.03	.08	-.01	-.09	.09	.18	-.05	.08
9.	Quality Friends									.04	.43*	-.24	-.17	.21	.12	.12	-.12	.11	-.03	.18
10.	Quantity Colleagues										.08	-.01	.02	.06	.04	.00	.06	.12	.16	.10
11.	Quality Colleagues											-.16	-.09	.32*	.11	.14	-.18	.00	.07	.20
12.	UCLA Loneliness												.78*	-.38*	-.10	-.34*	.49*	.02	-.04	-.17
13.	Perceived Loneliness													-.20	.01	-.28*	.45*	-.01	-.04	-.02
14.	Extraversion														.21	.27*	-.40*	.16	.12	.41*
15.	Agreeableness															.34*	-.29*	.14	-.20	.47*
16.	Conscientiousness																-.47*	.01	.00	.28*
17.	Neuroticism																	.03	.03	-.20
18.	Openness																		-.02	.16
19.	Individualism																			.02

Note. The alpha level for all predicted correlations (one-tailed) was set at .05, where + indicates p < .05, ++ indicates p < .01, +++ indicates p < .001. The alpha level for all other non-predicted correlations (two-tailed) was Bonferroni adjusted for 183 correlations at the .05 threshold, * indicates p < .05.

Of further interest were the relationships between the SAM² measures and the social network measures. As Table 8 illustrates, all these correlations tended to be weakly to moderately positive. Perhaps the most striking result is that the SAM² measures tended to correlate much more highly with network quality (ranging from .30 to .45) than with network quantity (ranging from .06 to .18). Although minor differences appeared between family, friends, and colleagues, the same general patterns just described held across them.

Finally, we explored the different types of situations for their levels of social connectedness, social support, and the eight predictors. Figures 13a and 13b present the relevant results, contrasting the mean ratings for social versus non-social situations and for positive versus negative situations (where each dot is an individual's mean judgment across the relevant subset of situations). For the social versus non-social situations, all measures were slightly higher for the social situations. For the positive versus negative situations, however, all measures were much higher for the positive situations, especially for social connectedness and its related predictors. To test this further we ran mixed-

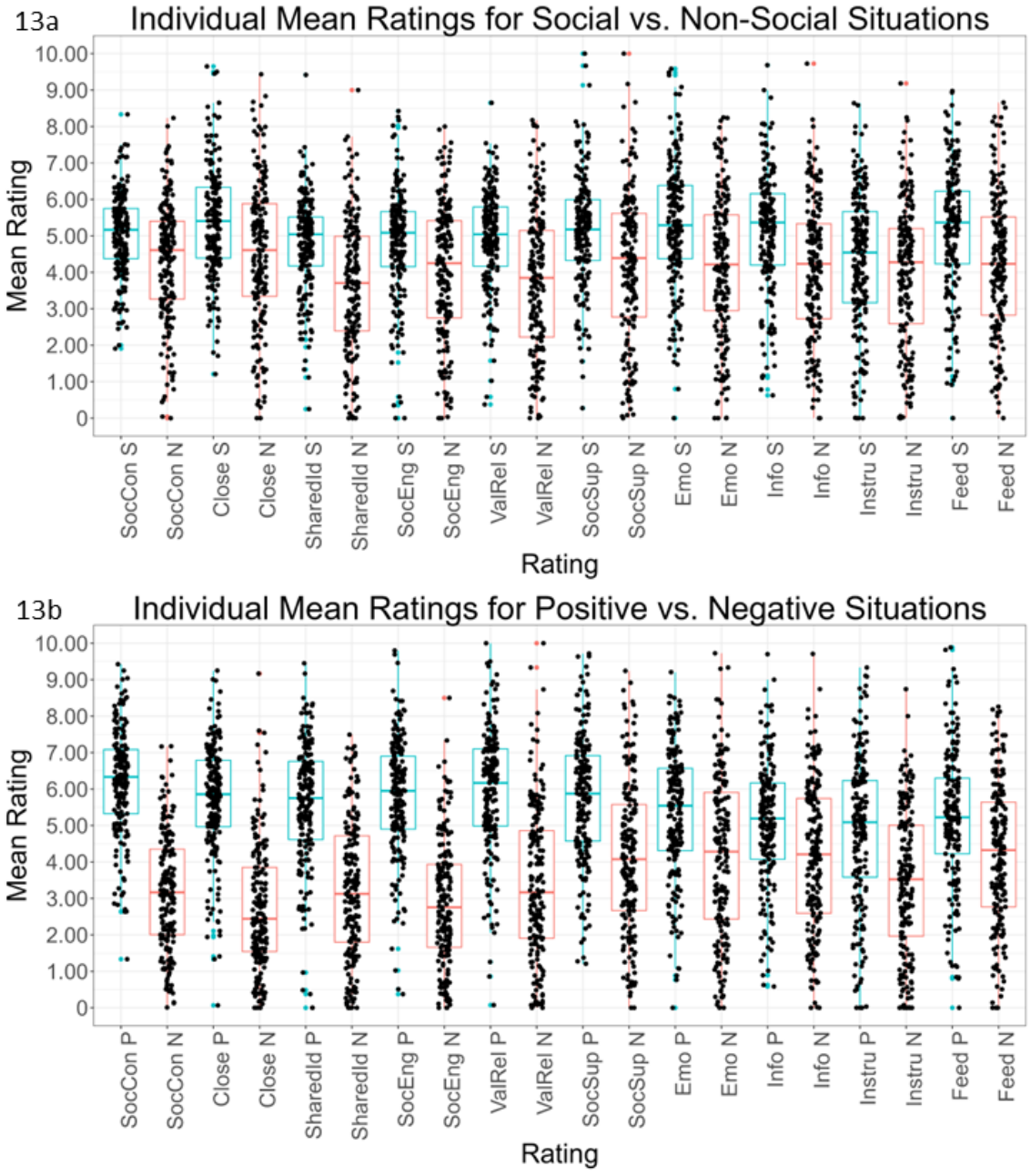


Figure 13. Mean individual judgments for each measure across the relevant subset of situations as a function of sociality (13a) and valence (13b). Each point in Figure 13a is the mean judgment for a participant across social situations (S) versus non-social situations (N). Each point in Figure 13b is the mean judgment for a participant across positive situations (P) versus negative situations (N). Each box and whisker plot shows the median and inter-quartile range for the respective measure

effect regressions that assessed sociality (social versus non-social situations), valence (positive versus negative situations), and their interaction as predictors for social connectedness, social support, and the eight predictors. All regressions included random intercepts and slopes for participants and situations. For all ten measures, the effects of sociality and valence were significant, except for the effect of sociality on instrumental support. Consistent with the pattern in Figure 13, the valence effect was larger than the sociality effect in every regression except for emotional support and informational support. For every measure, the interaction between sociality and valence was significant, indicating that every measure reached its maximal level when situations were both positive and social. For the full results see Supplementary Materials – SM_2.

3.4 Discussion

Using the Situated Assessment Method (SAM²; Dutriaux et al., 2021), we developed a new approach to assessing social connectedness and social support. Rather than assessing these constructs with unsituated test items—as in many psychometric instruments—we assessed them in specific situations where they're likely to occur. Additionally, we assessed factors that influence the experience of social connectedness and social support in these situations as well. Using this method, we established a rich descriptive profile of social connectedness and social support for each individual across different situations in their life.

3.4.1 Summary of results

Using the SAM² social connectedness and social support instrument, we established trait levels of social connectedness and social support in each individual (i.e., their mean judgment for each construct across 24 situations). The median value for each construct was around 5 for both (on a scale from 0 to 10), indicating moderate levels of social connectedness and support in our sample (Figure 7). More importantly, however, these trait-level assessments varied widely across individuals, indicating large individual differences. Whereas some individuals only experienced mean values of social connectedness and social support approaching 1, others experienced mean values approaching 9. Across situations, some individuals were highly socially connected and

supported, while others were much less. When Cronbach's alpha was used to assess the test reliability of these trait-level measures, we found acceptable levels around .9.

Not only did SAM² establish large differences between individuals in social connectedness and support, it also established large differences between situations (Figures 8a and 8b). Whereas some situations induced relatively high levels of social connectedness and support across individuals, others induced relatively low levels. Importantly, however, the large individual by situation interaction for each construct further indicated that individuals experience the same situations very differently. On average, the social connectedness experienced by one individual across situations only correlated .33 with the social connectedness experienced by another. Consistency across situations was even lower for social support (.17).

Using the rich data that SAM² provides, it becomes possible to establish an individual's unique experience of social connectedness and social support across situations. It also becomes possible to establish how individuals vary in their situational experience. Significantly, this variation indicates that social connectedness and social support are not solely caused by an external situation. Because different individuals experience social connectedness and support differently in the same situation, the situation itself can't be the sole cause of their experience. Instead, each individual's unique cognitive-affective system must be playing a central role (e.g., Bandura, 1978; Cervone, 2005; Dutriaux et al., 2021; Mischel & Shoda, 1995). It further follows from these interactions, that when measuring social connectedness and social support, it is necessary to assess them using subjective/cognitive measures (Haslam et al., 2015)— objective measures are not sufficient (e.g., an individual's amount social interaction or number of socially-connected individuals). Just knowing the situation is not sufficient to establish an individual's experiences of social connectedness and social support in them.

Finally, we demonstrated construct validity for both social connectedness and social support. As predicted, the four predictors for each construct loaded on separate factors, although there was considerable overlap between constructs. Consistent with the available literature on social connectedness (Hare-Duke et

al., 2019), identity, closeness, valued relationships and social engagement were all significant predictors of social connectedness. Interestingly, social engagement (engagement with other individuals in social activities) was the strongest predictor, followed by closeness (the level of mutual dependence with others). The importance of these predictors could reflect the fact that social engagement and becoming close with others are important first steps to establishing other elements of social connectedness (Hare-Duke et al., 2021). Being socially engaged with others allows an individual to develop closeness, valued relationships, a shared identity, and social support.

In contrast to social connectedness, social support was broadly predicted by all eight predictors, not just those for social support (especially at the individual level). Perhaps this reflects the importance of social connectedness for social support. Specifically, before one can request and receive social support from others, one must first feel socially connected with them.

The predictors for both social connectedness and social support exhibited high levels of content validity, explaining large amounts of variance in both. In group-level regressions, the predictors explained 50 to 55 percent of the variance in these constructs. In individual-level regressions, they explained 75 to 80 percent. Higher explanation at the individual level most likely resulted from large individual differences in social connectedness and support attenuating prediction at the group level. These results indicate that the eight predictors explain these constructs comprehensively.

3.4.2 Quality versus quantity of social interactions

As we saw earlier, low social connectedness and social support have a detrimental impact on mental and physical wellbeing (Cruwys et al., 2014; Haslam et al., 2015; Holt-Lunstad et al., 2010; Poscia et al., 2018; Snyder-Mackler et al., 2020; Zagic et al., 2022). Thus, it is not only important to develop accurate measures of social connectedness and support but also to establish effective interventions for increasing them as needed.

In discovery analyses, we contrasted the quantity versus quality of a person's social interactions. Across both SAM^2 and unsituated measures, the quality of an

individual's interactions correlated much more highly with social connectedness and social support than did the quantity of an individual's interactions. This suggests that interventions aimed at improving the subjective experience of relationships and interactions is of potentially greater benefit than interventions aimed at simply encouraging more social contact. We hasten to add, however, that increasing the quantity of social contact may be an important first step to increasing the quality of social interaction. As we saw earlier, social engagement was the best predictor of social connectedness and a strong predictor of social support. This suggests that to improve the quality of an individual's relationships, it may first be necessary to increase the quantity of their social engagement.

To date there has been little examination of the distinction between quality and quantity in interventions to increase social connectedness (Zagic et al., 2022), despite evidence that these factors are distinct and can have different impacts on health (Poscia et al., 2018). As one of the first to examine the difference in objective versus subjective interventions, Zagic and colleagues (2022) found that, overall, the quality of social connections was more important for wellbeing. They concluded that developing interventions to increase and maintain the quality of relationships should be the priority. This conclusion fits well with our finding that the quality of social interactions was more strongly related to social connectedness and social support than was the quantity of social interactions. Future research could further examine how to best measure these distinct facets of social interaction for tailoring related interventions appropriately.

3.4.3 Situational features associated with social connectedness and support.

In our discovery analyses, we compared social connectedness and support in social situations (situations that involved interactions with others) to non-social situations (situations where you would be by yourself). Upon visual inspection the differences appeared small, but they were on the whole significant. Interestingly, we found that the valence of a situation (whether it was positive versus negative) had a much more substantial impact on feelings of social connectedness and social support. When in positive situations, people

experienced much higher levels of social connectedness and social support than when they were in negative situations. Additionally, both social connectedness and support were at their highest in situations that were both positive and social, as indicated by consistent interactions between sociality and valence. It further follows that social connectedness and support are at their lowest in negative non-social situations.

Again, the subjective nature of experience appears important. As people feel better in a situation, they feel more socially connected and supported, even when by themselves. Future research could explore this relationship further and try to understand the mechanisms underlying it.

3.4.4 Limitations

Perhaps the primary limitation of this study is the correlational nature of its design and results. Although these results are informative and provide a rich picture of individual differences in social connectedness and social support, they do not establish causality. We cannot conclude that the eight predictors cause social connectedness or support but can only conclude that they are related. We cannot be sure, for example, that increasing social engagement will cause and increase social connectedness, even though they are closely related to one another.

Another potential limitation to note in the development of the SAM² social connectedness and social support instrument is the selection of the situations. These were not selected from a set of norms regarding situations people live through, but rather through discussion from our lab members. To develop the situations, initially 6 domains were chosen that have been used in previous SAM² work in the lab, that cover many aspects of human life. From these domains, multiple situations were generated that aimed to cover a broad and realistic range of situations. These were then narrowed down to the resulting 24 situations with an even sample from each domain, that were social, non-social, positive, and negative. Although this method of situation selection has the potential to introduce biases and potentially limit the validity of the measure this was most cost- and time-effective way to proceed with the development of SAM² social connectedness and social support instrument for this current thesis.

Future research and further development of the instrument could initially run a norming study on a sample of the population that social connectedness and social support is to be measured in. This would allow for an even more targeted instrument for the population of interest (e.g., older individuals, students, or a minority group etc.), thus ensuring the situations are relevant for the population in question.

3.4.5 Conclusion

The Situated Assessment Method (SAM^2) offers a novel approach to assessing the important constructs of social connectedness and social support. By assessing these constructs in situations, it becomes possible to establish rich descriptive profiles of them for specific individuals, and to further examine how different individuals vary in their responses to different situations. The SAM^2 measures of social connectedness and support developed here exhibit high levels of test reliability, construct validity, and content validity. By simultaneously assessing four predictors of social connectedness (closeness, shared identity, social engagement, and valued relationships), together with four predictors of social support (informational, emotional, instrumental, and feedback support), it becomes possible to further establish the factors associated with these constructs. Establishing such relationships can play an important role in defining and understanding social connectedness and support, an important step to developing research in this area.

Chapter 4: Using the Situated Assessment Method (SAM²) to measure social connectedness, social support, and loneliness before and during COVID-19

This chapter is an exact copy of the following preprint manuscript and has subsequently been submitted to European Journal of Social Psychology:

Taylor Browne Luka, C. & Barsalou, L. (2023) *Using the Situated Assessment Method (SAM²) to measure social connectedness, social support, and loneliness before and during COVID-19.* PsyArXiv. https://doi.org/10.31234/osf.io/j7kph

4 Abstract

Increased levels of social connectedness and social support, together with decreased levels of loneliness, have been consistently linked with good mental and physical health. To better understand these constructs, it is important to measure them accurately. In previous work, we used the Situated Assessment Method (SAM^2) to develop a situated psychometric instrument for measuring social connectedness and social support. The current work extended this instrument to also assess loneliness, and to assess all three constructs before and during COVID-19. As expected, we observed large individual differences, large situational variance, and large situation by individual interactions in social connectedness, social support, and loneliness. We also established underlying processes that explained high levels of variance in these constructs. Surprisingly, loneliness was unrelated to social connectedness and social support, but was explained well by underlying processes assessed with the SAM2 instrument. Interesting patterns emerged for all three constructs over the course of COVID-19.

4.1 Introduction

Not only are we an inherently social species, our physical and mental health depend considerably on the quality our social relationships (e.g., Cacioppo & Cacioppo, 2014; Gadermann et al., 2016; Hawkley & Cacioppo, 2010; Santini et al., 2015; Tough et al., 2017). The quality of our social relationships reflects our experience of feeling connected with other people and feeling supported by them. When we don't feel connected and supported, we may feel lonely instead. An interesting and important question is whether loneliness is simply the inverse of social connectedness and social support. Does an individual's loneliness increase as a simple function of their social connectedness and support decreasing? Additionally, can we decompose loneliness, social connectedness, and social support into a set of more specific, contributing factors, such as being engaged with others, feeling close, receiving their material support, and so forth? If so, are these factors differentially associated with loneliness, social connectedness, and social support? How comprehensively do they explain them? Are other factors important as well?

To begin addressing these issues, Taylor Browne Luka et al. (2023) developed a situated approach for measuring social connectedness and social support. We further demonstrated that this situated approach exhibited excellent psychometric properties for test reliability, construct validity, and content validity.

The recent COVID-19 pandemic, together with social distancing measures, offered a unique opportunity for further addressing these issues. Additionally, we wanted to address the relationship of loneliness to social connectedness and social support more closely. The study reported here was designed to achieve these goals.

4.1.1 Background

4.1.1.1 Social connectedness

Social connectedness refers to the perceived quality of an individual's social bond with other individuals (Lee & Robbins, 1995). Across the literature, however, there has been relatively little attempt to define social

connectedness. Recently, however, Hare-Duke and colleagues (2019) conducted a thematic synthesis of 28 studies that assessed individual experiences of social connectedness. Their analysis established five dimensions of social connectedness: *identity and common bond* (shared traits experienced with others), *closeness* (mutual dependence with others), *valued relationships* (relationships with high importance), *involvement* (engagement with other individuals in social activities), *cared for and accepted* (experiencing care and support from others). Notably, the dimension *cared for and accepted* is often also viewed as an aspect of social support (Chen et al., 2017; Martínez-Martí & Ruch, 2017) and so is not unique to social connectedness (indeed it seems more relevant to social support). It is therefore an open question what factors differentiate social connectedness and social support. Establishing the underlying factors will contribute to understanding these important social constructs, measuring them, and designing interventions to increase them.

4.1.1.2 Social support

In comparison to social connectedness, social support has been better defined in the literature. Within the social support literature, three constructs have played central roles: social embeddedness (connections that individuals have to significant others in their social environments); perceived social support (cognitive appraisal of being reliably connected to others, perceived availability and adequacy of supportive ties); and enacted support (actual actions that others perform when they render assistance to a focal person; Barrera, 1986).

Perceived social support is typically the most common way that social support has been conceptualized and assessed, as opposed to objective social support (Gariépy et al., 2016). To follow this tradition, subjective social support will also be the focus of our work here. Perceived social support has been consistently broken down into four dimensions (House, 1981; Langford et al., 1997; Muñoz-Laboy et al., 2013): *emotional support* (primarily in the form of empathy, concern, love, trust, and care), *appraisal support* (useful feedback about how one handles a particular situation), *informational support* (information and advice provided by others that is helpful to aid one during a difficult time), and *instrumental support* (provision of relevant goods and services).

4.1.1.3 Loneliness

Loneliness occurs when people have feelings of being alone. Loneliness is often viewed as a subjective construct that occurs when people perceive an unpleasant mismatch between their desired level of meaningful social relationships and what they perceive these relationships to actually be (Hawkley & Cacioppo, 2010). Systematic reviews have shown that loneliness is a risk factor for higher mortality, comparable with obesity and smoking (Holt-Lunstad et al., 2010, 2015). Loneliness has also been linked to poorer mental health (Leigh-Hunt et al., 2017; Wang et al., 2018). As a construct, loneliness has only been moderately linked to objective social measures, such as social network size, but has been more closely linked with subjective social measures. Studies have found loneliness to be closely related to perceived social support and social identity (the latter being a dimension of social connectedness; Mann et al., 2017; Wang et al., 2018). From this perspective, loneliness interventions have been oriented towards increasing an individual's perceptions of social connectedness and social support (J. I. Chen et al., 2020; Lloyd-Evans et al., 2020; Mann et al., 2017).

4.1.2 Social connectedness, social support, and loneliness during COVID-19

To prevent the rapid spread of the COVID-19 virus, numerous countries employed measures of social distancing, such as lock-downs, where in-person contact was extremely limited. Research has found significantly lower levels of self-reported social connectedness in university students during the COVID-19 pandemic, although this decline was small (Folk et al., 2020). A review of the literature found that loneliness did indeed increase during the pandemic, although the effect size again was small (Ernst et al., 2022). Tull et al. (2020) found that loneliness increased with stay-at-home orders, although they also found evidence for increased social support. These findings could suggest that the wide-spread shared experience and potential shared identity of COVID-19 may increase closeness and thus social connectedness. It is worth exploring the relationship between social connectedness, social support, and loneliness to further examine the impact COVID-19 may have had on these social experiences.

Unique to COVID-19 lockdown was wide access to technology that may have helped reduce feelings of loneliness and social isolation, along with related mental health problems (Saltzman et al., 2020). Ellis et al. (2020) found that adolescents frequently reached out to friends using virtual means, such as texting and online video chats. Interestingly, Ellis et al. further found that virtual time with friends was related to higher depression but also to lower loneliness. Finally, Ellis et al. found that social media use during the initial crisis was related to higher depression but was unrelated to loneliness.

4.1.3 The Situated Assessment Method (SAM²)

Inspired by the theoretical perspectives of situated, embodied, and grounded cognition, we have developed a new approach for profiling health behaviors at both the individual and group levels (Aydede & Robbins, 2009; Barsalou, 1999, 2008, 2016; Coello & Fischer, 2016; Newen, Bruin, & Gallagher, 2018). To date, we have applied this approach effectively to common habits, eating, drinking, stress, trichotillomania, mindfulness, wellbeing, social connectedness, and social support. Because this approach is grounded in two dimensions of situatedness—situational experience and the situated action cycle—we call it the *Situated Assessment Method* (SAM^2). For a general introduction and review, see Dutriaux et al. (2021).

Current measures of social connectedness, social support, and loneliness are unsituated. These measures are unsituated because they ask individuals to evaluate these constructs using general decontextualized items that abstract over the situations where these experiences occur. Consider, for example, an item from the Social Connectedness Scale-Revised, that assesses social connectedness: “I feel close to people” (Lee & Robbins, 1995). To evaluate this item, individuals must abstract over many situations in their life to estimate the overall closeness they experience across them. These unsituated measures most likely capture some individual differences in social connectedness, social support, and loneliness but do so via abstract assessments, not situated assessments. Consequently, unsituated measures may instead reflect intuitive theories and general impressions about oneself more than experiences of actual connection, support, and loneliness in real-life situations. Much research demonstrates the importance of not only performing trait-level assessments of a

construct but also capturing situational variability in the construct, often unique to each individual (e.g., Bandura, 1978; Cervone, 2005; Cervone et al., 2001; Dutriaux et al., 2021; Fleeson & Jayawickreme, 2021; Mischel & Shoda, 1995). Not capturing situational aspects of social connection, social support, and loneliness is likely to limit our understanding of how these important constructs materialize in specific situations for an individual, further limiting our abilities to measure and change them.

In contrast to unsituated methods, SAM² assesses individual differences in situational experience of a target domain. Instead of asking individuals to generalize about the behavior across situations without explicitly considering specific situations, SAM² first identifies relevant situations in the domain of interest, and then asks individuals to assess their behavior in each. Once relevant situations for a target behavior have been sampled, SAM² then evaluates each goal-directed action in each situation from the perspective of the *situated action cycle*. The situated action cycle captures the typical structure of the situations that iterate throughout daily experience, beginning with cognitive and affective evaluation of cues in the environment, ultimately leading to actions and outcomes. Assessing the situated action cycle for each individual further informs how a construct behaves for them in specific situations, and more generally, supports establishing construct validity and content validity for SAM² instruments. For a more detailed account the SAM² method and its psychometric properties, see Dutriaux et al. (2021).

4.1.4 Overview and hypotheses

To establish profiles of social connectedness, social support, and loneliness for specific individuals before and during the COVID-19 pandemic, we utilized the SAM² approach just described. Participants evaluated the 16 situations in Table 9 twice at the same time, first evaluating their experience before COVID-19 and then evaluating their experience during COVID-19 (when this study took place). The 16 situations evaluated covered a range of scenarios that were social and non-social, online and offline, positive and negative. Situations were specifically chosen that were deemed possible both before COVID-19 and also during subsequent lockdown measures.

Table 9. The 16 situations that participants evaluated, varying in domain, online status, sociality, and valence.

Item	Domain	Situation	Sociality	Valence
Online Situations				
1	Relationships	Having a friendly conversation with a neighbour outside	Social	Positive
2	Relationships	Waving and smiling when running into a friend while outside on a walk	Social	Positive
3	Housing	Having a difficult a conversation with a neighbour about noise levels in your home	Social	Negative
4	Identity costs	While at the supermarket, another shopper is rude to you	Social	Negative
5	Achievement	Successfully meeting a tight deadline you have	Non-social	Positive
6	Leisure	Reading a good novel in the evening	Non-social	Positive
7	Housing	A household appliance breaks	Non-social	Negative
8	Health	Feeling anxious and unable to sleep	Non-social	Negative
Offline Situations				
9	Relationships	Having a heart-to-heart with a friend via instant/text messaging	Social	Positive
10	Relationships	Catching up with family over video chat	Social	Positive
11	Identity costs	A friend criticises you on social media	Social	Negative
12	Relationship	Having a difficult conversation with a family member on the phone	Social	Negative
13	Finance	Finding a good deal in an online shop	Non-social	Positive
14	Leisure	Watching funny online videos	Non-social	Positive
15	Leisure	Having Wi-Fi cut out in the middle of streaming a film	Non-social	Negative
16	Finance	Monitoring your finances online to ensure you can afford necessities	Non-social	Negative

Across 11 blocks of judgments, the 16 situations were evaluated using the scales in Table 10 that assessed social connectedness, social support, loneliness, eight predictors of social connectedness and social support, and one additional scale that assessed how frequently each situation occurred. The eight predictors for social connectedness and social support were established through reviewing the literature and then evaluating them psychometrically in Taylor Browne Luka et al. (2023). For social connectedness, the four predictors were social engagement, closeness, shared identity, and valued relationships. For social support, the four predictors were emotional support, informational support,

Table 10. The 12 questions and the scales used by participants to evaluate the 12 measures in this study, together with their inter-rater agreement and test reliability across the 32 situations (16 before COVID, 16 during COVID; Table 9).

Measure	Rating Question	Scale Label	Agreement between individuals	Test reliability of overall participant scores
Frequency	How frequently do you experience this situation?	0-10 (never experienced, monthly, daily)	.72	.82
Social Connectedness	When this situation occurs, how much social connectedness do you experience?	0-10 (completely unconnected, moderately connected, strongly connected)	.29	.90
Social Support	When this situation occurs, how much social support do you experience?	0-10 (no support, moderate support, extensive support)	.14	.95
Loneliness	When this situation occurs, how lonely do you feel?	0-10 (not at all lonely, moderately lonely, completely alone)	.11	.95
Social Engagement	When this situation occurs, how social engaged do you feel?	0-10 (completely unengaged, moderately engaged, strongly engaged)	.35	.91
Valued Relationships	When this situation occurs, how much do you experience having a valued relationship with others?	0-10 (no valued relationship, moderate valued relationship, highly valued relationship)	.25	.94
Shared Identity	When this situation occurs, how much of a shared identity do you experience with others?	0-10 (no shared identity, moderate shared identity, highly shared identity)	.26	.93
Closeness	When this situation occurs, how much closeness do you experience with others?	0-10 (no closeness, moderate closeness, intense closeness)	.26	.93
Emotional Support	When this situation occurs, how much emotional support do you receive from others?	0-10 (no emotional support, moderate emotional support, extensive emotional support)	.18	.95
Informational Support	When this situation occurs, how much helpful advice and useful information do you receive from others?	0-10 (no helpful advice, moderate helpful Advice, extensive helpful advice)	.11	.95
Instrumental Support	When this situation occurs, how much relevant goods and services are available to you from others?	0-10 (no goods and services, moderate goods and services, extensive goods and services)	.11	.95
Feedback	When this situation occurs, how much useful feedback do you receive from others about how you're handling it?	0-10 (no useful feedback, moderate useful feedback, extensive useful feedback)	.11	.95

Note. Interrater agreement was computed using the ICC function for intraclass correlations in the R Psych package. The values shown are the ICC2 that takes random effects into account, such that these values are likely to generalise across other samples of participants from the same population. For each SAM² measure, the right column presents coefficient alpha (ICC3k), which estimates the stability of individual scores across assessment occasions (i.e., test reliability; Shrout & Fleiss, 1979). Values of alpha are shown for scores that were aggregated across the 16 situations in Table 9 assessed twice for before-COVID and during-COVID, for a total of 32 situations (computed with the ICC function in the R Psych package). ICC3k estimates fixed-effect values, assuming that the test instrument contains the same 32 situations across test occasions.

instrumental support, and feedback. For further detail on the development and testing of the initial SAM^2 instrument, see Taylor Browne Lūka et al. (2023).

The following hypotheses and discovery for the study were pre-registered on OSF (osf.io/fvgz2/). The motivation for many of the specific predictions included reflect findings that Taylor Browne Luka et al. (2023) observed in two samples (also preregistered on OSF; osf.io/8wf5t).

Hypothesis 1: Large individual differences will be observed for SAM^2 social connectedness, social support, and loneliness. We predicted that individuals would exhibit considerable variability in overall trait levels of social connectedness, social support, and loneliness across the 16 situations.

Hypothesis 2: Social connectedness, social support, and loneliness will be related in predicted ways. We predicted that social connectedness and social support would be positively related at a moderate level (0.4 to 0.6), with each related negatively to loneliness. We further predicted that each measure would exhibit unique variance. Finally, we predicted that the predictors for social connectedness and social support would load on different factors in an exploratory factor analysis but be highly correlated.

Hypothesis 3a: The predictors associated with social connectedness will significantly predict social connectedness. We predicted that social engagement would be the most important predictor, followed by closeness, valued relationships, and shared identity. We expected that the social support measures would not be important.

Hypothesis 3b: The predictors associated with social support will significantly predict social support. We predicted that informational support would be the most important predictor followed by emotional support, instrumental support, and feedback. We expected that some of the social connectedness measures would be important as well.

Hypothesis 4: Excellent prediction of social connectedness, social support, and loneliness for individuals. We predicted that SAM^2 modelling would explain large amounts of variance in social connectedness, social support, and loneliness

for *individual* participants. We further predicted that prediction at the individual level would be higher than prediction at the group level, given large individual differences in social connectedness, social support, and loneliness (Hypothesis 1). Although the overall patterns of prediction at the group and individual levels should be comparable, large individual differences in the importance of specific predictors should emerge as well.

Hypothesis 5: Individuals in single-occupancy households will differ in predicted directions from individuals in multiple-occupancy households in their levels of social connectedness, social support, and loneliness, with the COVID-19 lockdown having a greater impact on individuals in single-occupancy households. We expected that individuals living in single-occupancy households would have lower social connectedness, lower social support, and higher levels of loneliness than individuals living in households with at least one other person. We further predicted single occupancy households would observe more change in levels of social connectedness, social support, and loneliness in the months before and during the COVID-19 pandemic.

Hypothesis 6: Social connectedness, social support, and loneliness, will be related to perceived stress in predicted directions. Specifically, we expected that stress would decrease as social connectedness and social support increased but that stress would increase as loneliness increased. We further predicted that the eight SAM^2 predictors would explain the relationships of perceived stress to social connectedness, social support, and loneliness, demonstrating their explanatory power and construct validity.

Hypothesis 7: Social connectedness, social support, and loneliness will be related to SES in predicted directions. We expected that an individual's social connectedness, social support, and loneliness would be related to their socioeconomic status (SES). Decreasing SES would be associated with less social connectedness and social support and with more loneliness. Again, we predicted that the eight SAM^2 predictors would explain this relationship.

Hypothesis 8: Social connectedness, social support, and loneliness will be related to social network size and quality in predicted directions. We predicted that social network quantity and quality would correlate positively

with both social connectedness and social support but would correlate negatively with loneliness (all at low to moderate levels; 0.3 to 0.5). Again, we predicted that the eight SAM² predictors would explain these relationships.

Hypothesis 9: Social connectedness, social support, and loneliness will be related to extroversion and neuroticism in predicted directions. We expected that extraversion, as measured by the Big 5 Inventory, would correlate positively with social connectedness and social support but negatively with loneliness. Conversely, we predicted that neuroticism, as measured by the Big 5 Inventory, would correlate negatively with social connectedness and social support but positively with loneliness. Again, we predicted that the eight SAM² predictors would explain these relationships.

Discovery 1: Did the perceived levels of social connectedness, social support, and loneliness differ before and during the COVID-19 pandemic (no specific predictions)?

Discovery 2: Did the levels of social connectedness, social support, and loneliness experienced differ depending on the mode of interaction in a situation (online vs. offline; no specific predictions)?

Discovery 3: Was loneliness predicted by the predictors for social connectedness and for social support (no specific predictions)?

4.2 Methods

4.2.1 Participants

Participants were recruited via Prolific where they had to meet the following criteria: UK residents, >18 years old, first language English, used social media in the last month, completed at least 10 Prolific studies, had at least a 95% approval rate on Prolific, had not participated in similar previous studies (including Taylor Browne Luka et al., 2023). Participants were recruited in two groups. Participants in the first group were required to have at least one member, other than themselves, in their household; participants in the second group were required to live alone. These groups were selected using Prolific's

filtering criteria. According to these criteria, 106 participants were classed as multiple occupancy and 107 as single (*n* = 213).

A series of checks was performed on the data to ensure their quality, and 10 participants were removed for failing to meet checks on duration, standard deviations, flatlines, and a diagnostic correlation (i.e., outliers). This resulted in 100 participants in the multiple occupancy group and 103 in the single occupancy group (according to Prolific), leaving a total sample size of 203. Because circumstances in one's household can change after answering the occupancy question on Prolific, we also asked participants to state how many people other than themselves currently lived in their household. Based on this question, our sample included 74 single occupancy participants, 127 multiple occupancy participants, and two who left this question blank (both were classified as single occupancy for later analyses, given that this was their status according to Prolific). All later analyses used this partitioning of single-occupancy versus multiple-occupancy participants. Participants were compensated £5 for taking part in the study (a rate of approximately £7.50/hour) and were paid through Prolific.

4.2.2 Design.

All participants evaluated the same 16 situations in Table 9 (8 offline, 8 online, 8 social, 8 non-social, 8 positive, 8 negative) with respect to frequency, three dependent variables (social connectedness, social support, and loneliness) and eight predictors based on the literature (Table 10). After completing these situated judgments, all participants received unsituated surveys for The Big 5, loneliness (at the individual level), network measures (assessing the size, frequency and quality of individual networks), the Perceived Stress Scale, and measures of socioeconomic status.

4.2.3 Materials.

4.2.3.1 Situations

Situations were sampled that covered a broad range of experience. All situations could have reasonably occurred for most people before the COVID-19 pandemic and lockdown and then again during the pandemic and lockdown. Besides

attempting to cover as many domains of everyday experience as possible, we also included an equal number of offline and online situations, social and non-social situations, positive and negative situations, in a fully-crossed design (see Table 9).

4.2.3.2 The Big Five Inventory (BFI, (John & Srivastava, 1999b)

The BFI is a self-report questionnaire containing 44 items that assessed an individual on each of the Big Five Factors of personality (Goldberg, 1993). The 44 items are short statements that refer to the characteristics of extraversion, conscientiousness, neuroticism, agreeableness, and openness to experience. Participants are asked to rate themselves on each statement, ranging from 1 (strongly disagree) to 5 (strongly agree). The BFI yields high internal consistency for each of the five factors (α = 0.79 to 0.86; Srivastava et al., 2003) and good test-retest reliability for each of the five factors (r = 0.79 to 0.83; Arterberry et al., 2014; Gosling et al., 2003).

4.2.3.3 Loneliness Measures

Loneliness was measured using the UCLA-3 (Hughes et al., 2004) Scale containing 3 items such as “how often do you feel isolated from others?”. Items are rated on a scale of 1-3, from hardly ever to often. Higher scores indicate higher loneliness, with 9 being the maximum and 3 the minimum score. It exhibits reasonable test-retest reliability (α = 0.70; Cornwell & Waite, 2009). We also asked one additional question to assess perceived loneliness: “How often do you feel lonely?”. Scores on this scale range from (0)-Never to (4)-Always, where higher scores demonstrate higher levels of perceived loneliness.

4.2.3.4 Social network measures

The present study collected an additional 12 questions that assessed an individual’s personal networks across three subsets of individuals: (1) family members, (2) friends and/or partners, and (3) co-workers and/or fellow students. Each subset was assessed with the same four items that measured the quantity and the quality of interactions. Specifically, the following two questions assessed quantity of interactions: “How many [family members/close friends/co-workers] have you interacted with regularly in the past year, where regularly

means at least once a month?" and "On the average, across these particular [family members/close friends/co-workers], how many times do you interact each month?". Participants could respond to these questions with any numeric value. To establish the quantity of interaction for each subset, the mean of the two values was calculated. To assess the quality of an individual's interactions, the following two questions were asked: "On the average, across all these interactions, how would you rate the quality of the interactions?" and "In this group of [family members/close friends/co-workers], how central, on average, are you to the interactions among them versus how peripheral?" To these questions participants could respond on a sliding scale from 0 (Extremely Bad/Extremely Peripheral) to 10 (Extremely Good/Extremely Central). The mean of these two questions was used to assess the quality of interactions for an individual in each subset.

4.2.3.5 Perceived Stress Scale (PSS, Cohen et al., 1983)

The PSS measures how much stress an individual has been experiencing recently in their life. Here we used the 10-item version of the scale (PSS 10), which includes items such as, "In the last month, how often have you been upset because of something that happened unexpectedly?". The ten items refer to the last month and are rated on a scale of 0 (never) to 4 (very often). The PSS 10 has been shown to have good internal consistency (α = 0.74 to 0.91) and good test-retest reliability ($r > 0.70$) (E.-H. Lee, 2012).

4.2.3.6 Socioeconomic Status (SES)

To assess socioeconomic status, we asked a range of questions that covered education, employment, income, and perceived socioeconomic status currently and during childhood. We also asked about current working conditions during the pandemic and whether individuals had access to their own private gardens. Due to inconsistencies and inaccuracies in reporting some of these factors, the following analyses focus on the questions assessing perceived SES and perceived childhood SES. These were measured with 3 statements each. For current SES these were: "I feel I live in a relatively wealthy neighbourhood"; "I feel relatively wealthy compared to others"; "I feel I have enough money". For childhood SES theses were: "I feel my family had enough money for things when

I was growing up"; "I feel I grew up in a relatively wealthy neighbourhood"; when I was a child, I felt relatively wealthy compared to other children my age". For each statement, participants could respond on a sliding scale from 0 to 100, anchored with the labels *strongly disagree* to *strongly agree*.

4.2.4 Procedure.

After being referred from Prolific, all participants performed the study online using the Qualtrics platform. Participants first received an information sheet about the study and were asked to provide informed consent. Ethical approval was granted from the College of Science and Engineering Ethics Committee at the University of Glasgow (approval 300190229, 29th April 2020).

Participants then evaluated the 16 situations in 12 blocks for frequency, social connectedness, social support, loneliness, social engagement, valued relationship, shared identity, closeness, emotional support, informational support, instrumental support, and feedback. Frequency was always presented to the participants first so that it wasn't inflated by seeing the same situations repeatedly. The three dependent variables (DVs) were then assessed in a random order for each participant so that they wouldn't be influenced by the predictors. The DVs were then followed by the eight predictor variables which were also presented randomly. Table 10 provides the judgment scales that participants evaluated across these 12 blocks of judgments (for a total of 192 judgments).

In each block of judgments, participants received the 16 situations in a different random order. On each trial, participants evaluated 1 of the 16 situations in Table 9 for 1 of the 12 measures in Table 10. Two judgments were made on each trial. The first judgment evaluated the measure for the situation "in the months before the COVID-19 pandemic." The second judgment evaluated the measure for the situation "during the COVID-19 pandemic." In many analyses, when the two different measures were not relevant for the hypothesis being tested, they were averaged to create a single measure for the trial. When relevant for a hypothesis, they were analyzed separately.

Following the twelve blocks of judgments, participants provided demographic information for instruments that assessed SES, social networks, the Loneliness

Scale, the Big 5 inventory, and the Perceived Stress Scale. Finally, participants were debriefed, thanked for their participation, and redirected back to Prolific.

Participants typically took about 40 to 45 minutes to complete the study.

4.3 Results

All data files and analysis scripts used to produce the results reported here can be found on OSF (osf.io/fvgz2/).

Prior to presenting results that bear on the preregistered hypotheses, we first present preliminary results that document the substantial effects of situations on individual judgments of social connectedness, social support, and loneliness. According to the SAM^2 framework, these constructs shouldn't simply be viewed as traits that remain constant across situations. To capture these constructs for an individual, it's essential to see how they vary. Figures 14a, 14b, and 14c document the large situation effects present for social connectedness, social support, and loneliness, respectively.

In each heatmap, a row visualizes a participant's judgments for a construct, with each column containing judgments for 1 of the 16 situations (averaged across the before-COVID and during-COVID judgments). The redder the cell, the higher the judgment for social connectedness, social support, or loneliness; the bluer the cell, the lower the judgment; the whiter the cell, the more moderate the judgment. The overall redness of a row represents an individual's trait-level of social connectedness, social support, or loneliness. Analogously, the overall redness of a column represents a situation's overall level of social connectedness, social support, or loneliness. Finally, the considerable variation in the patterns across rows (captured by the clustering solution on the left) demonstrates how much individuals vary across the same situations (i.e., individual by situation interactions). Different individuals experience social connectedness, social support, and loneliness very differently across the same 16 situations.

These results confirm a core assumption of the SAM^2 framework: Individual traits for social connectedness, social support, and loneliness are not constant

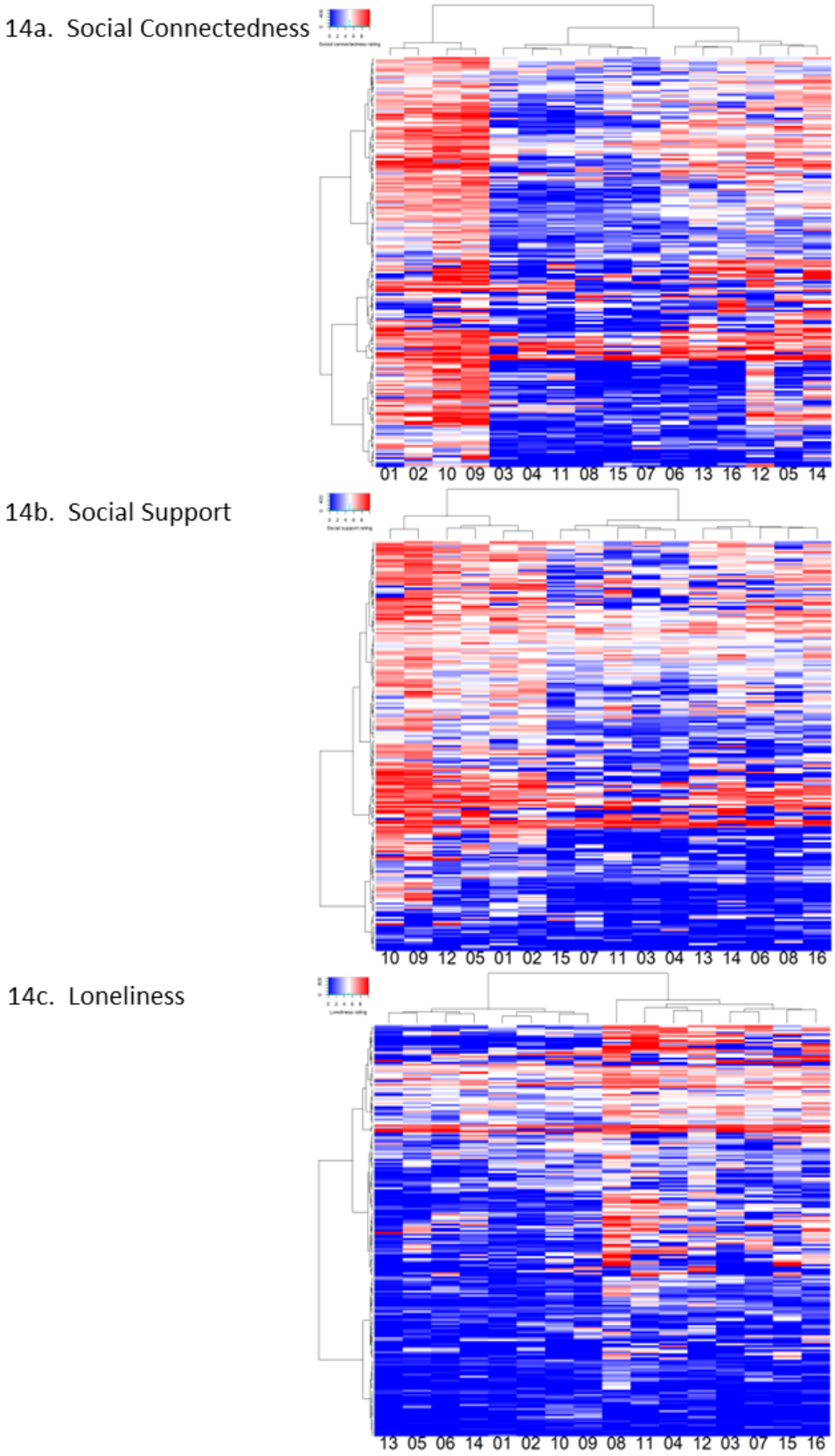


Figure 14. Visualizations of the social connectedness judgments (a), social support judgments (b), and loneliness judgments (c) for the 203 individuals (rows) across the 16 situations (columns). The 16 judgments for each of the 203 individuals are presented in a single row. The number below each column corresponds to the number of the corresponding situation in Table 9. As a cell becomes increasingly red, the judgment increasingly approached 10 (on a scale of 0 to 10; Table 10). As a cell becomes increasingly blue, the regularity judgment increasingly approached 0. As a cell becomes increasingly white, the regularity judgment increasingly approached 5. On the left, a hierarchical clustering dendrogram establishes groups of individuals having similar vectors of values across situations (from hierarchical clustering with the Ward D measure). Across the top, a hierarchical clustering dendrogram establishes groups of situations having similar vectors of values across individuals (again from hierarchical clustering with the Ward D measure). The ordering of individuals in rows is *not* constant across figure panels.

across situations. Different situations induce different levels of these constructs, although not in the same way across individuals, as reflected in substantial individual by situation interactions. We next turn to the preregistered hypotheses.

Hypothesis 1: Large individual differences will be observed for SAM² social connectedness, social support, and loneliness.

We predicted that individuals would exhibit considerable variability in their trait levels of social connectedness, social support, and loneliness across the 16 situations. Strong support for this prediction can be seen in Figure 15, which shows the mean judgement for each participant across the 16 situations for each measure (also averaged across the before-COVID and during-COVID judgments). These values provide a general sense of trait levels in the population sampled. For social connectedness and social support, the median level across participants was around 4, indicating moderate levels in this sample. For loneliness, the median level was around 2.5, reflecting a relatively low level.

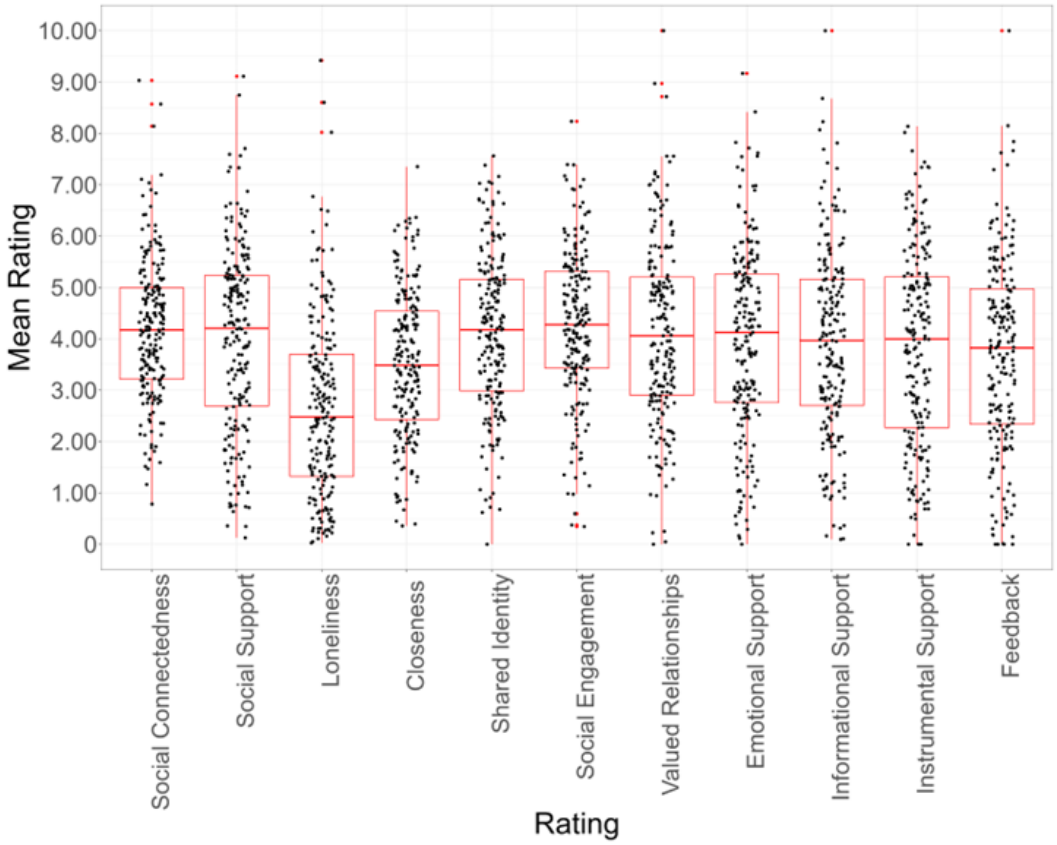


Figure 15. Box and whisker plots for social connectedness, social support, loneliness, and the eight predictors. Each point in a distribution represents the average judgment for 1 of the 203 individuals across the 16 situations (also averaged across the before-COVID and during-COVID judgments). Each box and whisker plot shows the median for a measure and its interquartile range.

In support of Hypothesis 1, the distributions of mean judgments for social connectedness, social support, and loneliness in Figure 15 exhibit substantial individual differences. Although the median level of loneliness was around 2.5 across the 203 participants, trait level values ranged from 0 to 9.5. Across the same 16 situations, different individuals experienced very different levels of loneliness overall. Similar ranges of trait-level values can be seen for social connectedness and social support.

Values of the intraclass correlations (ICC) in Table 10 further document these large individual differences. Here the ICC estimates the reliability of individual judgments, thereby establishing agreement between individuals (Shrout & Fleiss, 1979b). More specifically, these ICCs estimate the average correlation between all possible pairs of participants in a group, thereby establishing how much they agree on their judgments across the 32 situations (16 before COVID, 16 during COVID). Because the random effects version of the ICC was used (ICC2), the values here generalize to other samples drawn from the same population.

As can be seen, interrater agreement for social connectedness, social support, and loneliness was .29, .14, and .11, respectively, indicating large individual differences in judgments of social connectedness, social support, and loneliness. Different individuals experienced these constructs quite differently across the same situations (i.e., individual by situation interactions). Although this large variability could simply reflect noise, we will see later that it is highly systematic.

Interrater agreement for the eight predictors varied widely as well, ranging from .11 for feedback, instrumental support, and informational support to .35 for social engagement. In general, these values indicate large individual differences across all measures. Only frequency exhibited a high value of the ICC, .72, indicating that the 203 individuals experienced the 32 situations (16 before COVID, 16 during COVID) with similar frequencies.

As we just saw, SAM^2 creates an overall trait-level measure for social connectedness, social support, and loneliness across the 32 situations (16 before COVID, 16 during COVID). To determine the test reliability of these trait level measures, we computed Cronbach's alpha, estimating the stability of these

assessments across the 32 situations. As Table 10 illustrates, the alphas for social connectedness, social support, and loneliness were .90, .95, and .95, respectively, well above the acceptable level of .70. As Table 10 further illustrates, the eight predictors also exhibited acceptable values of alpha as well, all above .90.

4.3.1 Hypothesis 2: Social connectedness, social support, and loneliness will be related in predicted ways

We predicted that social connectedness and social support would be positively related at a moderate level (0.4 to 0.6), with each related negatively to loneliness. We further predicted that each measure would exhibit unique variance. Finally, we predicted that the predictors for social connectedness and social support would load on different factors in an exploratory factor analysis, with these factors highly correlated.

To assess these predictions, we computed Pearson correlation coefficients between the SAM² measures (averaged across the 16 situations and across before-COVID and during-COVID judgments). The first two columns of Table 11 present the results. As expected, social connectedness correlated positively with social support (r = .60, p<.001). Contrary to our expectations, however, loneliness correlated positively (but weakly) with both social connectedness (r = .17) and social support (r = .10). In a Bonferroni corrected test for non-predicted correlations, neither was significant, indicating that loneliness was unrelated to both social connectedness and social support at the trait level.

Table 11. Pearson correlations between SAM² social connectedness, social support, and loneliness (each averaged across the 32 situations) and the unsituated individual difference measures.

	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.Quality colleagues
1. SAM² Social Connectedness	.60+++	.17	-.09	-.03	.03	.09	.13	.21+++	-.07	-.03	.17+	-.05	.06	-.04	.12
2. SAM² Social Support		.10	-.22++	-.14+	.02	.14+	.18+	.32+++	-.08	.01	.21+++	.02	.22+++	-.09	.20++
3. SAM² Loneliness			.42+++	.44+++	.29+++	-.27+++	.01	-.07	.17+	.04	-.02	-.02	-.22++	-.02	-.08
4. UCLA Loneliness				.77*	.46*	-.41*	-.12	-.18	.35*	.05	-.22	.08	-.18	.06	.00
5. Perceived Loneliness					.50*	-.33*	-.06	-.06	.41*	.05	-.17	.01	-.21	-.01	-.01
6. Perceived Stress Scale						-.23	.04	-.07	.70*	.11	-.08	.19	-.04	-.05	-.14
7. Perceived SES (current)							.34*	.20	-.27*	.02	.25*	-.11	.15	-.04	.13
8. Perceived SES (childhood)								.15	-.06	-.02	.11	-.05	.01	-.07	-.03
9. BFI Extraversion									-.30*	.10	.09	.12	.21	-.04	.11
10. BFI Neuroticism										.07	-.04	.11	-.07	-.08	-.15
11. Quantity Family											.06	.20	.03	.00	.00
12. Quality Family												.00	.28*	-.05	.13
13. Quantity Friends/Partners													.35*	.02	-.02
14. Quality Friends/Partners														-.08	.25*
15. Quantity Colleagues															.26*

Note. The alpha level for all predicted correlations (one-tailed) was set at .05, where + indicates p < .05, ++ indicates p < .01, +++ indicates p < .001. The alpha level for all other non-predicted correlations (two-tailed) was Bonferroni adjusted for 78 correlations at the .05 threshold, * indicates p < .05.

We also predicted that the predictors for social connectedness and social support would load on different factors in an exploratory factor analysis. To assess this prediction, we ran an exploratory factor analysis on the eight predictor variables using a promax rotation (due to a likely correlation between factors). An initial scree plot indicated that a two or three factor model would be most appropriate. We ran both and found the two-factor model most compelling, shown here in Figure 16. The full factor loadings for both the two- and three- factor analysis models can be found in the supplementary materials (SM_1), along with the scree plot.

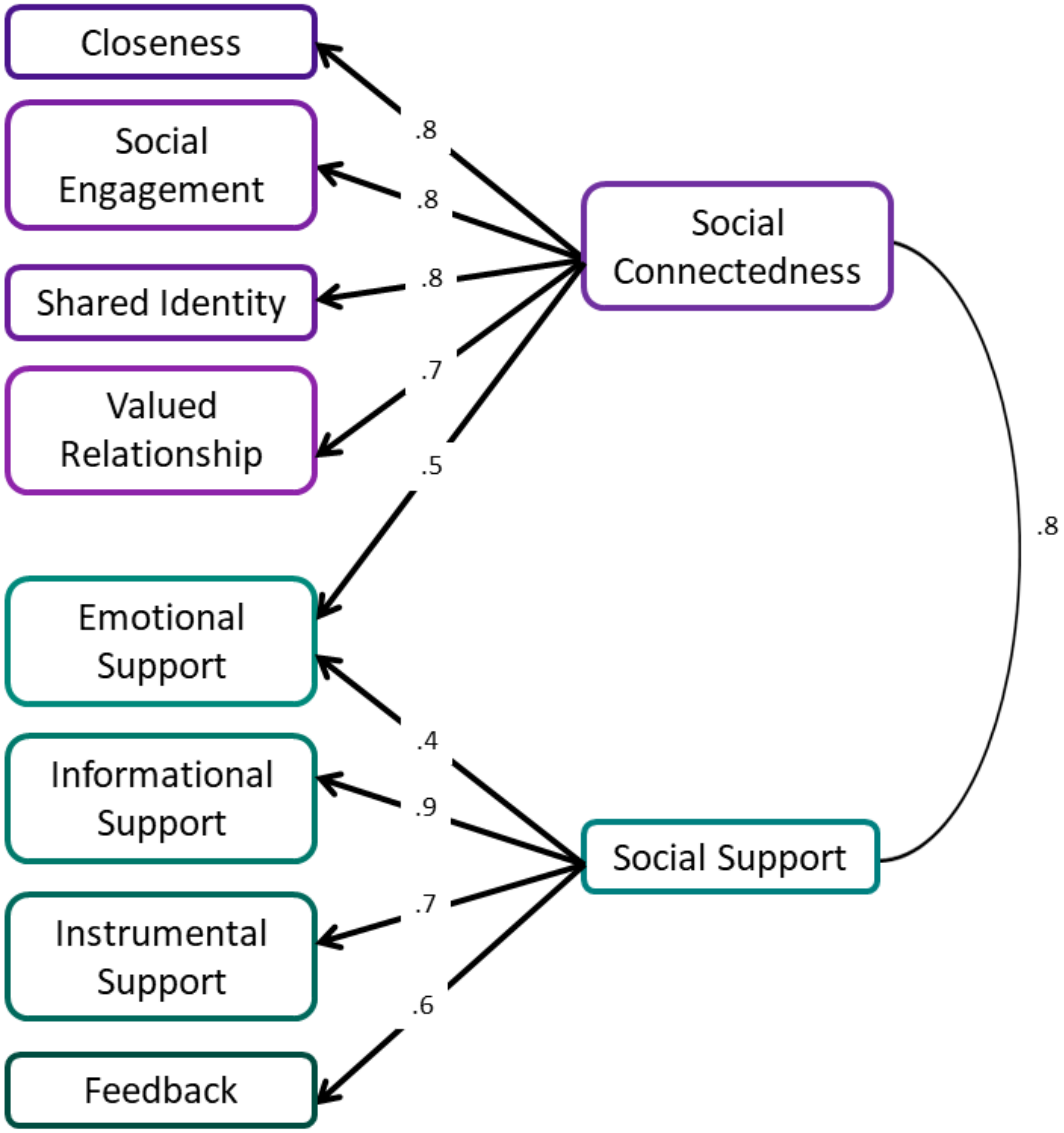


Figure 16. The two-factor solution from an exploratory factor analysis of the eight SAM[2] predictors for social connectedness and social support using an oblique (promax) rotation.

The results in Figure 16 confirm our prediction that four predictors for social connectedness and the four predictors for social support would load on different factors (all loadings > .40). The only exception is emotional support, which

loaded both on social connectedness and social support. As we found previously (Taylor Browne Luka et al., 2023), the loadings were stronger for social connectedness than for social support, indicating that all eight predictors are important for social support. As we also found previously, the two factors were highly correlated (*r* = .80), demonstrating how closely related social connectedness and social support are.

4.3.2 Hypotheses 3a and 3b: The predictors associated with social connectedness will significantly predict social connectedness, and the predictors associated with social support will significantly predict social support**. Discovery 3**: Was loneliness predicted by the predictors for social connectedness and for social support (no specific predictions)?

Based on our previous research (Taylor Browne Luka et al., 2023) and the broader literature, we anticipated the following patterns of prediction for social connectedness and social support. For social connectedness, we anticipated that social engagement would be the most important predictor, followed by closeness, valued relationships, and shared identity (and also that the social support predictors would not be important). For social support, we anticipated that informational support would be the most important predictor, followed by emotional support, instrumental support, and feedback. We also predicted that predictors for social connectedness would be important as well.

To assess these predictions at the group level, we ran multilevel mixed effect regression analyses for social connectedness and social support. We also ran a similar group-level regression to explore the predictors of loneliness, for which we had no specific predictions (Discovery 3). All regressions included the eight predictors as fixed effects, random intercepts and relevant random slopes for participants and situations. Figure 17 presents the standardized regression coefficients from these analyses that were significant after maximal testing (Barr et al., 2013). The supplemental materials provide the full regression pipeline (SM_2).

Consistent with Hypothesis 3a, social engagement, closeness, shared identity, and valued relationships all predicted social connectedness significantly (surviving maximal testing; Barr et al., 2013; SM_2). As also found in Taylor

Browne Luka et al., (2023), social engagement and closeness had the largest coefficients.

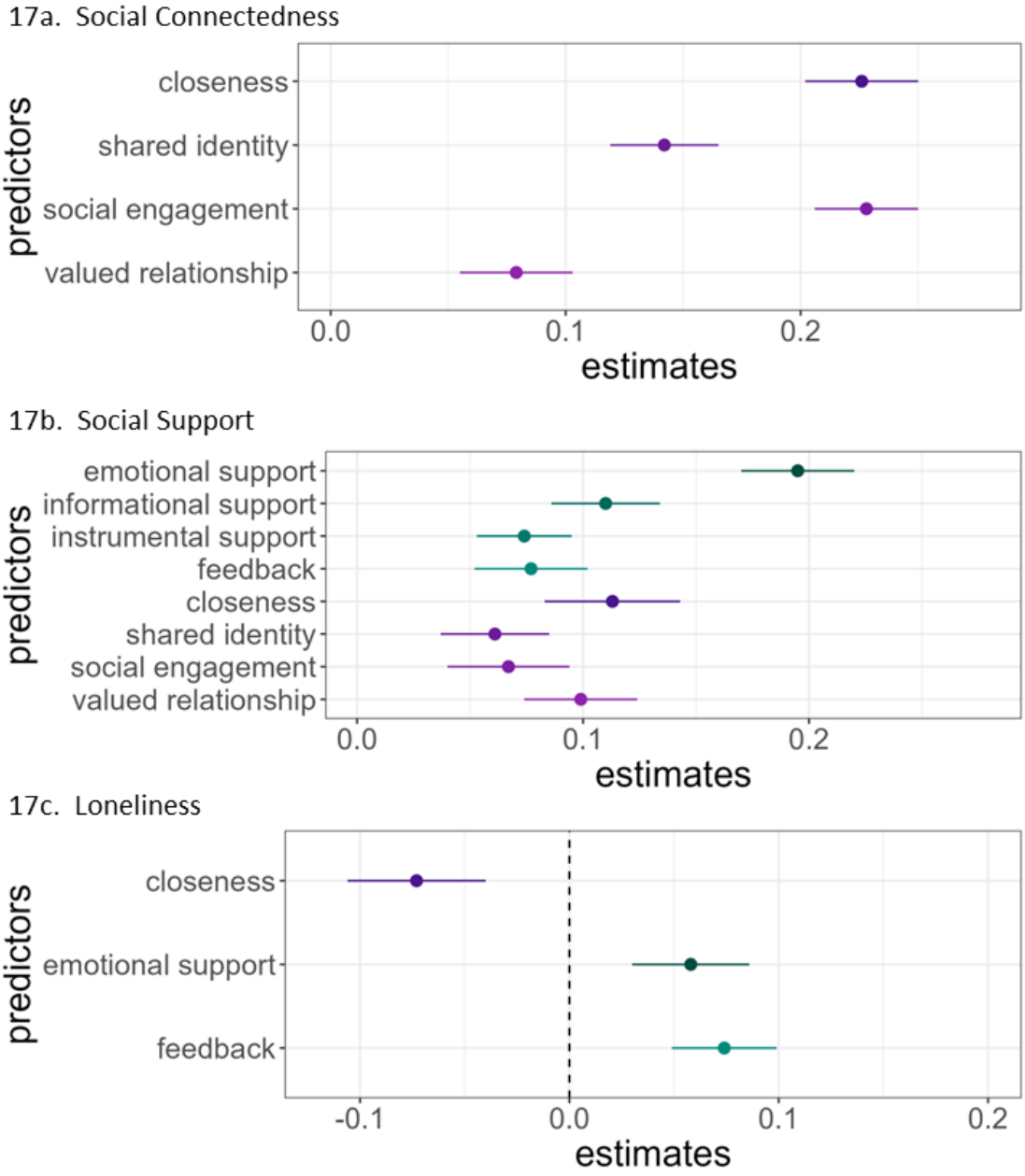


Figure 17. Estimated regression coefficients at the group level for the prediction of social connectedness (a), social support (b), and loneliness (c). All coefficients are standardized and were established in regression models that included random intercepts and relevant random slopes. The SM provides details of the regression analysis procedure.

Consistent with Hypothesis 3b, all eight predictors predicted social support significantly (again surviving maximal testing). Emotional support exhibited the largest coefficient, followed by informational support, closeness, and valued relationships. Instrumental support, feedback, social engagement, and shared identity also predicted social support significantly but less so.

In the exploratory analysis of loneliness (Discovery 3), three predictors explained its variance significantly at the group level. Closeness was negatively related to loneliness, indicating that loneliness increases as closeness to others decreases. Conversely, emotional support and feedback were positively related to loneliness, indicating that as participants become lonelier, they experienced more emotional support and feedback. Interestingly, none of the other predictors explained loneliness variance at the group level. As we'll see next, the prediction of loneliness is quite different at the individual level (and works much better).

4.3.3 Hypothesis 4: Excellent prediction of social connectedness, social support, and loneliness for individuals.

We predicted that SAM[2] modelling would explain large amounts of variance in social connectedness, social support, and loneliness in regressions for individual participants. We further predicted that prediction at the individual level would be higher than prediction at the group level, given large individual differences in social connectedness, social support, and loneliness (Hypothesis 1). Although the overall patterns of prediction at both levels should be comparable, large individual differences in the importance of specific predictors should emerge as well.

To establish prediction at the individual level, an individual regression was performed for each participant in on their standardized data (n = 203). Each regression only modelled fixed effects, given that no random effects existed in the design for an individual. For each individual, we ran one regression for each dependent variable (social connectedness, social support, loneliness) with the eight predictors as fixed effects. Only main effects were modelled with no interactions. The goal of these regressions was to construct a prediction profile for each dependent variable for each participant.

Figure 18 represents the variance explained in the individual regressions, with the median R^2 being 88% for connectedness, 85% for social support, and 80% for loneliness (where R^2 has been interpreted as a percentage). The R^2 in a group-level regression for the same model used in the individual regressions is plotted as the lower dashed purple line in Figure 18. The R^2 for a group-level regression

that added random intercepts and interactions is shown as the upper blue line. Consistent with Hypothesis 4, the median R^2 for the individual models was much higher than the variance explained by the group-level models for each dependent variable. Notably, prediction for loneliness improved markedly, indicating that the eight predictors explain loneliness well at the individual level.

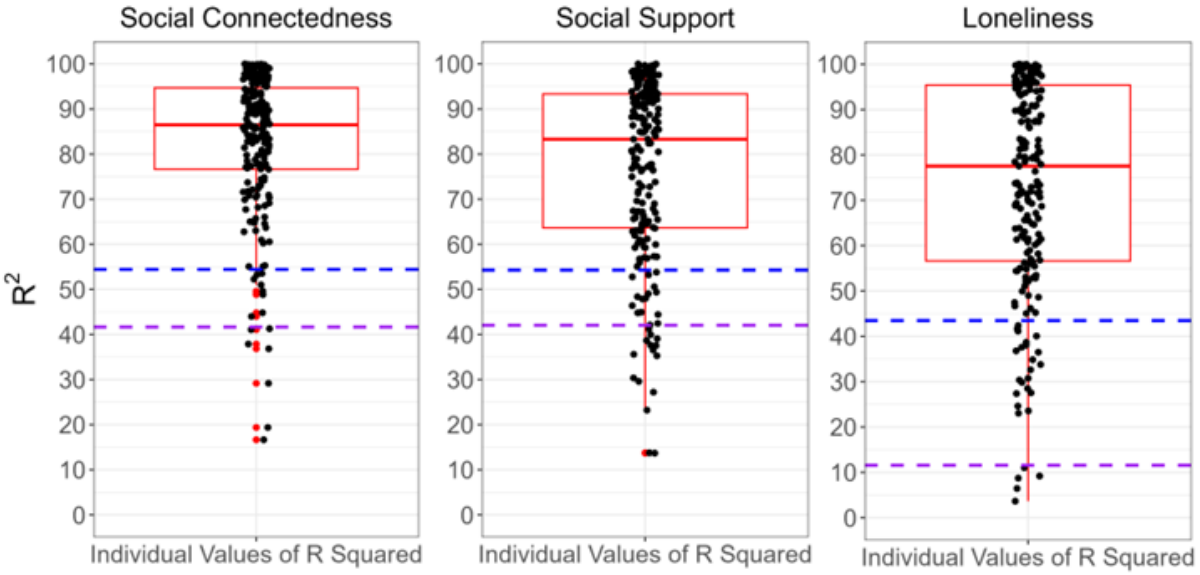


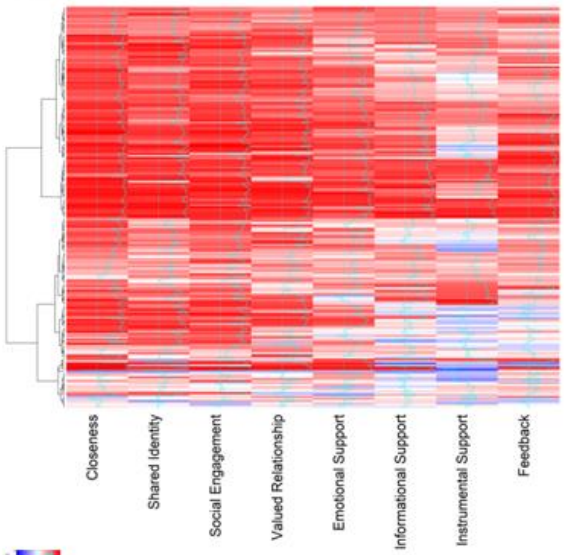
Figure 18. R^2 plotted as percentages for the individual regressions. Each dot is the R^2 for a participant's individual regression, where each regression predicts the individual's judgments of social connectedness, social support, or loneliness from their judgments of social engagement, valued relations, shared identity, closeness, emotional support, informational support, instrumental support and feedback (with no interactions or random effects). Each box and whisker plot shows the median and inter-quartile range for the respective measure. The R^2 for the same main-effects-only individual model with no random effects or interactions when run at the group level is plotted as the lower dashed purple line. The R^2 for a group-level model with random intercepts and interactions is plotted as the upper dashed blue line.

As reported earlier (Table 10), the agreement between participants for evaluating the dependent variables across situations ranged from .11 to .29. The individual regression results here indicate that this relatively low agreement did not simply reflect noise but instead reflected large systematic individual differences. Specifically, the high R^2 values for the individual regressions show that the SAM^2 judgments within individuals tended to be highly systematic. As a result, low agreement between individuals reflected large differences in their systematic assessments of common situations.

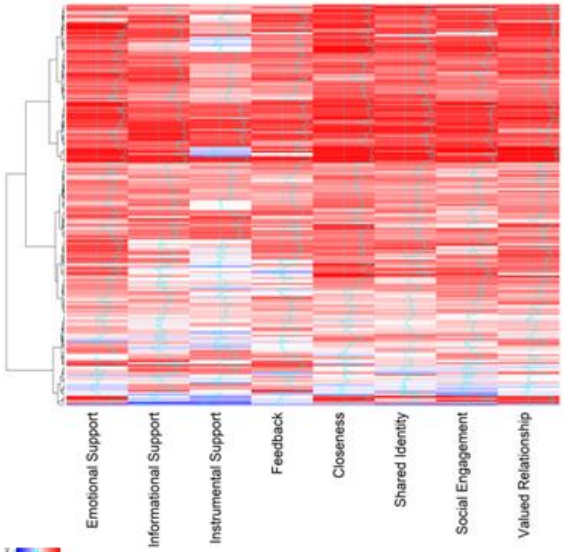
To further examine individual differences in prediction, we computed the eight correlations for each individual between their judgments for the eight predictors and their judgements for each dependent variable across the 16 situations.

Figures 19a, 19b, and 19c present the correlations for social connectedness, social support, and loneliness, respectively. In each figure, a row represents the prediction vector for a single participant, where each cell visualizes a specific

19a. Social Connectedness



19b. Social Support



19c. Loneliness

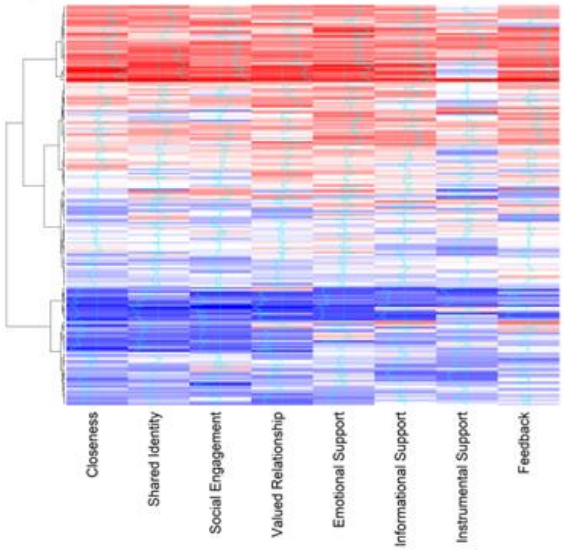


Figure 19. Visualizations of the correlations between the eight predictors and social connectedness (a), social support (b), and loneliness (c). The 8 correlations for each of the 203 individuals appear in a single row. As a cell becomes increasingly red, the correlation was increasingly positive. As a cell becomes increasingly blue, the correlation was increasingly negative. As a cell becomes increasingly white, the correlation increasingly approached 0. On the left, a hierarchical clustering dendrogram establishes groups of individuals having similar prediction vectors (from hierarchical clustering with the Ward D measure).

correlation. As a cell becomes redder, the correlation approaches +1, as it becomes bluer it approaches -1; as it becomes whiter it approaches 0. Table 12 presents a summary of these correlations across participants.

As Figure 19 and Table 12 indicate, the pattern of prediction at the individual level conformed to the pattern at the group level. For social connection, its four predictors were most important, similar to the group-level regression. For social support, all eight predictors played important roles, again similar to the group level.

Table 12. Medians and interquartile ranges (in parentheses) of the individual correlations between social connectedness, social support, loneliness and the eight predictors.

	Closeness	Shared Identity	Social Engagement	Valued Relationships	Emotional Support	Informational Support	Instrumental Support	Feedback
Social Connectedness	.69 (.50—.80)	.60 (.39—.74)	.66 (.45—.78)	.61 (.37-.74)	.50 (.28—.65)	.40 (.16—.59)	.26) (.01—.49)	.40 (.20—.61)
Social Support	.53 (.34—.71)	.47 (.22—.64)	.48 (.26—.66)	.53 (.30-.67)	.52 (.32—.67)	.43 (.22—.62)	.28 (.03—.52)	.42 (.26—.58)
Loneliness	-.07 (-.32—.20)	-.03 (-.26—.23)	-.02 (-.31—.23)	.02 (-.26—.29)	.09 (-.16—.33)	.00 (-20—.29)	-.09 (-.27—.13)	.04 (-.20—.30)

Note. For each dependent variable, the median correlation across participants is presented, followed by the interquartile range in parentheses. The median is the correlation at the 50th percentile, the first value in parentheses is the correlation at the 25th percentile, and the second value in parentheses is the correlation at the 75th percentile.

By examining Figure 19 and the last row of Table 12, we can see why prediction was relatively poor in the group-level regression for loneliness. As the three highest-level clusters on the left of Figure 19 illustrate, three groups of individuals experienced loneliness quite differently, at least from the perspective of the eight predictors. For individuals in the top group; the eight predictors correlated positively with loneliness. For individuals in the middle group, prediction was inconsistent and weaker. For individuals in the bottom group, the eight predictors correlated negatively with loneliness (as might seem most intuitive). Having three groups that exhibited positive, inconsistent, and negative patterns of prediction suggests that the median prediction for each predictor should approximate 0, as Table 12 indeed demonstrates. These diverse clusters of individuals further explain why so few predictors were significant at the group level (Figure 17) and why relatively little variance in loneliness was explained by its group-level regression (Figure 18 dashed lines).

4.3.4 Hypothesis 5: Individuals in single-occupancy households will differ in predicted directions from individuals in multiple-occupancy households in their levels of social connectedness, social support, and loneliness, with the COVID-19 lockdown having a greater impact on individuals in single-occupancy households.

We expected that individuals living in single-occupancy households would report lower social connectedness, lower social support, and higher loneliness than individuals living in households with at least one other person. We further predicted that single-occupancy households would observe more change in levels of social connectedness, social support, and loneliness as the COVID-19 pandemic emerged, relative to the months before.

To investigate these predictions, we compared single- versus multiple-occupancy households for SAM[2] social connectedness, social support, and loneliness before and during COVID-19. Each mixed-effect regression had fixed effects for occupancy, time period, and their interaction, along with random effects for participants and situations. Table 13 presents the results of these regressions. Figure 20 presents the mean judgments from them.

Table 13. Results from three mixed-effect regressions to assess single- versus multiple-occupancy households before versus during COVID-19.

DV	Predictor	Estimate	SE	*t*
Social Connectedness				
	Single vs. Multiple	.028	.031	.910
	Before vs. During	.063	.019	3.320*
	Single vs. Multiple*Before vs. During	.021	.010	2.073*
Social Support				
	Single vs. Multiple	.113	.041	2.728*
	Before vs. During	.056	.017	3.281*
	Single vs. Multiple*Before vs. During	.022	.010	2.144*
Loneliness				
	Single vs. Multiple	-.076	.044	-1.711
	Before vs. During	.114	.015	7.731*
	Single vs. Multiple*Before vs. During	-.024	.012	-1.935

Note. All regressions were performed on standardised measures. Each regression included fixed effects for occupancy, time period, and their interaction, along with random effects for participants and situations (both intercepts and slopes). Single and multiple occupancy were coded -1 and +1, respectively; before and during were coded as -1 and +1, respectively. An Estimate is the estimate of a standardised regression coefficient in the respective model, with SE and *t*, being the standard error and *t* value of the estimate, where * indicates $p < .05$.

Inconsistent with Hypothesis 5, individuals in single-occupancy households did not experience less social connectedness and more loneliness than individuals in multiple-occupancy households, although individuals in single-occupancy

households did experience significantly less social support. Also inconsistent with Hypothesis 5, the COVID-19 lockdown changed levels of social connectedness and social support more for multiple-occupancy households than for single-occupancy, as can be seen from observing the significant interactions in Figure 20. Loneliness did increase more for single-occupancy households during COVID-19 as we predicted, but not significantly. Perhaps not surprisingly, and

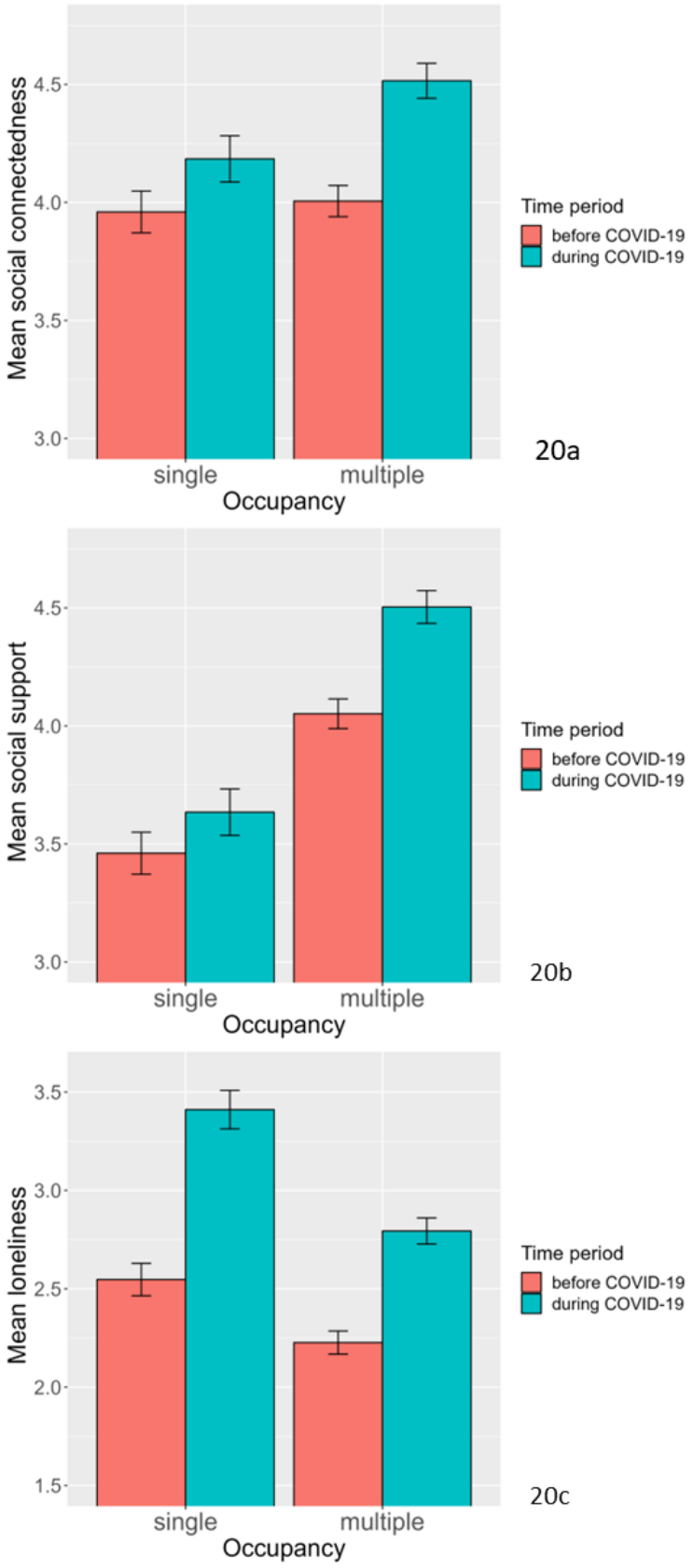


Figure 20. Mean social connectedness (a), social support (b), and loneliness (c) as a function of occupancy and time period (with SE error bars).

somewhat consistent with the spirit of our hypotheses, the highest levels of social connectedness and social support occurred for multiple-occupancy households during the lockdown, together with the lowest levels of loneliness.

In a discovery analysis, we assessed whether the perceived levels of social connectedness, social support, and loneliness differed before COVID-19 and after COVID-19 (without predicting the direction of any difference). As Figure 20 clearly shows, perceptions of all three constructs were significantly higher during the lockdown than before it. Not only did loneliness increase during the lockdown, so did social connectedness and social support.

4.3.5 Hypotheses 6, 7, 8, and, 9: SAM² measures of social connectedness, social support, and loneliness will be related to perceived stress, perceived SES, extroversion, neuroticism, and social network measures in predicted directions. We also expected that the SAM² predictors would explain these relationships.

We can first assess these predicted relationships with the correlations in Table 11. Support for some of our predictions is present (all reflecting significant correlations). Social connectedness correlated positively with extroversion and the quality of family connections. Social support correlated positively with current and childhood perceived SES, extroversion, and quality of connections with family, friends, and colleagues. Loneliness correlated positively with perceived stress and neuroticism and correlated negatively with perceived SES and quality of connections with friends.

Of interest was whether the SAM² predictors could explain these predicted relationships. If so, it follows that each relationship can be explained in terms of these specific predictors, not simply in terms of a more general contract. To assess this possibility, we ran a set of three regressions to assess each significant relationship just noted. In each set, the dependent variable (DV) was an unsituated individual difference measure, and the predictors were mean SAM² judgments across the 16 situations (i.e., individual-level measures). All regressions were performed on standardized means and were simple linear regressions with no random effects or interactions.

In each set of regressions, we first ran a simple linear regression with an unsituated individual difference measure as the DV (e.g., perceived stress) and either SAM^2 social connectedness, SAM^2 social support, or SAM^2 loneliness as the only predictor. If a significant relationship was present between the DV and the predictor in the first regression, we then ran a second regression that predicted the same unsituated individual difference measure (e.g., perceived stress) but included the eight SAM^2 predictors, leaving out the more general SAM^2 predictor from the first regression (e.g., SAM^2 social connectedness). We then took the residuals from the second regression and predicted them in a third regression with the original SAM^2 measure from the first model (e.g., social

Table 14. Hierarchical regressions to assess whether the eight SAM^2 predictors explained the relationship between an unsituated individual difference measure and a SAM^2 measure for social connectedness, social support, or loneliness. See the text for the details of these regressions.

DV	Predictor	Regression	Estimate	SE	*t*	*p*
Perceived Stress						
	Social Connectedness					
		Raw	.029	.073	.402	.688
		Residuals	.031	.071	.438	.662
	Social Support					
		Raw	.016	.073	.216	.829
		Residuals	.010	.071	.140	.889
	Loneliness					
		Raw	.287	.069	4.190	<.001***
		Residuals	.271	.067	4.037	<.001***
Current Perceived SES						
	Social Connectedness					
		Raw	.090	.070	1.283	.201
		Residuals	-.020	.068	-.301	.764
	Social Support					
		Raw	.144	.070	2.070	.040*
		Residuals	.008	.068	.112	.911
	Loneliness					
		Raw	-.268	.068	-3.948	<.001***
		Residuals	-.275	.065	-4.218	<.001***
Extraversion						
	Social Connectedness					
		Raw	.212	.069	3.082	.002**
		Residuals	-.003	.066	-.049	.961
	Social Support					
		Raw	.321	.067	4.809	<.001***
		Residuals	.084	.065	1.286	.200
	Loneliness					
		Raw	-.065	.070	-.925	.356
		Residuals	-.080	.066	-1.214	.226
Neuroticism						
	Social Connectedness					
		Raw	-.073	.070	-1.045	.297
		Residuals	.000	.068	-.005	.996
	Social Support					
		Raw	-.078	.070	-1.113	.267
		Residuals	.007	.068	.100	.920
	Loneliness					
		Raw	.165	.070	2.375	.019*
		Residuals	.179	.066	2.701	.008*

Note. An Estimate is the estimate of a standardised regression coefficient, with SE and *t* being the standard error and *t* value of the estimate, where * indicates p < .05, ** indicates p < .01, *** indicates p <.001.

connectedness). Of primary interest in this third model was whether the original predictor (e.g., social connectedness) was no longer significant in predicting the residuals from the second model. If so, this constituted evidence that the SAM^2 predictors explained the relationship between the unsituated individual difference measure and the original SAM^2 measure. In other words, the eight predictors of social connectedness and social support have explanatory value and construct validity.

Table 15. Hierarchical regressions to assess whether the SAM^2 predictors explained the relationship between an unsituated social network measure and a SAM^2 measures for social connectedness, social support, or loneliness. See the text for the details of these regressions.

DV	Predictor	Regression	Estimate	SE	*t*	*p*
AVG Quantity Family						
	Social Connectedness					
		Raw	-.030	.071	-.421	.674
		Residuals	-.065	.070	-.925	.356
	Social Support					
		Raw	.006	.071	.084	.933
		Residuals	-.024	.070	-.348	.728
	Loneliness					
		Raw	.037	.070	.529	.597
		Residuals	.035	.070	.494	.622
AVG Quality Family						
	Social Connectedness					
		Raw	.171	.070	2.453	.015*
		Residuals	.014	.068	.202	.840
	Social Support					
		Raw	.214	.069	3.107	.002**
		Residuals	.019	.068	0.288	.774
	Loneliness					
		Raw	-.018	.071	-.259	.796
		Residuals	-.037	.068	-.545	.586
AVG Quantity Friends/Partners						
	Social Connectedness					
		Raw	-.054	.070	-.773	.441
		Residuals	-.079	.068	-1.164	.246
	Social Support					
		Raw	.023	.071	.329	.742
		Residuals	.045	.068	.666	.506
	Loneliness					
		Raw	-.022	.071	-.314	.753
		Residuals	-.032	.068	-.468	.640
AVG Quality Friends/Partners						
	Social Connectedness					
		Raw	.062	.070	.888	.376
		Residuals	-.074	.067	-1.093	.276
	Social Support					
		Raw	.222	.069	3.235	.001**
		Residuals	.094	.067	1.395	.165
	Loneliness					
		Raw	-.216	.068	-3.134	.002**
		Residuals	-.24	.065	-3.6720	<.001***
AVG Quantity Co-workers/Students						
	Social Connectedness					
		Raw	-.038	.070	-.542	.589
		Residuals	.075	.066	1.138	.256
	Social Support					
		Raw	-.088	.070	-1.247	.214
		Residuals	.064	.066	.971	.333
	Loneliness					
		Raw	-.019	.071	-.265	.791
		Residuals	-.030	.066	-.452	.652
AVG Quality Co-workers/Students						
	Social Connectedness					
		Raw	.120	.070	1.721	.087
		Residuals	.008	.067	.120	.905
	Social Support					
		Raw	.199	.069	2.875	.004**
		Residuals	.092	.067	1.373	.171
	Loneliness					
		Raw	-.085	.070	-1.206	.229
		Residuals	-.072	.067	-1.068	.287

Note. An Estimate is the estimate of a standardised regression coefficient, with SE and *t* being the standard error and *t* value of the estimate, where * indicates p < .05, ** indicates p < .01, *** indicates p <.001.

Tables 14 and 15 present the results of these analyses. For relationships of the unsituated individual difference measures with social connectedness and social support, we can see considerable evidence for the hypothesis that the SAM^2 predictors explain these relationships well. When a significant relationship was present between an unsituated individual difference measure and either SAM^2 social connectedness or SAM^2 social support, the eight SAM^2 predictors typically explained all of it. Interestingly, however, this was not the case for loneliness, where the original SAM^2 measure of loneliness still explained variance in unsituated individual difference measures. This likely reflects the fact that these predictors don't explain much variance in SAM^2 loneliness at the group level but only at the individual level (Figure 18).

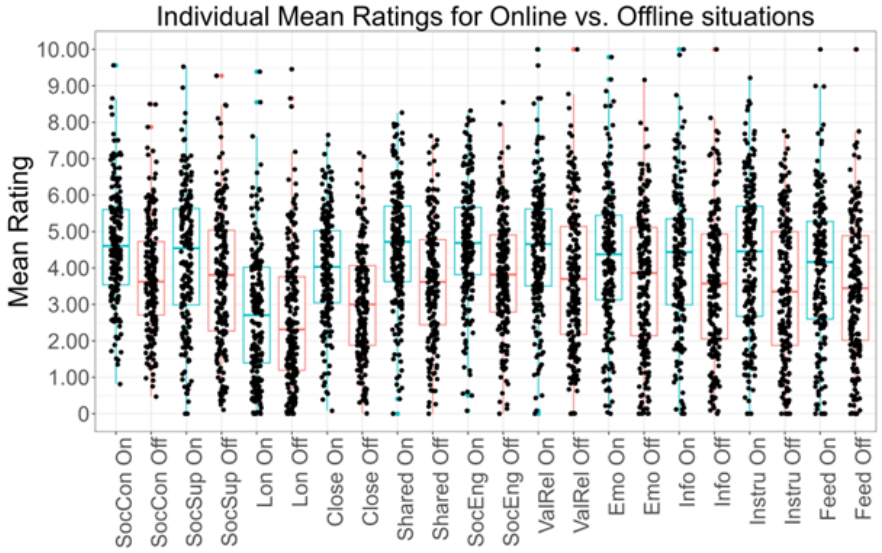
4.3.6 Discovery 2: Did the levels of social connectedness, social support, and loneliness differ for situations that individuals experienced online versus offline (no specific predictions).

In addition to exploring how social connectedness, social support, and loneliness changed before and during COVID-19 (Discovery 1, Figure 20, Table 13), we also wanted to explore whether the mode of interaction in a situation—online versus offline—was associated with these constructs. To do so, we compared the mean judgment for each participant across the eight online situations versus the eight offline situations (averaged across before-COVID and during-COVID judgments; Table 9). As can be seen from the means in Figure 21a, there was a clear tendency for participants to exhibit higher levels of social connectedness, social support, and loneliness in the online situations than in the offline situations. A similar difference appeared across the eight predictors.

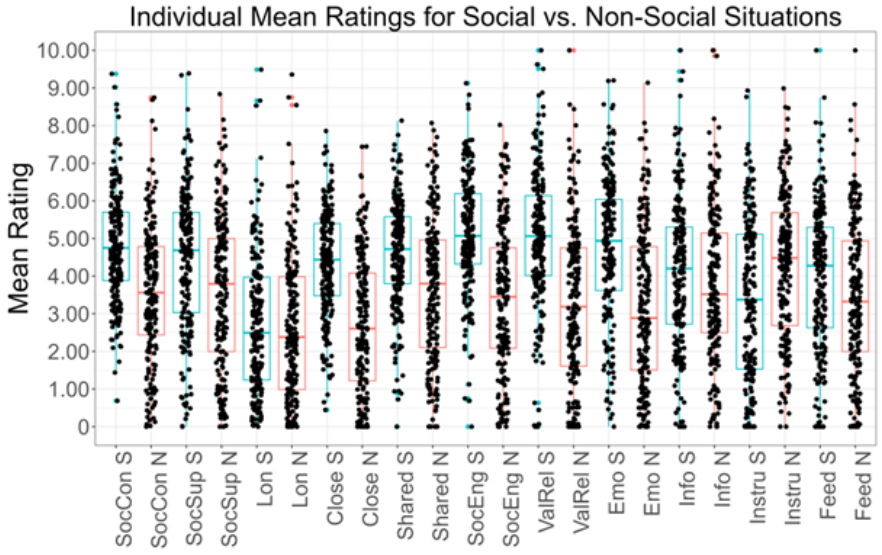
In Taylor Browne Luka et al. (2023), we also assessed differences between situations as a function of sociality (social versus non-social) and valence (positive versus negative). Surprisingly, Taylor Browne Luka et al. found only a small effect of sociality but a large of effect valence. Although we didn't preregister hypotheses for these differences here, we did expect to replicate them. As Figures 21b and 21c illustrate, these differences did indeed replicate. Again, we see a weak overall effect of sociality and a large effect of valence.

To assess these three sets of differences statistically, we ran a mixed-effect regression for each of the 11 SAM^2 measures that assessed interaction mode

21a



21b



21c

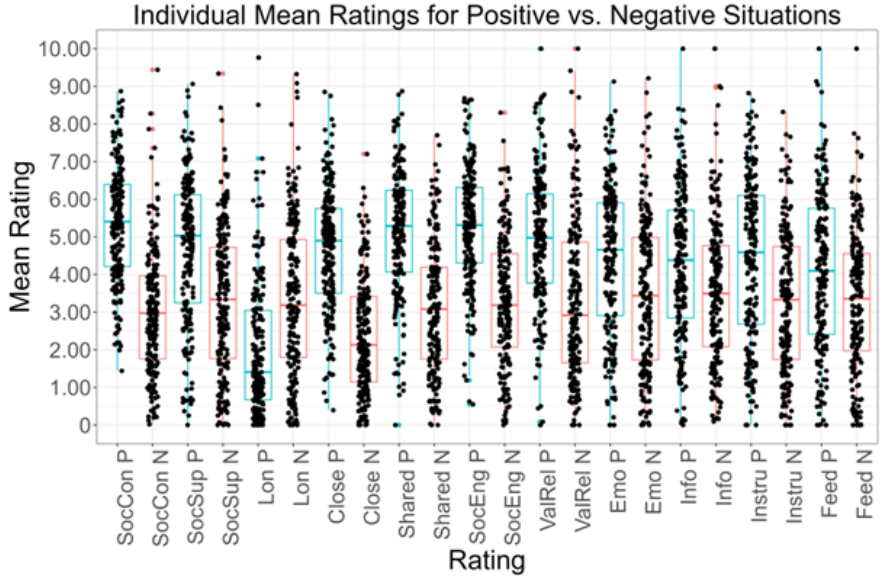


Figure 21. Mean judgments for individuals contrasting online versus offline situations (a), social versus non-social situations (b), and positive versus negative situations (c). Each point in a distribution represents the average judgment for 1 of the 203 individuals across the 16 situations (also averaged across the before-COVID and during-COVID judgments). Each box and whisker plot shows the median for a measure and its interquartile range.

(online versus offline), sociality (social versus non-social situations), and valence (positive versus negative situations) as fixed effects. To control for variance associated with before-COVID versus after COVID, we included this effect in the model, but don't report the results here, given that these results were already

reported for Hypothesis 5. All regressions included random intercepts and slopes for participants and situations but no interactions. Supplementary Materials SM_3 presents the full results of these analyses, summarized next.

Although online situations tended to exhibit higher values for all measures relative to offline situations, only instrumental support exhibited a significant difference. Social situations tended to exhibit higher values for most measures (mostly significant), except for loneliness (no difference) and instrumental support (non-social > social). Positive situations tended to exhibit much higher values than negative situations for all measures (mostly significant), except for loneliness (non-social > social, significant). Thus, we replicated the weak advantage for social situations and the strong advantage for positive situations found in Taylor Browne Luka et al. (2023), while observing a weak new advantage for online situations.

4.4 Discussion

4.4.1 Large Individual differences

Using a SAM^2 psychometric instrument, we established trait-levels of social connectedness, social support, and loneliness in 203 individuals (i.e., average judgments across 16 situations, before and during COVID-19). Most importantly, we confirmed Hypothesis 1 that the SAM^2 instrument would establish large individual differences, with trait-level assessments varying widely across individuals for all three constructs. Whereas some individuals experienced mean values of social connectedness, social support, or loneliness approaching 0, others experienced mean values approaching 9 (on a scale from 0 to 10). These distributions clearly indicated that SAM^2 instrument establishes large individual differences for these constructs.

As expected, these trait level measures for individuals were accompanied by large situation effects and large individual by situation interactions (Figure 14). Whereas some situations induced relatively high levels of social connectedness, social support, and loneliness across all individuals, others induced relatively low levels. The large individual by situation interaction for each construct further indicated that individuals experience the same situations very differently. On

average, the social connectedness experienced by one individual across the same 16 situations only correlated .29 with the social connectedness experienced by another. Consistency across situations was even lower for social support (.14) and loneliness (.11). In our earlier study (Taylor Browne Luka et al., 2023), the same general pattern occurred for traits, situations, and their interactions.

SAM² further established large individual differences in the eight factors that predict social connectedness, social support, and loneliness (Figure 19, Table 12). Across individuals, these factors explained social connectedness, social support, and loneliness comprehensively, accounting for a median of 88% of the variance for social connectedness, 85% for social support, and 80% for loneliness (compared to group levels of 40% to 55% for social connectedness and support, and 10% to 45% for loneliness; Figure 5). Thus, large individual differences in social connectedness, social support, and loneliness reflected systematic variance within individuals, not noise (Figure 14, Table 10).

These SAM² measures have significant potential for developing and assessing precision interventions tailored to specific individuals. Reviews highlight the lack of a clear theoretical base for developing interventions to decrease loneliness and increase social connectedness, along with the lack of measurement tools for establishing the effectiveness of interventions (Hogan et al., 2002; Jarvis et al., 2020; Ma et al., 2020; O'Rourke et al., 2018; Osborn et al., 2021). SAM² offers a theoretically-motivated approach for both developing and assessing precision interventions.

4.4.2 Relations between social connectedness, social support, and loneliness

As predicted, social connectedness correlated positively and significantly with social support (Hypothesis 2). Findings from the factor analysis also largely confirmed Hypothesis 2. A two-factor solution offered the best fit, with the four social connectedness predictors loading on one factor and the four social support measures loading on another (Figure 16). The only wrinkle was that emotional support loaded on both factors. Interestingly, however, this pattern is consistent with Hare-Duke et al. (2019) who proposed that *cared for and accepted* is a

facet of social connectedness. Importantly, the correlation of .8 between the two factors demonstrated that they are closely related to one another, as expected. Taylor Browne Luka et al. (2023) also found that a two-factor structure fit best.

Two other findings from the factor analysis have implications for understanding the constructs of social connectedness and social support. First, the four social connectedness predictors loaded more highly on the social connectedness factor than the four social support predictors loaded on the social support factor. Second, all eight predictors were important for social support (but not for social connectedness), a finding supported by Taylor Browne Luka et al. (2023). Regressions at the group level further documented this pattern (Figure 17), as did prediction profiles at the individual level (Figure 19, Table 12).

As the results just reviewed illustrate, elements of social connectedness were also important for social support. These findings suggest that to perceive social support from others, one must first feel socially connected with them. Indeed as Langford et al. (1997) argue, for social support to occur, a *social network* must be in place first. Conversely, social connection can exist without social support. Exploring the relationship between social support and connection is an important topic for future research.

Relative to social connectedness and social support, loneliness is an even more complicated construct. Contrary to our prediction in Hypothesis 2, we did not observe a negative correlation, nor any significant correlation, between SAM^2 loneliness and SAM^2 social connectedness or social support. At the trait-level, these constructs were not related when assessed across situations. As part of discovery, we ran a group-level regression predicting loneliness with the eight predictors for social connectedness and support. Only the predictors of closeness, emotional support, and feedback were significant.

This lack of a clear relationship at the group-level of loneliness with social connectedness and social support suggests that feelings of loneliness are somewhat independent of social activity. Rather than reflecting one's social interactions, loneliness is more about one's individual feelings. An individual may be able to build strong social connections with others and perceive that

they have good social support but nevertheless still feel lonely in many situations.

Although loneliness was not well explained at the group level, it was explained well at the individual level. Confirming Hypothesis 4, excellent prediction of social connectedness, social support, *and* loneliness all occurred in the individual regressions. For each participant, three simple regressions were performed predicting social connectedness, social support, or loneliness with only the eight predictors. For all three constructs, explained variance was much higher in the individual regressions than in the group-level regressions, suggesting that individual variance suppressed prediction. Notably, for loneliness, prediction at the individual level improved by far the most, relative to the group level.

Poor prediction at group-level for loneliness, especially in comparison to the prediction at the individual level, can be explained by looking at prediction profiles for individuals in Figure 19. As can be seen, three groups of individuals emerged who experienced loneliness very differently. For one group, all eight predictors correlated positively with loneliness; for a second group, prediction was inconsistent and weaker; for a third group (perhaps most intuitively), all eight predictors correlated negatively with loneliness. The presence of diverse groups explains why, at the group level, so few predictors were significant and why relatively little variance was explained.

4.4.3 The COVID-19 pandemic and lockdown

Contrary to our predictions (Hypothesis 5), levels of social connectedness and loneliness did not differ significantly between single and multiple occupancy households. Consistent with our predictions, however, social support was higher for individuals living with at least one other person. This finding may again suggest that for social support to occur, a social network must first be in place (Langford et al., 1997).

We explored the potential impact of the global pandemic and associated social distancing measures. As part of our discovery, we found COVID-19 to have a significant effect on social connectedness, social support, and loneliness, such that the perception of all three increased during COVID-19, with loneliness

increasing the most. The finding of increased social connectedness and social support is contrary to some previous findings (Folk et al., 2020). Other research, however, similarly found an increase in social support during the pandemic (El-Zoghby et al., 2020; Zhang & Ma, 2020). For some individuals, an increase may have occurred as they slowed down during lockdowns, offering a chance to connect and support one another. Feelings of social connectedness may have also grown from an increased sense of shared identity (an important predictor of social connectedness), as everyone was experiencing the pandemic at the same time.

Similar to existing literature, we also found a significant increase in loneliness during the pandemic (Ellis et al., 2020; Ernst et al., 2022; Tull et al., 2020). The fact that loneliness increased, despite social connectedness and social support also increasing, again highlights that loneliness is a different construct than social connectedness and support. Whereas perceptions of social connectedness and support may be grounded significantly in an individual's social network, loneliness may more reflect an individual's internal state, reflecting how they feel about themselves and others more generally. Consistent with this interpretation, Satici et al. (2016) found that subjective happiness mediated the relationship between loneliness and social connectedness. One can interpret our findings from Satici et al.'s perspective: Because the pandemic caused subjective happiness to decrease, loneliness increased, despite a simultaneous increase in social connection and social support.

We obtained mixed support for Hypothesis 5. For social connectedness and social support, living with others increased the positive effect of COVID-19, such that those living with others had a greater increase in their levels of social connectedness and social support during COVID-19 than those living alone (not as predicted). The opposite pattern occurred for loneliness. Those living alone had the largest increase (though not significant) in loneliness during COVID-19, relative to those living with others (as predicted). Okabe-Miyamoto et al. (2021) also observed an interaction between household size and the effect of COVID-19. Like us, they found that social connectedness increased over the pandemic, but only for those living with a romantic partner.

Not only did our discovery address the effects of COVID-19 on social connectedness, social support, and loneliness, it also addressed how social connectedness, social support, and loneliness differed across different kinds of situations. Of particular interest was the effect of interaction mode (online vs. offline). Ultimately, we found little significance in differences between online and offline situations, suggesting that people can potentially gain as much social connectedness and support from online communication as they can from in-person situations.

As would be expected, social situations generally exhibited higher levels of social support and connectedness and higher levels across measures (Figure 21). Interestingly, though, whether a situation was social or not had little impact on levels of loneliness, again suggesting that loneliness has little to do with social factors, and that interventions aiming to increase social interactions are unlikely to counteract feelings of loneliness.

What appears to be the most important factor influencing social connectedness, social support, and loneliness is the valence of a situation. As Figure 21 illustrates, people feel much more connected and supported in positive situations and much less lonely. These large, highly significant differences imply that when we feel positive, we experience higher senses of social connection and support and decreased feelings of loneliness, regardless of whether we are socially interacting with other people or not, and whether were interacting in-person or online.

4.4.4 Relations to unsituated individual difference measures

We found partial support for Hypotheses 6 to 9 concerning the relationship of the unsituated individual difference measures to the SAM² measures, and for the ability of the SAM² predictors to explain these relationships.

As expected, the SAM² measure of loneliness correlated positively with unsituated measures of loneliness (both UCLA-3 Loneliness and perceived loneliness, see Table 11) and perceived stress (Hypothesis 6), Contrary to our predictions, no relationship between existed between perceived stress and the SAM² measures of social connectedness and social support. As predicted, when

perceived SES increased, SAM² social support increased and SAM² loneliness decreased (Hypothesis 7). Unexpectedly, however, SES was unrelated to SAM² social connectedness. As expected, extraversion correlated positively with SAM² social connectedness and social support, and neuroticism correlated positively with SAM² loneliness (Hypothesis 9). In general, the SAM² predictors consistently explained significant relationships involving SAM² social connectedness and social support but not involving SAM² loneliness. The pattern likely reflects the earlier finding that the predictors didn't explain much variance in SAM² loneliness at the group level but only at the individual level.

We further found partial support for Hypothesis 8, SAM² social connectedness correlated positively with quality of family relationships and SAM² social support correlated positively with the quality of interaction for each social network group, but not with quantity. Finally, SAM² loneliness correlated negatively with the quality of friends/partners only. Again, for significant relationships of social connectedness and social support with social network measures, the SAM² predictors could explain them, but not for SAM² loneliness.

These findings highlight the value of quality over quantity in social interactions. Interventions that aim to improve subjective experience of relationships and interactions may well be more effective than interventions that aim to increase their number. Indeed, a recent review and meta-analysis found that the quality of social connections was more important than the quantity for well-being (Zagic et al., 2022). Future research could explore what constitutes quality of interactions, and whether this can be taught and learned so as to target quality in interventions.

4.4.5 Limitations

As informative as the SAM² results are their correlational nature limits interpretation. These correlational patterns do not support causal interpretations. Indeed, one must be careful to avoid the temptation of drawing such conclusions from the rich descriptive data available. We cannot conclude that the eight predictors cause social connectedness, social support, or loneliness. Despite the close relationship between social engagement and social

connectedness, for example, we cannot be sure that increasing one will increase the other.

Another limitation is the retrospective evaluation of situations before the COVID-19 pandemic. Participants were required to evaluate levels of social connectedness, social support, and loneliness, along with the eight predictors by imagining how the situations felt before the pandemic. This may have introduced biases and inaccuracies in participants' judgements, such as social desirability or recency biases. Social desirability may have occurred as by having to evaluate the situation pre-pandemic and during, it made it clear to the participants we were looking at differences before and during. This may have resulted in participants ensuring their answers were different for each. This may in part explain why social connectedness, social support, and loneliness all increased during the pandemic, when in reality they may not have been affected by the pandemic. However, our finding of increased social connectedness, social support, and loneliness was not entirely unique to our study. For example, Ernst et al. (2022) and Tull et al. (2020) both found increased loneliness and Tull et al. also found increased social support during the pandemic (along with El-Zoghby et al., 2020 and Zhang & Ma, 2020). Indeed, it is difficult to determine whether our findings are an artefact of our methodology or a reflection of the effect of the pandemic. Unfortunately, we were not able to compare SAM² social connectedness and social support scores with our previous research given that the situations assessed there were absent during the pandemic. We therefore had to pick 16 new situations and thus asked participants to judge how they felt in them both before and during the pandemic. Considering this, it is important to be cautious with any conclusions drawn from our findings in relation to the effect of the COVID-19 pandemic on social connectedness, social support, and loneliness.

Finally, it is important to note that the development of the situations was not based on population norms. The initial intention had been to replicate the 24 situations developed in the previous SAM² social connectedness and social support instrument. However, due to the pandemic related restrictions in place at the time of data collection, many of these situations were not currently possible. Furthermore, due to the constant changes in lockdown measures and

rules, there was little time to generate situation norms for individuals in the UK. Considering this we chose to generate our own that would be allowed under the current lockdown measures but were also feasible and likely to happen pre-pandemic for many individuals. Indeed, this may have affected the validity of the study and introduced biases from our own lives. However, due to the timing of the study and the scope of this current thesis this method of situation selection was deemed the most appropriate. Despite the new situations used the SAM² instrument largely replicated the findings of the SAM² social connectedness and social support instrument that used a different set of situations, demonstrating that the measure can still be used effectively with different situations.

4.4.6 Conclusion

Overall, this study found support for existing constructs of social connectedness and social support and the elements that constitute them. It did not, however, find support for the idea that loneliness is the inverse of social connectedness and support. Instead, loneliness appears to reflect one's internal states more than interactions with others. More importantly, we were able to demonstrate large individual differences in subjective experiences of social connectedness, social support, and loneliness. This was particularly the case for loneliness, where three groups of individuals emerged who experience loneliness very differently. This is a potentially important direction for future research and may enable targeted interventions. Furthermore, we found effects of the recent pandemic on social connection, social support, and loneliness, along with the buffering effect of living with others.

Chapter 5 General Discussion

The overarching objective of this thesis was to gain a better understanding of trichotillomania with the aim to build an intervention that incorporated social connectedness and social support. Firstly, a new assessment instrument was developed for trichotillomania (Chapter 2) and assessed, with implications of findings discussed (Chapter 2). Secondly, a new assessment instrument for social connectedness and social support was developed (Chapter 3) and assessed. It was further developed and applied to COVID-19; implications of these findings were then discussed (Chapter 4). In the following chapter I will first summarise the key findings of each empirical chapter. I will then discuss the overall contribution and implications of the findings for the wider field. I will discuss the potential applications for using SAM², with a specific example developed for trichotillomania. Lastly, I will describe the strengths and limitations of the work followed by potential future research directions.

5.1 Summary of findings

Chapter 2 focussed on developing a novel assessment instrument for trichotillomania based in the theory of grounded cognition – the Situated Assessment Method Trichotillomania Assessment Instrument (SAM² TAI). As part of the development of SAM² TAI an initial norming study was conducted to identify situations in which people with trichotillomania do and do not pull their hair. From the norming study 700 pulling and 602 non-pulling situations were generated resulting in 234 unique pulling situations and 201 unique non-pulling situations. Not only did this initial study provide situations for the development of SAM² TAI, it also demonstrated the heterogeneity of hair pulling. There were a number of situations generated by participants that no other participant generated. Furthermore, for some, a situation classed as a pulling situation could also be classed as a non-pulling situation for another.

From the norming study 52 situations were chosen (31 pulling and 21 non-pulling) for the SAM² TAI. From the literature three proposed models trichotillomania were chosen to develop our influential processes: the Comprehensive Behavioural Model (ComB, (Mansueto et al., 1997)), the Cognitions and Beliefs Model (Rehm et al., 2015) and the emotion regulation model. This resulted in 13

influential processes for our initial version which were distilled into 8 for our second version. Results of using the SAM² TAI demonstrated large individual differences in pulling. There were also substantial situational effects and situation by individual interactions. Patterns of prediction at both the group and individual level showed support for all three models in varying degrees. Further still the influential processes in SAM² TAI were able to explain large amounts of variance at the group level and even more so at the individual. Taken together the results suggest that the cycle of hair pulling is unique to each individual and the situation with which they are in. The results further demonstrate that SAM² TAI can detect this rich information in a way that traditional measures are less able to do so.

Chapter 3 presents our development of SAM² for social connectedness and social support. For this initial version, 24 situations were chosen with an equal number of social and non-social and positive and negative situations. From the literature on social connectedness and social support 8 influential processes were chosen, four for social connectedness and four for social support. Like with SAM² TAI, the results demonstrated large individual differences and substantial situational effects and situation by individual interactions. Furthermore, through a factor analysis we were able to demonstrate that social connectedness and social support are distinct but connected constructs. Indeed, it seems for social support to occur and be perceived there must first be perceived social connection, likely through social engagement. Again, our SAM² measure of social connectedness was able to explain large amounts of variance in social connectedness and social support at the group level, and even more so at the individual level. Results also demonstrated that the valence of the situation had a much greater impact on perceived social connectedness and support than whether the situation was social or not, such that positive situations were deemed as having more social connectedness and support regardless of the presence of others.

Chapter 4 took advantage of the COVID-19 pandemic and the associated lockdown and social distancing measures. To do so we modified the 24 situations in the original SAM² measure for social connectedness and social support to 16 situations that could reasonably occur under the UK restrictions at the time of

data collection. Within these situations we also included an equal mix of online and offline situations to examine the effect of modality of communication on social connectedness and social support. Chapter 4 largely confirmed the findings of Chapter 3 in relation to the constructs of social connectedness and social support, their predictors and large individual, situational and situation be individual interaction effects. The results also established that social connectedness, social support, and loneliness all increased during the pandemic. Furthermore, there was an effect of living with at least one other person, versus living alone, such that those who lived with others had a greater increase in social connectedness and social support than those who lived alone during COVID-19. Conversely, those who lived alone had a greater increase in loneliness during the pandemic than those who lived with at least one other person. In exploratory analysis we saw little effect of modality on social connectedness, social support and loneliness, again, what seemed most important was the valence of the situation.

5.2 Thesis contribution and implications

Overall, this thesis highlights the importance of the individual when looking at varying constructs. For both our SAM² assessment instruments (trichotillomania and social connectedness/support) we were able to demonstrate substantial individual differences. By examining each individuals' unique experience of the construct of interest we were able to provide rich descriptive data. Looking at the individual allowed for a deeper understanding of how the construct is experienced by the target population and how it is influenced.

The substantial individual differences we found across constructs offers support for the theory of grounded cognition (Barsalou, 2008). Cognition does not happen in a vacuum, instead it is grounded in one's external and internal perceptions, the body, and the physical and social environment. Cognitions guide our actions, through the Situated Action Cycle which covers five phases (the environment, self-relevance, affect, actions, and outcomes). Each iteration of the cycle is stored in our memory in a multi-modal manner, known as *situated conceptualisations* (Barsalou, 2009, 2019; Lebois et al., 2020; Papies, 2017). Thus, if a relevant situation occurs a *situated conceptualisation* is activated which may lead to a particular behaviour, such as the construct of interest.

By measuring the construct of interest in relevant situations using the SAM² framework the individual's *situated conceptualisations* are being activated. Because *situated conceptualisations* store multi-modal information specific to each individual and their previous experiences of each situation, substantial individual differences emerge. The presence of such individual differences and the SAM²'s ability to detect these can have important implications. For example, if you take our SAM² measure of loneliness, ignoring the individual (group-level results) meant that variation in loneliness could not be explained well. Contrastingly, by examining the individual, important differences and nuances within the construct appeared. Thus, by looking at the individual a deeper understanding of the construct of interest can be obtained, with potential to develop more targeted and potentially beneficial interventions.

Further evidence to support the Situated Action Cycle and its use within SAM² stems from its successful application across a variety of constructs. Use of the Situated Action Cycle in SAM² instrument has successfully managed to explain variance in habitual behaviour (Dutriaux et al., 2023), drinking consumption (Werner, Papies, Best, et al., 2022), eating behaviour (Werner, Kloidt, et al., 2022; Werner, Papies, Gelibter, et al., 2022), stress, and sustainable behaviour. Combined with the findings from the previous chapters in this thesis, using the Situated Action Cycle successfully explains large amounts of variance in a wide variety of constructs. The fact that the Situated Action Cycle can explain the bulk of variance between individuals implies it is sufficiently thorough and complete. Furthermore, the fact it can be applied to a variety of different constructs provides evidence that it can be a useful model to explain a wide range of constructs.

5.2.1 Practical Applications

The SAM² approach to measuring constructs could have potential clinical and practical applications. SAM² instruments could be tailored to specific individuals and a variety of clinical functions. Take for example, our social connectedness and social support instrument. If one wanted to improve an individual's social connectedness and social support, they could initially begin by utilising our SAM² instrument. However, instead of using a specific set of 24 situations, the individual would generate their own situations relevant to their life. A predictive

model could then be developed unique to that individual of factors associated with social connectedness and social support. This model could then be used to guide behaviour change interventions. For example, if the individual found social engagement was a strong predictor of their social connectedness, interventions could aim to increase social engagement. Longitudinal assessment could then track the effectiveness of the intervention over time.

5.2.1.1 SITUATE trich: a behavioural intervention tool for trichotillomania.

As part of this thesis a behavioural intervention tool was developed for trichotillomania using SAM², referred to as SITUATE trich. SITUATE trich builds on current treatments of trichotillomania, the simultaneous development of a stress behavioural intervention tool (SITUATE stress), and our own research in to understanding trichotillomania.

As our SAM² TAI demonstrated substantial support for ComB conceptualisation of trichotillomania, it follows that an intervention based on this theory would have merit. Indeed, evidence so far does suggest that ComB treatment can be effective and potentially better than the current most prescribed treatment of habit reversal training (HRT) (Bottesi et al., 2020; Carlson et al., 2021; Flannery et al., 2022). However, as noted in our research the ComB model does not fully account for all potential influential processes and perhaps focuses more on the behavioural elements as opposed to the cognitive processes involved. Furthermore, ComB requires a trained professional and a patient actively seeking help through professional health services. Many individuals with trichotillomania do not seek treatment for a variety of reasons (Woods et al., 2006). This limits their access to such a treatment, and thus even if the treatment is effective, one must question how useful it is for the trichotillomania community. Indeed, there is evidence for an online trichotillomania community that regularly seek information and accessible treatment options online (Bruwer & Stein, 2005; Tan et al., 2021).

Typical treatments of trichotillomania (with the exception of ComB treatment) tend to focus on the behaviour of hair-pulling and replacing this with something less harmful. These treatments are useful, but they ignore the specific situation where pulling occurs. They teach useful skills for managing pulling behaviour but

not necessarily when it is most useful to apply it. Some skills may work well in some situations, but some may not be possible or simply be ineffective in other situations.

As we demonstrated in Chapter 2, trichotillomania is incredibly heterogenous in nature. It differs significantly from person to person, but also from situation to situation and there is a substantial situation by individual interaction. This interaction can most simply be evidenced by the fact the exact same situation for one person can be classed a frequent pulling situation, but for another individual they would never consider pulling in it (Taylor Browne Lūka, Hendry, et al., 2023). Considering the previous findings, we developed a behavioural intervention tool for trichotillomania that first starts by identifying situations where pulling occurs - SITUATE trich.

SITUATE trich was designed as an online intervention tool that individuals can use to help manage, reduce, or even cease their own pulling, without needing a trained therapist to administer it. The aim is to help the individual become more aware of their pulling, where and when it occurs, what influences this, and how they can react to help minimise their pulling.

The first stage of SITUATE trich is to identify and recognise pulling situations, to help the individual develop an awareness of their pulling and potential situations that are the most triggering for them. It then aims to help identify the influential processes that produce pulling and urges to pull in certain situations. Finally, SITUATE trich teaches skills to help regulate the influential processes, and recognise which skills would be the most useful in each unique situation.

The influential processes chosen for SITUATE trich were developed from the psychometric paper discussed previously (Taylor Browne Luka, Hendry et al., 2023) with the addition of social support. For these we focused on the most relevant processes for the majority of people and chose to align with the original instrument, rather than combining processes as was done in the second version. This was primarily to help the individual delve into the specifics of what was occurring in each situation. This ultimately resulted in ten influential processes: external triggers, external control, internal triggers, internal control, automatic

vs. focused pulling, ritualised behaviour, how good pulling feels, reduction in negative emotion, long-term consequences, and social support.

The next stage of SITUATE trich teaches the individuals specific skills they can use to help manage their pulling. These were developed from the literature, the stress behavioural intervention tool (SITUATE stress), and our previous research into trichotillomania and social connectedness and support (Taylor Browne Lūka, Hendry, et al., 2023; Taylor Browne Lūka, Iswaraan, et al., 2023; Taylor Browne Lūka & Barsalou, 2023). This resulted in the following seven skills: acknowledgment, changing your environment, social support, pulling management, reappraisal, relaxation, and distraction. The skills of changing your environment and pulling management were largely developed from our SAM² Trichotillomania Assessment Instrument (TAI) (Taylor Browne Luka, Stevenson et al., 2023). The skill of social support was inspired by our SAM² Social Connectedness and Social Support Instrument (Taylor Browne Luka, Iswaraan & Barsalou, 2023).

Although we have not yet been able to test the efficacy of our intervention, we were able to establish if the community would be receptable to such a tool. The majority of participants enjoyed using SITUATE trich and would recommend it to anyone wanting to manage and/or reduce their pulling. A key part of our SITUATE trich intervention is incorporating SAM² TAI and allowing individuals to see their own unique pulling profile in situations most relevant to themselves. Many participants appreciated this opportunity to really delve into their pulling and felt it made them think about their pulling it ways they had not previously. It may therefore be useful for any intervention for trichotillomania to initially begin with SAM² TAI. Used in this way, the individual would initially pick pulling situations relevant to themselves and then evaluate the influential processes within them. Using such a tool could enable more targeted approaches which could be beneficial considering the heterogeneity of trichotillomania and the currently high relapse rates using HRT (Farhat et al., 2020).

5.2.2 Trichotillomania

Specifically in relation to our findings on trichotillomania and the development of our new assessment tool SAM² TAI there are important implications. The

following section will first outline the theoretical implications, followed by a discussion of the issue of hair pulling subtypes and whether they are a useful subclassification tool for trichotillomania.

5.2.2.1 Theoretical implications

Firstly, our findings using the SAM² TAI could have important theoretical implications. Across all individuals there was ultimately evidence for all three models of hair pulling (ComB model, cognitions and beliefs, and emotion regulation). Looking at the results one could argue that the ComB model had the most support with external triggers being such a strong predictor for almost everyone. Being that external cues in the environment seem to be closely associated with pulling, the ComB model is able to account for this, and indeed it is a key part of the model. The model of cognitions and beliefs and emotion regulation model focus more on internal cues which our results also demonstrated to be of high importance, perhaps more so than external cues. Although it should be noted that the ComB model also acknowledges internal cues.

Indeed, the models are not mutually exclusive, one could argue that the ComB model considers the other two models just in less detail, taking a more overarching look at the hair pulling cycle as a whole. The ComB model thus acknowledges the role of cognitions and emotion regulation within the pulling cycle. The model of cognition and beliefs can easily be incorporated into ComB, giving specificity to the cognitions that are internal cues and facilitators for pulling. Furthermore, the perfectionistic standards for hair, identified as part of the cognitions and beliefs model, could easily be incorporated into the ritualistic behaviour element of the ComB model. Emotion regulation model can also be seen as one potential version of ComB cycle, there is an initial internal cue of a negative emotion, an internal facilitator of wanting to regulate this, followed by the pulling behaviour. This then culminates into consequences such as the negative emotion being reduced, thus reinforcing the behavioural cycle. Clearly the ComB model can effectively account for pulling rooted in behavioural theory.

One can also look at hair pulling from the theory of grounded cognition (as oppose to behavioural theory), particularly the Situated Action Cycle (Barsalou, 2008, 2020; Dutriaux et al., 2021). From the Situated Action Cycle there are perceived entities and events in the environment (external cues and external facilitators/inhibitors in the ComB model) that would typically initiate the cycle. Here, like the ComB model and unlike the cognition and beliefs and emotion regulation models, the Situated Action Cycle acknowledges the importance of the situation and external factors that may influence pulling.

Once the environment is perceived the self-relevance of the entities and events is assessed. For hair pulling this could be in the form of internal cues (internal facilitators/inhibitors in the ComB model), these cues likely reflect the cognitions identified by Rehm et al. (2015), such as negative self-beliefs, the acknowledgement of how good it feels to pull one's hair, and how it may reduce any negative emotion currently being experienced in the situation. Self-relevance then induces affect, which for hair pulling specifically may be the urge to pull, bodily arousal, internal control in form of emotion regulation (accounted for in some form in all three models), or experiential avoidance (part of the model of cognitions and beliefs). If strong enough this then likely leads to the action of pulling, this can then be automatic or focused in nature and include ritualistic behaviour (ComB model) and/or perfectionistic standards for hair (model of cognitions and beliefs). Situational control (or lack thereof) may also come into play at this stage of the cycle.

Actions then lead to outcomes, much like the consequences stage of the ComB, these can be rewarding/reinforcing or aversive. Specifically, there can be the physical sensation of how good it feels to pull the hair, the resulting reduction in any negative emotion and long-term consequences. These phases of the Situated Action Cycle can run in parallel, be omitted, or overlap. From this perspective it is possible to account for the individual differences in pulling we observed in terms of influential processes. It can further account for the situational effects we observed and the substantial situation by individual interactions. The Situated Action Cycle of pulling can thus give a more comprehensive account of pulling for each individual and using SAM^2 TAI can provide a useful assessment instrument for each individual's unique pulling cycle.

5.2.2.2 Hair pulling subtypes

Finally, another interesting avenue of this thesis is the question of the existence of hair pulling subtypes and as to what use they may be. One common suggestion as to why interventions have limited effect for trichotillomania is the potential existence of subtypes. A common school of thought believes there are underlying psychological mechanisms driving hair pulling and thus pulling can be either 'automatic' (when one is not fully aware of their pulling) or 'focused' (when one is aware of their pulling and intention to do so) (Christenson et al., 1993). Using these two types of pulling it has been suggested that there are four subtypes of trichotillomania: low automatic / low focused; low automatic / high focused; high automatic / low focused; and high automatic / high focused (Flessner, Conelea, et al., 2008). There is evidence to suggest that scoring highly for one type of pulling may increase the pulling severity and focused pulling may be linked to poorer quality of life (Flessner, Conelea, et al., 2008; Flessner, Woods, Franklin, Keuthen, et al., 2008; Tung et al., 2014). Another large scale study using a range of measures, including pulling style, found three subtypes of trichotillomania (Grant et al., 2021). There is also evidence to suggest that these styles of pulling respond differently to therapy, with HRT being more effective for focused pullers compared with automatic pullers (McGuire et al., 2020).

However, from our own research in Chapter 2 it was difficult to conclude that there were distinct subtypes of trichotillomania. There was some clustering in terms of hair pulling style, but these were not strong or well differentiated. Instead, there was tremendous variability across individuals and situations. Grant & Chamberlain (2021) also found that automatic and focused pulling may not be that useful in subtyping trichotillomania. Despite their large sample their k-means clustering model was unable to converge on an optimal solution. The lack of clear clustering of individuals based on subtype of pulling from our research and Grant and Chamberlain is not wholly that surprising. Individuals often report both styles of pulling during the same pulling episode and across different episodes of pulling (Christenson et al., 1991, 1993; Grant & Chamberlain, 2021a), which was also reflected within our own data.

If the type of pulling someone exhibits is related to the efficacy of treatment, then continuing to establish subtypes is important (McGuire et al., 2020). However, the fact that our research and indeed others, have failed to consistently find distinct subtypes of pulling may mean it is not the most useful avenue for research to explore. Indeed, from our own findings the most important differences may exist at the level of individuals, not at the level of subtypes. Identifying subgroups of hair pullers may not therefore be possible as trichotillomania may be too heterogeneous in nature. Even if subtypes are clearly identified, large individual variance within these subtypes could still affect treatment outcomes significantly. For this reason, it may be more useful for treatment to focus on the individual and tailor treatment to what influences that individual's pulling most.

5.2.3 Social Connectedness and Social Support

Chapters 3 and 4 developed some important implications for social connectedness and social support. The following section outlines the broader potential theoretical implications for the constructs of social connectedness and social support. This is then followed by discussion of the situational effects on the two constructs. Thirdly the relationship, or lack thereof, between loneliness and social connectedness and social support is then discussed.

5.2.3.1 Theoretical implications

Using our SAM^2 measure of social connectedness and social support we were able to develop our understanding of the two constructs and their relationship with one another (Chapters 3 & 4). Our findings supported Hare-Duke et al.'s (2019) conceptualisation of social connectedness, with evidence of the importance of shared identity, closeness, valued relationships, and social engagement in predicting an individual's social connectedness. Developing and confirming a theory of social connectedness is an important step in being able to build effective interventions. Indeed, Dickens et al. (2011) found that interventions with a sound theoretical basis were more effective than those that did not. Considering this our confirmation of Hare-Duke et al.'s conceptualisation of social connectedness offers a potential theoretical framework for interventions to be developed.

Interestingly, for social support not only did we find that theoretical conceptualisations of social support were supported, but also that social connectedness was relevant as well. As expected, key elements of social support did predict the construct (e.g., emotional support, instrumental support, informational support and feedback; House, 1981; Langford et al., 1997; Muñoz-Laboy et al., 2013) but so too did elements of social connectedness (e.g., closeness, valued relationships, social engagement and shared identity). Thus, one could argue that to perceive social support, one must also feel connected to others. Indeed it has been suggested that an antecedent of social support is social embeddedness (Barrera, 1986; Langford et al., 1997). Social embeddedness, like social connectedness, refers to the extent to which individuals are integrated/connected into their social networks, thus providing a foundation for social support.

From our research we found evidence to suggest that social connectedness can be a clearly defined construct but that social support is less clearly defined. Social support seems to not only be about the perceived support one could receive, but also the perceived social connection one has. Perhaps one cannot conceive of receiving support if there is no closeness with others or a valued relationship with which to receive support from. The relationship between social connection and social support is a potential avenue future research could explore. Specifically, whether to increase perceived social support, first social connectedness must be developed.

5.2.3.2 Situational effects

An interesting finding from our research was the situational effects in perceived social connectedness and support, particularly the valence of the situation. We found across both studies positive situations increased social connectedness and social support far more than social situations. The influence of the situation on social connectedness and social support has not been widely researched but there is some evidence to support our finding.

Sandstrom & Dunn (2014) found that positive interactions, even with acquaintances as opposed to close friends and family, increased feelings of social connection. Furthermore, Pressman et al. (2009) found that participating

in enjoyable leisure activities increased feelings of social connectedness. They further found the positive benefit of the activity was greater when with others than with alone. Our research also supports this as we found a significant interaction between valence and sociality of the situation, such that there was an increase in social connectedness/support if the situation was both positive and social. Valence alone still had the greatest effect, but the interaction was greater than sociality alone. As there has been little exploration into the effect of the situation on social connectedness and social support it is an avenue that future research could explore. It would be interesting to explore if the valence of the situation could be manipulated to increase social connectedness and social support and to explore the underlying relationship between valence and social connectedness/support.

5.2.3.3 Loneliness

Of final interest from our research was the relationship between SAM² social connectedness, social support and loneliness. Overall, at the group level there appeared to be little relationship between social connectedness, social support, and loneliness, in terms of trait measures and influential processes. However, by looking at the individual, interesting relationships could be observed. From our analysis (Chapter 4) three groups of people emerged who experienced loneliness very differently from one another. One group of people whose loneliness increased as social connectedness and social support influential processes increased; one whose loneliness seemed to have little relation to the social influential processes; and one final group who loneliness increased as social connectedness and social support processes decreased.

The emergence of such divergent groups helps to explain why at the group level there seemed little relation between SAM² loneliness and social connectedness and social support. Adaptive and maladaptive responses to perceived loneliness offer one possible explanation for this pattern of results. As Hawkley and Cacioppo (2010) suggest, every individual is capable of feeling lonely, and the pain of loneliness can motivate an individual to maintain and form social connections, a key to survival of their genes. Thus, from an evolutionary perspective, loneliness can be seen as a useful experience when it motivates an individual to acknowledge and build social connections (S. Cacioppo et al., 2015;

Hawkley & Cacioppo, 2010; Qualter et al., 2015). Conversely for some individuals, loneliness can become chronic, resulting in harmful consequences to cognition, emotion, behavior, and health, in turn producing more profound social isolation and perceived loneliness.

Our finding that different groups of people respond and interpret feelings of loneliness differently constitutes another important direction for future research. Using the SAM² loneliness measure, individuals who experience loneliness in different ways can be identified. Precision interventions tailored to the loneliness they experience can be implemented. For example, lonely individuals who have acceptable levels of social connectedness and social support may benefit most from social cognition interventions to reduce loneliness (for relevant findings, see Hawkley & Cacioppo, 2010). In contrast, lonely individuals low in social connectedness and social support may benefit from assistance that first strengthens their social networks.

5.3 Strengths and Limitations

A major strength of the empirical work described is the use of a novel assessment method based in theory of grounded cognition. Taking a situated approach using the SAM² to assess trichotillomania, social connectedness, social support and loneliness, allowed us to capture a rich descriptive profile of each construct for individuals. Trichotillomania is very heterogeneous in nature, a fact which may limit the efficacy of generic treatment. Loneliness also appears to be experienced very differently by individuals, also potentially effecting efficacy of interventions. Instead of relying on generalised assessments of these constructs SAM² captures these constructs in a situated manner, thus picking up the heterogeneity of the construct. By doing so it can identify perhaps what aspects are most relevant for intervention for each individual. Furthermore, the SAM² is based in the theory of grounded cognition which, particularly in field of social connectedness and social support, can help to offer theoretical insight into the construct of interest and be a target for developing interventions.

There are, however, also recurrent limitations associated with the empirical work discussed. Firstly, Chapters 2-4 all rely on correlational results and so we cannot infer causality. Although we found evidence of the effect of influential

processes on trichotillomania, social connectedness, social support and loneliness, we cannot say that any cause an increase or decrease. However, the correlational results do demonstrate, and provide an informative, rich picture, of individual differences. Secondly, all our data relied on self-report measures which can be vulnerable to many biases, such as social desirability, recency effects etc.

Specifically for Chapter 4 one limitation is the reliance on post-hoc judgements for pre-pandemic levels of social connectedness, social support and loneliness. By simultaneously self-reporting these construct before and during COVID-19 this may have artificially created a difference as participants may purposefully rate them differently, believing it to be an expectation of the researchers. However, we were limited in how we could compare the constructs before and during COVID-19 as our previous data utilised situations that were no longer possible during COVID-19.

A specific limitation of Chapter 2 is in relation to the sample of participants. Participants self-reported trichotillomania, rather than being clinically diagnosed. Our sample may therefore have been less severe than the clinical population and so results may not be generalisable to those clinically diagnosed with trichotillomania. However, seen as many with trichotillomania do not come forward to be clinical diagnosed, our sample may be fairly representative of the general population with trichotillomania. A further specific limitation of Chapter 2 was the test duration for SAM² TAI. Evaluating 52 situations for multiple influential processes is very time consuming, leading to drop-outs and potential mechanical responses later on. We did try to overcome this through randomisation, but potential future versions could utilise less situations to reduce the time.

5.4 Future directions

There are many potential directions for future research stemming from the research presented in this thesis. Firstly, future research could develop and finetune our SAM² TAI to reduce the time taken to complete whilst still ensuring a rich descriptive pulling profile for individuals. This would enable its clinical utility in treatment for individuals with trichotillomania. One potential way to

shorten our SAM² TAI would be to reduce the number of situations evaluated. Indeed, our SAM² social connectedness and social support measure just used 24 situations and was still able to provide rich data. Secondly, if an aim is to use our SAM² TAI in clinical settings to aid personalised treatment it would be useful for future research to explore the benefits of participants generating their own unique situations to evaluate.

A second avenue of research could explore the situational effects on social connectedness, social support and loneliness. In discovery analysis across both Chapters 3 & 4, we found that the valence of the situation had the greatest impact on levels of perceived social connectedness, social support, and loneliness (Chapter 4). Thus, suggesting that in positive situations people in general feel more connected, more supported and less lonely, regardless of what is occurring in the situation (be it social or not). Future research could explore the situational effect we observed both quantitatively exploring size and direction and qualitatively to explore underlying reasons why. It would also be worth exploring if this is something that can be manipulated, and if so, whether this would affect perceived levels of social connectedness, social support, and loneliness, presenting a possible direction for interventions.

A third interesting area for future research to explore would be the individual differences in experiencing loneliness. From our research there appeared to be three groups of people who experienced loneliness differently from one another. Potential research could explore these groups and find differences between them. Are the groups reflective of adaptive and maladaptive forms of loneliness? Are there personality differences that can account for the different experiences? For the group whose loneliness seemed unrelated to social connectedness and social support predictors, what predicts their loneliness? Can different interventions be targeted for each group, and would this improve efficacy?

Finally, another important avenue of future research would be to explore the relationship between social connectedness, social support and hair pulling within the trichotillomania population. This had always been the initial plan for the thesis but due to COVID-19 such a study did not get conducted. It has been well documented the relationship between social connectedness, social support and mental health, but there has been little research looking into the

trichotillomania population specifically. Of what little research exists there has been found a negative correlation with perceived social support and hair pulling symptom severity (Falkenstein & Haaga, 2016). It would therefore be of interest to explore the potential relationship further and using SAM². One potential avenue would be to add social connectedness and social support as predictors in the SAM² TAI to see what impact they have on urges and frequency of pulling across different situations and individuals.

5.5 Conclusions

Overall, this thesis contributed to the understanding of trichotillomania through development of a novel assessment instrument (SAM² TAI) that evaluated current theories of hair pulling. It further developed one potential form that an intervention could take (SITUATE trich). The findings affirm the widely accepted model of hair pulling (ComB model) and offer another way to conceptualise trichotillomania through grounded cognition and the Situated Action Cycle. Furthermore, we developed SAM² instrument for social connectedness and social support (and loneliness). Findings from this help to develop our understanding of these constructs and how they differ and relate to one another. Finally, the consistent finding across this thesis is the large individual differences in behaviour (hair pulling) and perception (perceived social connectedness, social support, and loneliness). Not only are there large individual differences in these constructs but also substantial situational effects and situation by individual interactions. From these results there is evidence to support the theory of grounded cognition and understanding human behaviour and cognition through the Situated Action Cycle.

Appendix A Supplementary materials for Chapter 2

SM 1
Supplementary Materials
Courtney Taylor Browne Luka et al. norms for pulling situations

Table 1. The 700 pulling situations generated from Study 1. Each situation listed was generated by a single participant using the description in the column, Original Text. The description used for the item in the analysis after collapsing similar situations into a common unique situation is provided in the column, Unique Situation. The domain used to cue the item is provided in the column, General Domain. The participant's responses for frequency, arousal, and valence can be found in the right-most columns.

Partic_ID	Generation Domain	General Category	Unique Situation	Original Text	Frequency	Arousal	Valence
21	Travel	airport	waiting at the airport	Waiting at airport	2	0	-1
29	Travel	airport	waiting at the airport	Waiting at airport	2	NA	0
34	Travel	airport	waiting at the airport	Waiting at the airport	1	2	-2
40	Travel	airport	travelling to the airport	Travelling to the airport	2	3	1
9	UniWork	arts & crafts	painting or drawing artwork	Painting artwork	5	1	1
9	LeisHome	arts & crafts	painting or drawing artwork	Painting art pieces	4	NA	2
29	FamRel	at home	living with husband	Living with husband	4	1	0
22	LeisHome	at home	home alone	Home alone	3	0	3
7	UniWork	at school/university/work	being bored at school/university/work	Bored at work	4	0	0
10	UniWork	at school/university/work	attending classes/lectures	Listening to presentations and taking notes	4	0	0
11	UniWork	at school/university/work	attending classes/lectures	Listening to a lecture/discussion	4	0	1
14	UniWork	at school/university/work	attending classes/lectures	listening to a professor lecture	4	0	0
16	UniWork	at school/university/work	attending classes/lectures	Listening to lectures	5	0	-1
16	UniWork	at school/university/work	socialising at school/university/work	Talking to classmates	5	0	-1
17	UniWork	at school/university/work	being bored at school/university/work	Sitting at desk during a lull	4	0	0
18	UniWork	at school/university/work	having bad relationship at work	Having bad relationship at work	1	0	-2
19	UniWork	at school/university/work	questions from coworkers	Being asked about my hair by my coworkers	2	2	-3
20	UniWork	at school/university/work	sitting in a meeting	Sitting in a meeting	5	1	0
20	UniWork	at school/university/work	working alone at own desk	Working alone at my desk on my computer	5	0	0
23	UniWork	at school/university/work	working alone at own desk	Working at my desk when alone in the office	4	4	0
24	UniWork	at school/university/work	working alone at own desk	working at my desk at work	5	NA	0
25	UniWork	at school/university/work	at work in general	Working as a teacher in a high school	4	0	-3
25	UniWork	at school/university/work	attending classes/lectures	Sitting through an art critique at college	1	0	-1
26	UniWork	at school/university/work	attending classes/lectures	going to class	4	1	0
28	UniWork	at school/university/work	attending classes/lectures	Sitting in class	5	2	1
28	UniWork	at school/university/work	sitting in a meeting	Sitting in work meeting	4	1	-2
30	UniWork	at school/university/work	being bored at school/university/work	Hair pulling event #1: sitting through a boring lecture	2	1	1

31	UniWork	at school/university/work	attending classes/lectures	Attending sessions	4	1	1
33	UniWork	at school/university/work	attending classes/lectures	Listening to a presentation at work	2	NA	0
33	UniWork	at school/university/work	waiting for a lesson	Waiting for a lesson to begin at university	4	0	0
37	UniWork	at school/university/work	being bored at school/university/work	Having a boring lecture	NA	0	NA
39	UniWork	at school/university/work	attending classes/lectures	attending class	5	0	NA
39	UniWork	at school/university/work	reading an article or book in class	reading an article or book in class	5	2	NA
40	UniWork	at school/university/work	attending classes/lectures	Listening to a lecture	5	0	2
48	UniWork	at school/university/work	watching videos in class	Watching videos in class	4	0	2
53	UniWork	at school/university/work	waiting in the break room	Waiting in the break room between clients	4	4	0
57	UniWork	at school/university/work	attending classes/lectures	Listening to lecture	4	0	-1
14	FamRel	at school/university/work	attending classes/lectures	Listening to a professor	2	0	0
55	Travel	at school/university/work	at work in general	Working at work	4	2	-1
25	LeisOut	at school/university/work	socialising at school/university/work	Listening to discourse at my college	2	0	0
22	UniWork	bathroom	being in the bathroom	Bathroom	5	0	NA
10	Health	bathroom	sitting on the toilet	Sitting on toilet	5	NA	0
22	LeisHome	bathroom	being in the bathroom	Bathroom before going pee	5	1	2
4	LeisOut	bathroom	using a public toilet	having used the restroom, staying in the stall a little longer to pull as people make my anxiety worse.	3	2	0
4	FamRel	being intimate	cuddling with partner/spouse	having cuddly time with my husband	2	0	3
19	FamRel	being intimate	lying in bed with partner/spouse	Laying in bed with my husband at night	5	0	3
31	FamRel	being intimate	cuddling with partner/spouse	Cuddling with partner	5	1	3
41	FamRel	being intimate	lying in bed with partner/spouse	Lying in bed with my husband	5	3	3
48	FamRel	being intimate	being in a romantic relationship	Being in a romantic relationship	0	0	-3
51	FamRel	being intimate	lying in bed with partner/spouse	Falling alseep with partner	5	0	3
52	FamRel	being intimate	lying in bed with partner/spouse	Laying next to my husband when he is asleep	5	1	0
57	FamRel	being intimate	cuddling with partner/spouse	Cuddling on couch with Husband or kids	4	0	3
4	UniWork	being tired	being tired from work	having been at work all night and am extremely tired, but forced to stay awake with my two year old, which is a bursting ball of energy, until her nap time after lunch. I tend to calm my nerves pulling, but not actually realizing till its too late.	5	0	-1
51	UniWork	being tired	being tired from work	Tiredness from work	5	NA	3
26	UniWork	changing/dressing	changing after gym class	changing after gym class	4	4	1
5	Health	changing/dressing	removing glasses	taking my glasses off	NA	NA	NA
4	FamRel	child care	playing with children	having cuddle time with my children/playing with my children	5	1	3
26	FamRel	child care	activities with baby	activities with baby	5	0	3

48	FamRel	child care	babysitting	Babysitting siblings	5	0	2
57	FamRel	child care	helping with homework	Helping with homework	5	0	-2
4	Health	child care	managing rowdy child	having to manage my rowdy 2 yr old and fighting sleep	5	NA	1
56	Health	child care	daughter's autism diagnosis	My daughter's autisms diagnosis	5	0	2
56	Travel	child care	waiting for child's haircut	Waiting for my son to get a hair cut	3	1	3
57	Travel	child care	taking children to school	Biking kids to school	4	0	2
26	LeisOut	child care	waiting for programmes for baby	waiting for programs to begin for baby	4	1	-1
56	LeisOut	child care	in the park with children	Park with the kids	4	0	2
57	LeisOut	child care	in the park with children	Watching the children playing at a park	2	NA	2
41	NonLeis	child care	feeding children	Feeding babies	5	NA	1
37	Health	chore	doing household chores	Doing household chores	NA	1	NA
3	NonLeis	chore	folding/putting away laundry	Folding the laundry	4	0	1
4	NonLeis	chore	working on to-do lists	having to inventory housing needs	4	1	-1
5	NonLeis	chore	cleaning the house	cleaning the bathroom	NA	1	NA
8	NonLeis	chore	washing the dishes	Washing the dishes	4	0	-1
8	NonLeis	chore	cleaning the house	Cleaning around the house	5	0	1
9	NonLeis	chore	cleaning the house	Cleaning home	2	NA	0
10	NonLeis	chore	folding/putting away laundry	Putting away laundry	4	4	-1
10	NonLeis	chore	vacuuming	Vaccuuming	3	2	-1
11	NonLeis	chore	working on to-do lists	Planning or organizing myself (e.g. to do lists, looking st my week's appointments and planning when I'll do x or y, or figuring out how much to spend on groceries this week so that I have enough for x or y)	4	0	0
16	NonLeis	chore	cleaning the house	Cleaning the house	4	0	-2
21	NonLeis	chore	folding/putting away laundry	Folding laundry	3	0	-3
23	NonLeis	chore	working on to-do lists	Writing to-do lists for chores that need to be done	4	0	0
26	NonLeis	chore	folding/putting away laundry	folding clothing	4	0	0
26	NonLeis	chore	folding/putting away laundry	hanging up clothing and putting them in drawers	3	4	-1
26	NonLeis	chore	picking up rubbish in the house	picking up toys and house litter	5	1	0
31	NonLeis	chore	folding/putting away laundry	Folding clothes	4	0	-1
31	NonLeis	chore	folding/putting away laundry	Putting clothes away	4	1	-2
33	NonLeis	chore	washing the dishes	Washing the pots	5	0	1
33	NonLeis	chore	cleaning the house	Cleaning the kitchen	5	NA	3
34	NonLeis	chore	cleaning the house	Cleaning my house	4	0	-1
40	NonLeis	chore	cleaning the house	Cleaning the home	4	0	0
47	NonLeis	chore	cleaning the house	Sweeping my floors	4	0	0
48	NonLeis	chore	picking up rubbish in the house	Picking rubbish up off floor	4	0	-2
48	NonLeis	chore	vacuuming	Hoovering the carpet	4	0	0
49	NonLeis	chore	washing laundry	Washing a huge load of clothes	4	0	-2

55	NonLeis	chore	cleaning the house	Cleaning house	4	4	-1
57	NonLeis	chore	cleaning the house	Cleaning the house	4	3	-2
57	NonLeis	chore	washing laundry	Washing the laundry	4	2	2
58	NonLeis	chore	washing laundry	Awaiting laundry or dishes finish running	3	1	1
58	NonLeis	chore	working on to-do lists	Researching from self notes or eliminate to do list	3	0	1
19	Travel	commuting	commuting to work	Commuting to work, 20mins away	4	2	1
24	Travel	commuting	reading while commuting	reading a book or newspaper on my commute	5	1	0
40	Travel	commuting	commuting to work	Commuting to work	5	0	-1
21	UniWork	computer	using the computer	Sitting at computer	5	1	0
28	UniWork	computer	using the computer	Sitting at work in front of computer	5	0	-2
57	UniWork	computer	using the computer	Looking at computer	5	1	-2
58	UniWork	computer	reading on the computer	relaxing and leisure computer research or reading	2	0	2
18	Travel	computer	using the computer	Working with computer	5	NA	0
18	LeisHome	computer	reading on the computer	Reading on computer	5	0	2
40	LeisHome	computer	using the computer	Using the computer	5	0	2
6	NonLeis	computer	using the computer	Working at computer	NA	1	NA
18	NonLeis	computer	using the computer	Sitting in front of computer	5	0	0
18	NonLeis	computer	reading on the computer	Reading news on computer	5	0	1
55	FamRel	cooking	cooking with family	Cooking with family	5	1	-1
4	LeisHome	cooking	cooking in a quiet place	having a chance to cook in quiet peace.	3	0	2
3	NonLeis	cooking	cooking a meal	cooking a meal	5	1	1
57	NonLeis	cooking	cooking a meal	Cooking dinner	5	3	-1
2	UniWork	doing school/university/work assignments	researching papers for assignments	Researching papers for assignments	4	0	1
2	UniWork	doing school/university/work assignments	writing assignments	Writing university assignments	4	3	1
2	UniWork	doing school/university/work assignments	writing assignments	Writing up lecture notes	5	0	2
7	UniWork	doing school/university/work assignments	studying in general	Studying at school	4	4	-1
8	UniWork	doing school/university/work assignments	working to meet deadlines	Being rushed to complete something before the deadline hits	2	0	0
9	UniWork	doing school/university/work assignments	revising for an exam	Revising for assessments	5	1	0
9	UniWork	doing school/university/work assignments	writing assignments	Writing pages out	5	0	1
10	UniWork	doing school/university/work assignments	studying in general	Studying	4	0	-1
11	UniWork	doing school/university/work assignments	writing assignments	Writing for school	4	NA	-2
11	UniWork	doing school/university/work assignments	reading for school	Reading for school	4	0	-2
16	UniWork	doing school/university/work assignments	giving a presentation	Giving a presentation	2	1	-3

18	UniWork	doing school/university/work assignments	working to meet deadlines	Working to deadline	2	0	-3
21	UniWork	doing school/university/work assignments	doing work in general	Reviewing spreadsheets	5	2	-2
24	UniWork	doing school/university/work assignments	writing assignments	writing essays on my laptop at home	2	1	-2
26	UniWork	doing school/university/work assignments	taking an exam	taking a test	2	NA	-2
27	UniWork	doing school/university/work assignments	working on homework/coursework	Doing homework	5	1	0
30	UniWork	doing school/university/work assignments	working on homework/coursework	Hair pulling event #2: working on assignments worth large portion of my grade	2	1	2
31	UniWork	doing school/university/work assignments	writing assignments	Writing assignments	5	NA	-1
31	UniWork	doing school/university/work assignments	giving a presentation	Performing presentations	1	0	-2
31	UniWork	doing school/university/work assignments	working in a group	Working with unknown people	2	0	1
33	UniWork	doing school/university/work assignments	working in a group	Sitting in a group activity at university	1	0	-1
34	UniWork	doing school/university/work assignments	doing work in general	Filing paperwork	4	2	0
36	UniWork	doing school/university/work assignments	working on homework/coursework	Working on homework	5	0	-1
38	UniWork	doing school/university/work assignments	studying in general	Studying for class	NA	0	NA
38	UniWork	doing school/university/work assignments	working on homework/coursework	Working on homework	NA	0	NA
39	UniWork	doing school/university/work assignments	taking an exam	completing a test or quiz	4	0	NA
40	UniWork	doing school/university/work assignments	taking an exam	Taking a written examination	2	2	-2
40	UniWork	doing school/university/work assignments	revising for an exam	Revising for an examination	4	0	-1
41	UniWork	doing school/university/work assignments	doing work in general	Filling out paperwork	2	4	-1
41	UniWork	doing school/university/work assignments	studying in general	Studying for s test	1	3	-2
48	UniWork	doing school/university/work assignments	writing assignments	Writing essays	5	0	-2
48	UniWork	doing school/university/work assignments	working in a group	Conducting research with other students	1	0	2
49	UniWork	doing school/university/work assignments	taking an exam	Carrying out tough tests	4	0	-1
49	UniWork	doing school/university/work assignments	revising for an exam	Carrying out personal revision	5	1	0
49	UniWork	doing school/university/work assignments	doing work in general	During maths	5	0	-1
53	UniWork	doing school/university/work assignments	working on homework/coursework	Doing homework	4	2	-3

56	UniWork	doing school/university/work assignments	doing work in general	Work	5	1	-3
56	UniWork	doing school/university/work assignments	doing work in general	Doing work	5	0	-3
4	Health	doing school/university/work assignments	doing work in general	having to deal with work and fighting sleep	5	0	0
27	LeisHome	doing school/university/work assignments	doing work in general	Working at my desk	5	0	2
28	LeisHome	doing school/university/work assignments	studying in general	Studying my schoolwork	5	0	1
38	LeisHome	doing school/university/work assignments	working on homework/coursework	Doing homework	NA	2	NA
56	LeisHome	doing school/university/work assignments	doing work in general	Work	1	2	3
38	LeisOut	doing school/university/work assignments	working on homework/coursework	Working on homework	NA	1	NA
2	NonLeis	doing school/university/work assignments	researching papers for assignments	Researching for university assignments	4	0	2
2	NonLeis	doing school/university/work assignments	writing assignments	Writing assignments for university	4	NA	1
9	NonLeis	doing school/university/work assignments	revising for an exam	Revising for exams and assessments	3	0	-2
10	NonLeis	doing school/university/work assignments	studying in general	Studying on bed	5	0	-1
16	NonLeis	doing school/university/work assignments	working on homework/coursework	Doing homework	5	NA	-2
30	NonLeis	doing school/university/work assignments	writing assignments	Hair pulling event #2: writing an essay for school	4	1	3
52	NonLeis	doing school/university/work assignments	working on homework/coursework	Doing schoolwork on the computer	4	NA	-2
4	UniWork	driving	driving a car in general	having to drive. I drive one handed, the other hand is either free or holding a cig. my free hand is usually scratching at my head attempting to not pull, but resulting in failure all the same.	5	NA	0
23	UniWork	driving	driving to work	Traveling in the car for work	4	0	-1
29	UniWork	driving	driving a car in general	Driving the car	NA	0	NA
9	FamRel	driving	driving a car in general	Going in car to travel	4	NA	0
15	FamRel	driving	driving a car in general	Driving the car	5	4	NA
32	FamRel	driving	being stuck in traffic	Pulling when stuck in traffic	NA	NA	NA
49	Health	driving	being stuck in traffic	Driving in slow moving traffic	4	NA	-2
2	Travel	driving	being a passenger in a car	Traveling as a passenger in a car	4	1	2
3	Travel	driving	driving to work	Driving to work	5	0	-3
3	Travel	driving	filling car with fuel	Gassing up car	4	2	3
4	Travel	driving	driving to work	having to drive to work, thinking of working another 8 hr long night shift and knowing I have to be done in time to get my children on the bus after I get off.	5	0	1

4	Travel	driving	driving from work	Having to drive home from work, stressing over cars driving the speed limit as I'm flying the 30 minute drive making it in 15 minutes	5	1	2
4	Travel	driving	driving a car in general	driving in general, with one hand and nothing to hold in my hand.	4	0	2
6	Travel	driving	driving a car in general	Driving my car	NA	NA	NA
6	Travel	driving	being a passenger in a car	Being a Passenger in a car	NA	0	NA
7	Travel	driving	driving a car in general	Driving my car	5	2	-1
11	Travel	driving	driving a car in general	Driving in a car	5	2	0
11	Travel	driving	being a passenger in a car	Riding in a car/bus	4	NA	0
12	Travel	driving	driving a car in general	Driving in a car	NA	0	NA
15	Travel	driving	driving a car in general	Driving the car	5	0	NA
21	Travel	driving	driving long distances	Driving a long distance	2	0	-3
23	Travel	driving	being stuck in traffic	Sitting in traffic	4	NA	-3
25	Travel	driving	waiting at dmv	Waiting at the DMV	2	1	-2
27	Travel	driving	driving long distances	Driving long distance	2	0	0
28	Travel	driving	being stuck in traffic	Driving in my car looking at my mirror stopped in traffic	5	4	-1
29	Travel	driving	being a passenger in a car	Riding in car	3	0	0
30	Travel	driving	being a passenger in a car	Hair pulling event #1: sitting in a car for long periods of time	2	3	3
31	Travel	driving	driving a car in general	Driving my car	5	0	2
32	Travel	driving	driving a car in general	Pulling when driving	NA	0	NA
33	Travel	driving	driving to work	Driving to work	5	4	0
36	Travel	driving	driving a car in general	Driving my car	5	2	0
38	Travel	driving	driving a car in general	Driving my car	NA	NA	NA
46	Travel	driving	being stuck in traffic	Driving when in traffic or stopped at lights I pull	5	NA	0
48	Travel	driving	waiting for a taxi	Waiting on a taxi to arrive	3	2	-1
50	Travel	driving	driving long distances	Driving to Paris a 8 hour trip	1	1	NA
51	Travel	driving	driving a car in general	Driving in the car	5	0	3
53	Travel	driving	waiting at traffic lights	Waiting in the car at stop lights	5	0	-2
55	Travel	driving	being stuck in traffic	Driving the car in traffic	5	1	-1
57	Travel	driving	driving to work	Driving to work	5	4	-2
3	LeisOut	driving	driving a car in general	Driving my car	5	0	-3
21	LeisOut	driving	driving a car in general	Driving my car	5	4	2
29	LeisOut	driving	driving a car in general	Driving the car	5	4	0
30	LeisOut	driving	being stuck in traffic	Hair pulling event #1: sitting in traffic	3	1	1
34	LeisOut	driving	driving a car in general	Driving to an activity	4	0	0
41	LeisOut	driving	being a passenger in a car	Riding in the car	4	2	3
46	LeisOut	driving	waiting at traffic lights	Driving I pull when stopped at lights	NA	3	NA
50	LeisOut	driving	driving a car in general	Driving my car	4	NA	NA
53	LeisOut	driving	being a passenger in a car	Riding in the passenger seat of a car	4	NA	0
55	LeisOut	driving	driving a car in general	Driving the car	2	1	-1

56	LeisOut	driving	being a passenger in a car	In the car	5	0	-3
57	LeisOut	driving	driving a car in general	Driving the car	5	0	1
47	NonLeis	driving	driving a car in general	Driving a vehicle	4	1	0
21	UniWork	eating	eating lunch	Eating lunch	5	1	2
26	UniWork	eating	eating lunch	eating at lunch	4	1	1
56	UniWork	eating	eating lunch	Lunch break at work	5	4	-3
58	UniWork	eating	eating out in a restaurant	Eating at a resturaunt	2	2	2
26	FamRel	eating	eating with family	eating with family	5	4	1
57	FamRel	eating	eating a meal	Eating dinner	5	0	3
8	Health	eating	eating a meal that I personally didn't cook	Eating a meal that I personally didn't cook	4	1	0
37	Health	eating	eating a meal	Having dinner everyday	NA	0	NA
56	LeisHome	eating	eating a meal	Sitting eating	5	2	1
16	LeisOut	eating	eating out in a restaurant	Going out for food	5	NA	-1
26	LeisOut	eating	waiting for food at a restaurant	waiting for food at restaurant	3	2	0
40	LeisOut	eating	eating out in a restaurant	Eating in a restaurant	4	0	3
41	LeisOut	eating	eating out in a restaurant	Eating at a restaurant	3	1	3
58	LeisOut	eating	eating out in a restaurant	Eating or after completion of meal in resturaunts	4	0	1
3	NonLeis	eating	eating a meal	Eating a meal	5	4	1
57	FamRel	exercise	riding a bicycle	Biking excursion	2	0	2
57	Health	exercise	exercising at the gym	Excercising on crosstrainer	4	0	-2
17	LeisOut	exercise	taking a walk	Taking a walk	4	1	0
26	LeisOut	exercise	walking with baby	walking with baby	4	0	2
40	LeisOut	exercise	horse riding	Riding my horses	4	1	3
43	LeisOut	exercise	walking quickly down the street texting a friend	walking quickly down the street texting a friend	3	3	2
49	LeisOut	exercise	going for a run	Taking a jog	3	1	-1
49	LeisOut	exercise	long exercising	Engaging in long tiresome exercises	4	3	-2
51	LeisOut	exercise	going for a run	Running	4	1	3
1	UniWork	feeling bad	worrying/stressing about work	Thinking about work	2	2	0
1	UniWork	feeling bad	worrying/stressing about work	Worrying about work	4	0	0
5	UniWork	feeling bad	being stressed	stressing over school	NA	0	NA
8	UniWork	feeling bad	feeling judged on appearance	Feeling as if I'm being constantly judged by my appearance and how it'll affect my work	5	2	0
17	UniWork	feeling bad	worrying/stressing about work	Stressing about work load	4	0	-1
34	UniWork	feeling bad	being stressed	When under a lot of stress and deadlines	1	4	0
51	UniWork	feeling bad	worrying/stressing about work	Stress from work	4	0	3
58	UniWork	feeling bad	thinking about disabilities	Thinking about my disabilities	2	1	2
11	FamRel	feeling bad	worrying about relationships with friends, family, or partners	Worrying about relationships with friends, family, or partners	4	0	-2
12	FamRel	feeling bad	being stressed	Stress from deaths in family	NA	0	NA
29	FamRel	feeling bad	worrying about holiday parties	Worrying about holiday parties	2	1	0
38	FamRel	feeling bad	being stressed	Stress from family	NA	1	NA

38	FamRel	feeling bad	being stressed	Stress from fiancé	NA	NA	NA
58	FamRel	feeling bad	rumination of criminal behaviors and worrying about them and myself	Rumination of criminal behaviors and worrying about them and myself	2	0	0
1	Health	feeling bad	worrying/stressing about work	Feeeling stressed about work	4	1	0
1	Health	feeling bad	feeling fat	Feeling fat	3	0	0
9	Health	feeling bad	feeling negative about self	Thinking about negative of myself	4	0	-3
21	Health	feeling bad	feeling anxious	Feeling anxious or stressed	5	0	-2
21	Health	feeling bad	feeling sad/depressed	Feeling sad	4	3	-3
23	Health	feeling bad	feeling tired	Feeling tired	4	1	-2
46	Health	feeling bad	feeling sad/depressed	Feeling depressed	5	0	-3
51	Health	feeling bad	feeling tired	Feeling tired	5	1	3
51	Health	feeling bad	feeling sad/depressed	Feeling upset	3	1	3
54	Health	feeling bad	feeling tired	Laying in bed when tired	4	2	3
50	LeisHome	feeling bad	feeling tired	When tired	NA	0	NA
4	LeisOut	feeling bad	being anxious people can see bald spots	having to visit my childrens school, anxious if anyone in the school can see the patches and if my hair is covered nicely enough	2	1	0
35	LeisOut	feeling bad	being stressed	Stressing on the bed	NA	1	NA
58	LeisOut	feeling bad	thinking about disabilities	Ruminating on prognosis or self diagnosed disabilities	4	NA	2
4	Health	finance	paying bills	having to deal with bills	4	3	-2
31	LeisOut	finance	worrying about money	Worrying about money when shopping	4	4	-2
4	NonLeis	finance	paying bills	having to balance bills vs mine and my husbands paychecks	4	0	-1
4	NonLeis	finance	figuring out finances	having to figure out finances for upcoming birthdays	3	0	2
4	NonLeis	finance	figuring out finances	having to figure out finances for school activities and functions	3	0	2
7	NonLeis	finance	balancing cheques	Balencing my checkbook	4	0	0
17	NonLeis	finance	paying bills	Paying bills in online bank	3	NA	0
21	NonLeis	finance	paying bills	Paying bills	3	NA	-3
23	NonLeis	finance	paying bills	Paying bills	3	0	-3
24	NonLeis	finance	figuring out finances	completing online "chores" such as finances etc	2	NA	0
25	NonLeis	finance	paying bills	Paying bills	3	NA	-3
25	NonLeis	finance	filing taxes	Filing taxes	2	NA	-1
27	NonLeis	finance	paying bills	Paying bills	4	1	-3
28	NonLeis	finance	figuring out finances	Figuring out banking	5	0	-1
29	NonLeis	finance	worrying about money	Worrying about money	4	1	0
29	NonLeis	finance	arguing over money	Arguing over money issues	3	0	0
30	NonLeis	finance	filing taxes	Hair pulling event #1: filing my taxes	2	0	1
34	NonLeis	finance	paying bills	Paying my bills	3	NA	-1
41	NonLeis	finance	paying bills	Paying bills	3	NA	-1
46	NonLeis	finance	paying bills	Sorting through letters and bills	4	NA	-1

49	NonLeis	finance	figuring out finances	Creating budgets for personal finance	4	3	-1
55	NonLeis	finance	paying bills	Calling in to pay bills	3	4	-3
56	NonLeis	finance	paying bills	Paying bills	4	3	-3
57	NonLeis	finance	paying bills	Balancing bills	3	0	-2
56	NonLeis	finance	figuring out finances	Counting how much is left to spend	4	0	2
56	NonLeis	finance	figuring out finances	Putting my husband's and my income together	4	0	-3
56	NonLeis	finance	filing taxes	Doing our taxes	3	0	3
6	Travel	flying	flying on a plane	Travelling on olanes	NA	0	NA
8	Travel	flying	flying home to visit family	Flying back home to visit family	1	1	0
16	Travel	flying	flying on a plane	Going on airplanes	2	0	-2
20	Travel	flying	flying on a plane	Flying on an airplane	2	0	0
27	Travel	flying	flying on a plane	Flying in a plane	2	1	0
33	Travel	flying	flying on a plane	Travelling on a plane	2	2	-1
40	Travel	flying	flying on a plane	Flying on a plane	2	4	1
41	Travel	flying	flying on a plane	Flying on a plane	1	0	0
51	Travel	flying	flying on a plane	Flying in a plane	2	0	1
57	Travel	flying	flying on a plane	Flying in a plane	2	1	2
6	UniWork	general grooming	looking in the mirror	Looking in a mirror	NA	NA	NA
2	Health	general grooming	plucking body and facial hair	Grooming/Plucking body hair (scalp, eyebrows, leg hair & pubic hair)	5	NA	3
5	Health	general grooming	removing make-up	taking my makeup off	NA	3	NA
6	Health	general grooming	during electrolysis	During electrolysis	NA	0	NA
6	Health	general grooming	plucking body and facial hair	During plucking	NA	NA	NA
6	Health	general grooming	applying make-up	During make up application	NA	2	NA
28	Health	general grooming	applying make-up	Looking in the mirror putting on makeup	5	1	-3
28	Health	general grooming	plucking body and facial hair	Pulling my chin whiskers	4	1	-1
31	Health	general grooming	plucking body and facial hair	Tweezing eyebrows	3	0	3
31	Health	general grooming	shaving body hair	Shaving body hair	4	0	3
52	Health	general grooming	looking in the mirror	Looking in the mirror	5	3	0
55	Health	general grooming	applying make-up	Fixing/applying makeup	5	NA	-1
55	Health	general grooming	plucking body and facial hair	Plucking hair on chin (normal stuff)	5	0	2
56	Travel	general grooming	at the nail salon	Nail salon	3	0	3
2	LeisHome	general grooming	plucking body and facial hair	Plucking eyebrows	4	1	3
8	LeisHome	general grooming	plucking body and facial hair	Plucking my eyebrows for grooming purposes	5	0	3
55	LeisOut	general grooming	looking in the mirror	Looking in mirrors	3	3	-2
7	LeisHome	getting ready	getting ready	Getting ready	4	1	0
19	LeisHome	getting ready	getting ready	Getting ready for my day while doing my hair	5	1	-2
26	LeisHome	getting ready	getting ready for shower	getting ready for shower	4	1	1
26	LeisHome	getting ready	getting ready to leave	getting ready to leave	4	NA	1
40	FamRel	going out	going on a date	Going on a date	4	0	3
2	LeisOut	going out	watching a film at the cinema	Watching a film at the cinema	2	NA	1
7	LeisOut	going out	watching a film at the cinema	Watching a movie	3	0	3

9	LeisOut	going out	watching a film at the cinema	Going to cinema	3	0	2
11	LeisOut	going out	watching a film at the cinema	Watching movies at a theater	3	1	2
20	LeisOut	going out	watching a film at the cinema	Watching a movie at a movie theater	2	1	2
24	LeisOut	going out	watching a film at the cinema	watching a film at the cinema	2	4	1
25	LeisOut	going out	watching a film at the cinema	Watching a movie in a theater	2	4	3
30	LeisOut	going out	watching a boring sports game	Hair pulling event #2: watching a boring sports game	2	1	2
31	LeisOut	going out	watching a film at the cinema	Watching a film at the cinema	3	1	3
33	LeisOut	going out	watching a film at the cinema	Watching a film in the cinema	3	0	3
40	LeisOut	going out	watching a film at the cinema	Watching a movie at the cinema	3	0	2
53	LeisOut	going out	watching a film at the cinema	Watching a movie at the movie theater	3	0	2
56	LeisOut	going out	watching a film at the cinema	Movies night out	5	NA	3
57	LeisOut	going out	watching a film at the cinema	Watching a movie	3	0	3
56	FamRel	hair grooming	when I have my hair down	When I have my hair down	1	4	3
2	Health	hair grooming	brushing hair	Brushing my hair	5	NA	2
10	Health	hair grooming	cutting and drying hair	Cutting and drying hair	4	NA	-1
19	Health	hair grooming	fixing hair	Getting ready for my day while attempting to do my hair	5	0	-1
31	Health	hair grooming	brushing hair	Brushing hair	5	NA	3
36	Health	hair grooming	brushing hair	Combing my hair	5	3	0
47	Health	hair grooming	brushing hair	Brushing my hair	5	0	0
48	Health	hair grooming	brushing hair	Brushing my hair	5	4	-1
53	Health	hair grooming	looking for split ends	Looking for split ends	5	0	0
57	Health	hair grooming	brushing hair	Brushing hair	5	0	2
52	LeisHome	hair grooming	touching hair and/or scalp	Touching my hair and/or scalp	5	1	0
3	Health	health appointments	waiting for appointment	Waiting to see doctor	3	2	-2
15	Health	health appointments	before and after surgery	Before & after surgery	2	0	NA
16	Health	health appointments	being at the doctors	Going to the doctor’s	2	0	-3
16	Health	health appointments	being at the dentists	Going to the dentist	2	0	3
25	Health	health appointments	being at the doctors	Visiting the Doctor	4	NA	0
25	Health	health appointments	sitting in group therapy	Sitting in group therapy	2	3	-2
29	Health	health appointments	waiting for test results	Waiting on test results	2	0	0
33	Health	health appointments	waiting for appointment	Waiting in the doctors surgery for an appointment	3	0	-1
34	Health	health appointments	being at the dentists	Had my wisdom teeth pulled	1	0	-3
34	Health	health appointments	being at the doctors	Visiting the doctors office	2	0	0
40	Health	health appointments	being at the doctors	Visiting the doctor	2	4	-1
29	LeisOut	health appointments	being at the doctors	Visiting a doctor	2	NA	0
30	LeisOut	health appointments	waiting for appointment	Hair pulling event #3: waiting in a waiting room	3	0	2
56	LeisOut	health appointments	being at the doctors	Clinic appointments	4	0	1
5	UniWork	health concerns	having panic attacks	having panic attacks	NA	2	NA
8	Health	health concerns	taking medication	Taking my daily medications	5	1	1

11	Health	health concerns	researching health concerns	Researching health related questions or concerns online	3	NA	0
14	Health	health concerns	worrying about health	worrying about my health	3	0	-1
26	Health	health concerns	thinking about own mental health condition	thinking about anxiety	5	NA	-2
26	Health	health concerns	thinking about own mental health condition	thinking about ocd	5	0	-2
26	Health	health concerns	thinking about own mental health condition	thinking about trichotillomania	4	2	-2
26	Health	health concerns	thinking about own mental health condition	thinking about depression	5	1	-2
30	Health	health concerns	thinking about bald spots	Hair pulling event #1: thinking about my bald spots	4	0	1
39	Health	health concerns	having cases of severe anxiety	having cases of severe anxiety	4	0	NA
39	Health	health concerns	having ADHD - always needing something to do	having ADHD- always needing something to do	5	NA	NA
48	Health	health concerns	taking medication	Swallowing medication	5	1	-3
56	Health	health concerns	female concerns	Vagina problems	5	0	3
56	Health	health concerns	tooth pain	Tooth pain	2	1	-2
58	Health	health concerns	thinking about own mental health condition	Ruminating about my self diagnosis, symptoms of	4	3	2
58	Health	health concerns	thinking about scalp health	Thinking of scalp health	4	4	2
37	LeisOut	health concerns	having asthma symptoms	Having asthma symptoms	NA	2	NA
12	NonLeis	health concerns	noticing pulling daily	Noticing pulling daily	NA	0	NA
12	NonLeis	health concerns	being out of medicatoin	Out of medication	NA	3	NA
7	Travel	holiday	planning vactions	Preparing for holidays	2	NA	-1
16	Travel	holiday	going to hotels	Going to hotels	3	NA	-1
30	Travel	holiday	planning vactions	Hair pulling event #2: planning a vacation	2	0	1
34	Travel	holiday	going to hotels	Checking in to a hotel	1	NA	-1
48	Travel	holiday	going on holiday	Going on holiday	1	2	2
9	Health	ill	having a cold/flu	Having a cold	2	0	-1
9	Health	ill	having sore eyes	Having sore eyes	3	0	-3
9	Health	ill	being ill in general	Being ill in general	2	0	-2
17	Health	ill	having headaches	Feeling generally achy, especially headaches	3	0	-1
22	Health	ill	being ill in general	Under the weather	3	0	0
22	Health	ill	having a cold/flu	Flu or something	2	2	1
29	Health	ill	resting when ill	Lying in bed ill	2	0	0
31	Health	ill	resting when ill	Resting when ill	2	0	0
32	Health	ill	being ill in general	Pulling when sick	NA	0	NA
33	Health	ill	resting when ill	Staying in bed due to illness	2	0	-2
40	Health	ill	vomiting due to being unwell	Vomiting due to being unwell	1	0	-3
40	Health	ill	resting when ill	Staying in bed due to illness	2	0	-2
41	Health	ill	resting when ill	Lying down while sick	2	2	-2
53	Health	ill	resting when ill	Laying in bed all day sick	1	0	-3
28	FamRel	internet	using social media (e.g. facebook, twitter, instagram)	Looking on Facebook	5	0	2
56	FamRel	internet	using social media (e.g. facebook, twitter, instagram)	On facebook	5	0	3
56	FamRel	internet	browsing the internet	On the internet looking at all the illnesses I have	4	0	3

49	Health	internet	using social media (e.g. facebook, twitter, instagram)	Going through my social media in free time	5	0	0
47	Travel	internet	using social media (e.g. facebook, twitter, instagram)	Reading through posts on facebook	3	0	2
2	LeisHome	internet	using social media (e.g. facebook, twitter, instagram)	Looking at social media	5	0	3
30	LeisHome	internet	using social media (e.g. facebook, twitter, instagram)	Hair pulling event #3: scrolling through social media	5	2	2
34	LeisHome	internet	browsing the internet	Surfing the internet	4	0	2
41	LeisHome	internet	using social media (e.g. facebook, twitter, instagram)	Scrolling through Facebook	5	2	2
46	LeisHome	internet	using social media (e.g. facebook, twitter, instagram)	Reading social media	5	0	-1
47	LeisHome	internet	using social media (e.g. facebook, twitter, instagram)	Scrolling through facebook	5	NA	2
48	LeisHome	internet	using social media (e.g. facebook, twitter, instagram)	Using social media apps on mobile	5	0	-1
52	LeisHome	internet	browsing the internet	Browsing the internet	5	0	3
57	LeisHome	internet	using social media (e.g. facebook, twitter, instagram)	Looking on Facebook	5	NA	3
58	LeisHome	internet	browsing the internet	Surfing the web freely	4	0	2
35	LeisOut	internet	using social media (e.g. facebook, twitter, instagram)	Scrolling through Facebook	NA	1	NA
18	Health	menstruation	during menstruation	Menstruation	3	NA	-2
56	Health	menstruation	during menstruation	Period (menstrual cycle)	5	0	1
5	Health	personal hygiene	putting on facial products	putting on facial products	NA	0	NA
10	Health	personal hygiene	brushing your teeth	Brushing teeth	5	1	0
32	Health	personal hygiene	brushing your teeth	Pulling when looking in the mirror at night to brush teeth	NA	0	NA
41	Health	personal hygiene	having a bath	Taking a bath	4	0	3
47	Health	personal hygiene	washing your face	Washing my face	5	0	0
4	LeisHome	personal hygiene	having a bath	having an opportunity to bath by myself	4	2	3
15	LeisHome	pets	cuddling pet	Cuddling dogs	5	0	NA
51	LeisOut	pets	walking the dog	Walking the dog	5	0	3
7	NonLeis	pets	cleaning cat litterbox	Cleaning the cat litter box	5	0	-1
7	FamRel	playing	playing video games	Playing video games	5	NA	3
9	FamRel	playing	playing video games	Playing PS4	4	0	2
20	FamRel	playing	playing card games	Playing a card game	1	0	3
4	LeisHome	playing	playing video games	having an opportunity to play a video game by myself.	4	0	2
7	LeisHome	playing	playing video games	Playing video games	4	0	3
7	LeisHome	playing	playing on your phone	Playing on my phone	5	0	3
8	LeisHome	playing	playing on your phone	Playing a game on my phone	4	0	0
9	LeisHome	playing	playing video games	Playing computer games	4	0	2
17	LeisHome	playing	playing video games	Playing computer games	5	0	2
33	LeisHome	playing	playing on your phone	Playing games on my phone	5	1	3
38	LeisHome	playing	playing on your phone	Playing on my phone	NA	0	NA
39	LeisHome	playing	playing video games	playing board games/video games	4	0	NA

40	LeisHome	playing	playing video games	Playing video games	5	1	2
46	LeisHome	playing	playing puzzles e.g. word search puzzles, jigsaws etc.	Playing puzzle games	4	1	3
8	LeisOut	playing	playing puzzles e.g. word search puzzles, jigsaws etc.	Working on word search puzzles	5	0	1
47	LeisOut	playing	shooting pool in a pub	Shooting pool in a pub	1	0	3
58	UniWork	public transport	using public transport	Riding public transportation	1	2	2
2	Travel	public transport	traveling on the train	Traveling on the train	2	1	2
6	Travel	public transport	traveling on the train	Traveling on trains	NA	0	NA
8	Travel	public transport	travelling on a bus	Riding the bus to my appointments with my therapist	3	0	1
9	Travel	public transport	travelling on a bus	Travelling on bus to college	5	0	1
10	Travel	public transport	travelling on a bus	Riding bus to grandparent's house	2	0	0
17	Travel	public transport	waiting for the bus	Waiting for the bus	4	0	0
20	Travel	public transport	traveling on the train	Commuing on a train to or from work	5	0	-1
25	Travel	public transport	travelling on a bus	Riding in a bus	1	2	3
31	Travel	public transport	using public transport	Using public transport	4	0	1
48	Travel	public transport	waiting for the bus	Waiting for a bus	4	0	-1
18	LeisOut	public transport	using public transport	Being on a train or bus	1	3	0
6	UniWork	reading	reading long text passages	Reading long introduction's to questionnaires!	NA	NA	NA
6	UniWork	reading	reading a book	Reading books	NA	1	NA
20	UniWork	reading	reading in general	Reading a document or watching a presentation	5	3	0
21	UniWork	reading	reading text or emails	reading text or emails	5	1	-2
29	UniWork	reading	reading a book	Reading a book	NA	0	NA
40	UniWork	reading	reading a book	Reading books in the library	5	0	0
55	UniWork	reading	reading a book	Reading books or online	2	1	2
57	UniWork	reading	reading long text passages	Reading complicated instructions	5	3	-2
15	FamRel	reading	reading a book	Reading a book	4	0	NA
42	Health	reading	reading a book	reading a book	4	0	2
12	Travel	reading	reading a book	Reading a book	NA	1	NA
26	Travel	reading	reading a book	reading a book	4	0	2
43	Travel	reading	reading a book	reading a book	3	1	1
47	Travel	reading	reading a book	Reading a book	3	1	2
5	LeisHome	reading	reading a book	reading a book	NA	NA	NA
6	LeisHome	reading	reading a book	Reading a book	NA	NA	NA
8	LeisHome	reading	reading a book	Reading a book on my kindle	5	0	0
9	LeisHome	reading	reading a book	Reading a book	5	0	1
10	LeisHome	reading	reading in general	Reading	4	0	-1
11	LeisHome	reading	reading in general	Reading (books, articles online, Facebook posts, etc)	5	3	1
12	LeisHome	reading	reading a book	Reading a book	NA	NA	NA
15	LeisHome	reading	reading a book	Reading a book	4	1	NA
17	LeisHome	reading	reading a book	Reading books	4	NA	2
20	LeisHome	reading	reading a book	Reading a book	3	0	1
23	LeisHome	reading	reading a book	Reading a book	3	NA	2

24	LeisHome	reading	reading a book	reading a book	4	1	3
25	LeisHome	reading	reading a book	Reading a book	4	NA	2
29	LeisHome	reading	reading a book	Reading books	4	0	0
29	LeisHome	reading	reading magazines	Reading magazines	4	0	0
30	LeisHome	reading	reading a book	Hair pulling event #2: reading a book	4	1	1
31	LeisHome	reading	reading a book	Reading a book	3	0	3
34	LeisHome	reading	reading a book	Reading a book	4	0	3
39	LeisHome	reading	reading a book	reading a novel	5	1	NA
40	LeisHome	reading	reading a book	Reading a book	5	0	2
41	LeisHome	reading	reading a book	Reading a book	4	0	3
46	LeisHome	reading	reading a book	Reading books	3	0	2
48	LeisHome	reading	reading a book	Reading a book	5	1	3
49	LeisHome	reading	reading a book	Reading a very long book	4	0	1
51	LeisHome	reading	reading a book	Reading a book	4	NA	1
53	LeisHome	reading	reading a book	Reading a book	3	1	3
55	LeisHome	reading	reading a book	Reading books or reading online	5	0	2
57	LeisHome	reading	reading a book	Reading a book	4	0	2
24	LeisOut	reading	reading a book	reading a book in a cafe	2	0	3
4	UniWork	relaxing	relaxing in the bath	resting in a warm bath, with no thing to do but lay back and relax I pull my hair.	5	0	3
9	UniWork	relaxing	using one hand while another is free	Using 1 hand while another is free	5	0	-1
29	UniWork	relaxing	relaxing in general	Sitting doing nothing	NA	2	NA
56	UniWork	relaxing	smoking a cigarette	Smoke break at work	5	0	-3
2	FamRel	relaxing	relaxing with partner/spouse	Relaxing with boyfriend	5	4	3
7	FamRel	relaxing	lying in bed	Lying in bed	5	NA	1
11	FamRel	relaxing	relaxing with friends/family	Relazing with friends/family	4	1	2
15	FamRel	relaxing	smoking a cigarette	Smoking a cigarette	4	3	NA
47	FamRel	relaxing	lying in bed	Laying in bed	5	2	2
3	Health	relaxing	lying in bed	Laying in bed	5	1	3
10	Travel	relaxing	lying in bed	Sitting on couch or bed at grandparent's house	2	0	0
41	Travel	relaxing	lying on the beach	Lying on a beach	1	1	3
1	LeisHome	relaxing	lying in bed	Lying in bed	4	0	-1
13	LeisHome	relaxing	relaxing at home	relaxing + at home	5	0	2
15	LeisHome	relaxing	smoking a cigarette	Smoking a cigarette	4	3	NA
19	LeisHome	relaxing	lying in bed	Laying in bed	5	1	3
26	LeisHome	relaxing	relaxing during naptime	relaxing during naptime	5	0	1
26	LeisHome	relaxing	relaxing after bedtime	relaxing after bedtime	5	0	1
27	LeisHome	relaxing	lying in bed	Laying in bed	5	0	3
31	LeisHome	relaxing	lying in bed	Relaxing in bed	5	0	2
33	LeisHome	relaxing	relaxing in the bath	Relaxing in the bath	4	3	3
35	LeisHome	relaxing	relaxing in general	Resting	NA	4	NA
36	LeisHome	relaxing	relaxing in general	Sitting on the couch	5	0	1
36	LeisHome	relaxing	lying in bed	Laying in bed	5	1	2
47	LeisHome	relaxing	lying in bed	Laying in bed	5	1	2
48	LeisHome	relaxing	listening to radio	Listening to radio	5	0	3

49	LeisHome	relaxing	lying in bed	Relaxing on my bed while checking my messages	5	1	0
50	LeisHome	relaxing	being on the phone	When on my phone	NA	4	NA
56	LeisHome	relaxing	relaxing in general	Relaxing	4	3	2
56	LeisHome	relaxing	smoking a cigarette	Smoking outside	4	NA	3
57	LeisHome	relaxing	relaxing outside	Lying in the sun	3	1	3
26	LeisOut	relaxing	relaxing outside	sitting at park	4	0	1
35	LeisOut	relaxing	lying in bed	Laying on the bed	NA	0	NA
47	LeisOut	relaxing	relaxing outside	Sitting out in the sun	2	0	3
5	NonLeis	relaxing	lying in bed	laying in bed	NA	1	NA
9	NonLeis	relaxing	relaxing in general	Resting with nothing to do	4	0	-3
56	Travel	shopping	shopping for groceries	Grocery shopping	4	3	2
56	Travel	shopping	shopping for make-up	Shopping for make up	4	2	3
3	LeisOut	shopping	shopping for clothes	Shopping for clothing	3	0	3
3	LeisOut	shopping	shopping for groceries	Shopping for groceries	4	2	2
8	LeisOut	shopping	going shopping in a store where i'm not familiar with the floor plan of the store	Going shopping in a store where I'm not familiar with the floor plan of the store	3	2	1
23	LeisOut	shopping	shopping in general	Shopping at a store	4	0	2
27	LeisOut	shopping	shopping for groceries	Shopping for groceries	4	3	-1
33	LeisOut	shopping	shopping with partner/spouse	Shopping with my boyfriend	3	3	2
34	LeisOut	shopping	shopping for groceries	Walking through the grocery store	3	1	0
40	LeisOut	shopping	shopping for clothes	Shopping at a mall	4	2	3
4	Health	sleeping	fighting sleep	having to fight sleep while managing my three children	5	NA	1
37	Health	sleeping	having trouble sleeping	Having a sleepless night	NA	0	NA
49	Health	sleeping	having trouble sleeping	Failing to fall asleep at night	3	0	-1
57	Health	sleeping	sleeping in bed	Sleeping in bed	5	0	3
30	Travel	sleeping	sleeping in strange/new place (e.g. hotels)	Hair pulling event #3: sleeping in a strange, new place (hotels)	2	3	1
52	NonLeis	sleeping	having trouble sleeping	Laying awake in bed during sleep hours	5	0	-1
2	FamRel	socialising	socialising with friends	Gossiping with friends	4	1	3
3	FamRel	socialising	socialising with family	Visiting parents	4	0	2
3	FamRel	socialising	talking on the phone	Talking on phone	5	0	2
4	FamRel	socialising	socialising with family	having a nice day with my mom	1	NA	3
6	FamRel	socialising	socialising with partner/spouse	Talking to partner when I don't want to listen to him	NA	3	NA
8	FamRel	socialising	talking on the phone	Talking to my mother on the phone	2	1	-2
8	FamRel	socialising	having an argument with a partner/spouse	Having an argument with my boyfriend	2	1	0
9	FamRel	socialising	socialising with family	Talking and listening to family	4	NA	1
10	FamRel	socialising	talking over meals	Having conversations over meals	4	1	0
16	FamRel	socialising	socialising with friends	Talking with friends	5	1	2
16	FamRel	socialising	socialising with family	Talking with family members	4	4	2
17	FamRel	socialising	socialising with family	Talking to my father	2	0	-1
18	FamRel	socialising	having an argument with a partner/spouse	Having arguments with partners	1	1	-3
18	FamRel	socialising	having a break up	Having break-up	0	NA	-3

21	FamRel	socialising	talking on the phone	Talking on phone	4	NA	2
21	FamRel	socialising	socialising with family	Sitting with family	2	0	-2
23	FamRel	socialising	talking on the phone	Talking on the phone	4	3	2
23	FamRel	socialising	socialising with partner/spouse	Sitting on the couch with my spouse in the evenings	5	NA	3
25	FamRel	socialising	having an argument with family	Arguing with my father	1	1	-3
25	FamRel	socialising	socialising with partner/spouse	engaging in discussions about my family from my spouse	5	NA	-2
26	FamRel	socialising	talking about past	talking about past	2	0	-3
26	FamRel	socialising	talking about future	talking about future	4	1	-2
27	FamRel	socialising	socialising with family	Talking to My family	5	0	3
28	FamRel	socialising	talking on the phone	Talking on the phone	5	2	2
28	FamRel	socialising	texting friends	Texting friends	5	0	2
30	FamRel	socialising	having an argument with a partner/spouse	Hair pulling event #1: fighting with a friend/ spouse	2	1	1
30	FamRel	socialising	socialising with family	Hair pulling event #2: attending family get-togethers	1	2	1
31	FamRel	socialising	talking on the phone	Talking to family on the phone.	4	1	2
31	FamRel	socialising	having an argument with family	Arguing with family	2	0	-3
33	FamRel	socialising	socialising with partner/spouse	Talking to my boyfriend	5	0	3
33	FamRel	socialising	socialising with family	Talking to my mum	4	0	3
33	FamRel	socialising	socialising with family	Visiting my grandparents	4	0	3
34	FamRel	socialising	having an argument	Disagreeing with a friend	0	3	-3
37	FamRel	socialising	having an argument with a partner/spouse	Quarrelling with my boyfriend	NA	NA	NA
39	FamRel	socialising	socialising with friends	listening to a friend talk	4	0	NA
40	FamRel	socialising	socialising with family	Visiting my parents	2	0	2
40	FamRel	socialising	socialising with family	Visiting the in-laws	4	2	2
41	FamRel	socialising	talking on the phone	Talking on the phone	5	NA	0
46	FamRel	socialising	talking on the phone	Talking on phone to friend	4	0	1
48	FamRel	socialising	talking on the phone	Talking on phone with family	5	3	-1
49	FamRel	socialising	socialising with family	Engaging in long family meetings	2	0	-2
49	FamRel	socialising	having an argument	During arguements	2	0	-3
51	FamRel	socialising	having drinks	Having drinks	2	1	1
53	FamRel	socialising	socialising with family	Sitting in a room with my whole immediate family having a conversation	1	0	0
53	FamRel	socialising	socialising with family	Sitting in a room with my in-laws or husband's family having a conversation	1	0	0
58	FamRel	socialising	socialising with family	rumination and excitement or relaxing while hanging out with family	2	0	0
37	Health	socialising	talking on the phone	Chatting on my phone	NA	0	NA
11	LeisHome	socialising	socialising with friends	Conversing with roommates/friends	5	NA	2
21	LeisHome	socialising	socialising with friends	Chatting with friends	5	NA	3
24	LeisHome	socialising	talking on the phone	talking to friends on the phone	4	0	3

58	LeisHome	socialising	socialising with friends	Talking with my roomate	4	0	2
3	LeisOut	socialising	socialising with family	Visiting family	4	NA	2
4	LeisOut	socialising	socialising with family	having a nice ride with my mom, nervous she might mention my hair	2	3	3
4	LeisOut	socialising	socialising with family	having to visit with my grandma because she always talks about my hair.	3	0	1
16	LeisOut	socialising	socialising with friends	Hanging out with friends	5	3	2
17	LeisOut	socialising	socialising with a group of people	Being in a large group of people	4	1	-3
31	LeisOut	socialising	socialising with friends	Visiting friends for a catch up	4	1	3
33	LeisOut	socialising	drinking coffee with friends	Drinking coffee with friends	3	0	3
37	LeisOut	socialising	socialising with a group of people	Being uncomfortable in a gathering	NA	0	NA
48	LeisOut	socialising	socialising with friends	Visiting a friend	5	0	3
9	NonLeis	socialising	talking on the phone	Talking over phone	2	0	-1
26	NonLeis	socialising	waiting for company	waiting for company	4	3	-1
26	Travel	thinking	thinking about the future	thinking about future	5	1	-2
26	Travel	thinking	thinking about past	thinking about past	5	4	3
58	Travel	thinking	day dreaming	Daydreaming	3	0	1
58	Travel	thinking	day dreaming	Starring into space	3	1	1
13	LeisHome	thinking	deliberating difficult decisions	deliberating + difficult decisions	5	NA	-1
58	LeisHome	thinking	planning healthier life	Planning for a healthier life and what to do with scalp/root health in particular	4	1	2
58	LeisHome	thinking	thinking about lovelife	fantasizing and thinking about my lovelife	3	0	1
49	NonLeis	thinking	thinking about the future	Thinking of the future	3	1	-1
4	UniWork	watching tv/a film	watching a film	trying to enjoy a movie, I tend to pull my hair.	4	0	2
6	UniWork	watching tv/a film	watching tv	Watching TV	NA	0	NA
22	UniWork	watching tv/a film	watching tv	Watching tv	5	0	NA
29	UniWork	watching tv/a film	watching tv alone	Watching tv alone.	NA	0	NA
55	UniWork	watching tv/a film	watching tv	Watching tv	2	1	2
7	FamRel	watching tv/a film	watching tv	Watching tv	5	0	3
9	FamRel	watching tv/a film	watching tv with family	Watching TV with family	5	0	1
10	FamRel	watching tv/a film	watching a film	Watching movies	4	4	2
15	FamRel	watching tv/a film	watching netflix	Watching netflix	5	0	NA
19	FamRel	watching tv/a film	watching tv with partner/spouse	Watching tv on the couch with my husband	5	0	3
20	FamRel	watching tv/a film	watching tv	Watching TV	4	0	1
24	FamRel	watching tv/a film	watching tv with partner/spouse	watching tv or films with my boyfriend	4	NA	3
24	FamRel	watching tv/a film	watching tv with family	watching tv with my family	2	1	2
32	FamRel	watching tv/a film	watching tv	Pulling when watching tv	NA	0	NA
33	FamRel	watching tv/a film	watching tv with partner/spouse	Watching television with my boyfriend	5	0	3
34	FamRel	watching tv/a film	watching a film with partner/spouse	Watching a movie with my husband	2	0	2
46	FamRel	watching tv/a film	watching tv with partner/spouse	Watching tv with partner	5	0	2

47	FamRel	watching tv/a film	watching a film	Watching a movie	5	3	2
55	FamRel	watching tv/a film	watching tv with family	Watching tv with family	5	0	1
56	FamRel	watching tv/a film	watching tv in bed	On the bed watching tv	5	0	3
54	Health	watching tv/a film	watching tv	Watching tv	4	1	3
12	Travel	watching tv/a film	watching tv	Watching TV	NA	1	NA
26	Travel	watching tv/a film	watching tv	watching television	4	0	1
28	Travel	watching tv/a film	watching tv in bed	Laying in bed watching tv on vacation	2	NA	2
42	Travel	watching tv/a film	watching netflix	watching my favourite TV show on Netflix	5	0	1
47	Travel	watching tv/a film	watching tv	Watching a television show	3	NA	2
1	LeisHome	watching tv/a film	watching tv	Watching tv	4	3	0
2	LeisHome	watching tv/a film	watching a film	Watching a film or TV show	5	NA	3
5	LeisHome	watching tv/a film	watching tv alone	watching t.v. by myself	NA	0	NA
6	LeisHome	watching tv/a film	watching tv	Watching TV	NA	0	NA
7	LeisHome	watching tv/a film	watching tv	Watching tv	5	0	3
8	LeisHome	watching tv/a film	watching netflix	Watching tv shows on netflix	5	NA	2
9	LeisHome	watching tv/a film	watching tv	Watching TV	5	NA	1
10	LeisHome	watching tv/a film	watching tv alone	Watching YouTube videos privately	5	0	2
10	LeisHome	watching tv/a film	watching tv with family	Watching TV with family	4	0	1
11	LeisHome	watching tv/a film	watching tv	Watching tv or videos on computer, phone, or TV	5	0	2
12	LeisHome	watching tv/a film	watching tv	Watching tv	NA	NA	NA
14	LeisHome	watching tv/a film	watching netflix	listening to youtube/hulu/netflix	5	0	3
15	LeisHome	watching tv/a film	watching netflix	Watching Netflix	4	2	NA
16	LeisHome	watching tv/a film	watching netflix	Watching Netflix	5	0	1
17	LeisHome	watching tv/a film	watching tv	Watching TV or streaming services	5	0	2
18	LeisHome	watching tv/a film	watching tv	Watching television	5	0	2
19	LeisHome	watching tv/a film	watching tv	Watching tv	5	0	3
20	LeisHome	watching tv/a film	watching tv	Watching TV	4	0	2
21	LeisHome	watching tv/a film	watching tv	Watching TV	5	0	0
23	LeisHome	watching tv/a film	watching tv	Watching TV	5	0	3
24	LeisHome	watching tv/a film	watching netflix	watching netflix on my computer	5	3	2
25	LeisHome	watching tv/a film	watching netflix	Watching show on Netflix	5	NA	1
27	LeisHome	watching tv/a film	watching tv	Watching tv	5	0	1
28	LeisHome	watching tv/a film	watching tv in bed	Laying in bed pulling my hair watching tv before bed	5	0	2
29	LeisHome	watching tv/a film	watching tv	Watching tv	4	0	0
30	LeisHome	watching tv/a film	watching tv	Hair pulling event #1: watching T.V.	5	0	3
31	LeisHome	watching tv/a film	watching a film	Watching a film	5	0	3
32	LeisHome	watching tv/a film	watching tv	Pulling when watching tv	NA	0	NA
33	LeisHome	watching tv/a film	watching tv	Watching the television	5	3	3
36	LeisHome	watching tv/a film	watching tv	Watching TV	5	NA	1
38	LeisHome	watching tv/a film	watching tv	Watching tv	NA	NA	NA
39	LeisHome	watching tv/a film	watching tv	watching television	5	0	NA
40	LeisHome	watching tv/a film	watching tv	Watching tv	5	NA	2

41	LeisHome	watching tv/a film	watching tv	Watching TV	5	0	3
43	LeisHome	watching tv/a film	watching netflix	watching my favourite TV show on Netflix	5	0	2
46	LeisHome	watching tv/a film	watching tv	Watching tv	4	1	2
47	LeisHome	watching tv/a film	watching tv	Watching a television show	5	1	2
48	LeisHome	watching tv/a film	watching tv	Watching television	5	2	3
49	LeisHome	watching tv/a film	watching a film	Watching action movies	4	NA	1
50	LeisHome	watching tv/a film	watching tv	When watching tv	NA	NA	NA
51	LeisHome	watching tv/a film	watching tv	Watching tv	5	NA	3
52	LeisHome	watching tv/a film	watching tv	Watching TV	5	1	2
53	LeisHome	watching tv/a film	watching netflix	Watching Netflix	4	0	3
55	LeisHome	watching tv/a film	watching tv	Watching television	5	0	2
57	LeisHome	watching tv/a film	watching tv	Watching TV	5	NA	2
35	LeisOut	watching tv/a film	watching tv	Watching tv	NA	0	NA
18	NonLeis	watching tv/a film	watching a film	Watching movie	4	2	2

Note: Rated frequency was on a scale 0(never)-5(once or more a day); Rated arousal was on a scale 0(no bodily arousal)-4(intense bodily arousal); Rated valence was on a scale -3(highly unpleasant)-3(highly pleasant).

SM 2
Supplementary Materials
Courtney Taylor Browne Luka et al. norms for non-pulling situations

Table 1. The 602 non-pulling situations generated from Study 1. Each situation listed was generated by a single participant using the description in the column, Original Text. The description used for the item in the analysis after collapsing similar situations into a common unique situation is provided in the column, Unique Situation. The domain used to cue the item is provided in the column, General Domain. The participant's responses for frequency, arousal, and valence can be found in the right-most columns.

Partic_ID	Generation Domain	General Category	Unique Situation	Original Text	Frequency	Arousal	Valenc
21	LeisHome	arts & crafts	colouring	Coloring	2	0	3
25	LeisHome	arts & crafts	knitting items for sale or to give away	knitting items for sale or to give away	5	3	3
21	LeisHome	arts & crafts	making arts and crafts	Working on arts & crafts	3	1	2
47	LeisHome	arts & crafts	making arts and crafts	Making arts and crafts	4	0	3
25	UniWork	arts & crafts	painting or drawing artwork	Making artwork	5	3	3
7	LeisHome	arts & crafts	painting or drawing artwork	Drawing prices of art	4	0	2
9	LeisHome	arts & crafts	painting or drawing artwork	Painting details on artwork	4	1	1
24	LeisHome	arts & crafts	painting or drawing artwork	painting or drawing	3	0	3
30	LeisHome	arts & crafts	painting or drawing artwork	Drawing or coloring a picture	4	0	2
48	LeisHome	arts & crafts	painting or drawing artwork	Drawing a picture	4	2	3
17	LeisHome	arts & crafts	working on a crocheting project	working on a crocheting project	2	0	2
32	UniWork	at school/university/work	at work in general	When at work	NA	NA	NA
48	UniWork	at school/university/work	at work in general	Being at work in general	5	4	1
7	UniWork	at school/university/work	at work in general	Doing anything at work	5	0	2
30	UniWork	at school/university/work	at work in general	Restocking products at work	4	0	1
33	UniWork	at school/university/work	at work in general	Cutting out at work	4	0	0
51	UniWork	at school/university/work	at work in general	Teaching a class	5	0	3
15	LeisOut	at school/university/work	at work in general	Working	0	NA	NA
25	LeisOut	at school/university/work	at work in general	Teaching a knitting class	4	1	1
58	LeisOut	at school/university/work	at work in general	Working	4	1	1
1	UniWork	at school/university/work	attending a meeting	Attending meetings	4	0	-1
10	UniWork	at school/university/work	attending a meeting	Attending meetings	3	1	1
21	UniWork	at school/university/work	attending a meeting	Attending a meeting	3	0	-1
49	UniWork	at school/university/work	attending a meeting	During campus meetings	3	0	-1
36	UniWork	at school/university/work	attending classes/lectures	Sitting in class	4	0	-1
39	UniWork	at school/university/work	attending classes/lectures	participating in gym class	4	NA	NA
5	FamRel	at school/university/work	attending classes/lectures	being at school	NA	NA	NA
30	UniWork	at school/university/work	attending classes/lectures	Working on an assignment in class	4	0	0
37	UniWork	at school/university/work	attending classes/lectures	Having an interesting lecture	NA	NA	NA
4	UniWork	at school/university/work	interacting with clients	having to care for my clients	5	0	0
24	UniWork	at school/university/work	interacting with clients	interacting with clients	5	0	2

53	UniWork	at school/university/work	interacting with clients	With a client working on their hair	4	0	2
34	UniWork	at school/university/work	meeting with an authority	Meeting with my supervisor	1	0	0
43	UniWork	at school/university/work	meeting with an authority	Meet with the boss	3	0	-1
3	UniWork	at school/university/work	serving customers	Talking to a customer	5	1	2
17	UniWork	at school/university/work	serving customers	Serving customers/patrons on a busy shift	5	0	2
30	UniWork	at school/university/work	serving customers	Talking with a customer	5	0	0
52	UniWork	at school/university/work	serving customers	Serving customers	5	4	-2
3	UniWork	at school/university/work	serving customers	Checking out a customer	5	1	2
21	UniWork	at school/university/work	socialising with peers/co-workers	Speaking to boss or coworkers	5	0	1
21	UniWork	at school/university/work	socialising with peers/co-workers	Teaching a skill to a coworker	4	1	3
26	UniWork	at school/university/work	socialising with peers/co-workers	speaking with peers	3	0	0
40	UniWork	at school/university/work	socialising with peers/co-workers	Discussing work with peers	3	1	2
11	UniWork	at school/university/work	socialising with peers/co-workers	Talking to peers or professors one on one	4	1	0
9	UniWork	at school/university/work	studying in lessons	Studying in lessons	5	0	0
31	UniWork	at school/university/work	taking notes	Taking notes	4	0	0
57	UniWork	at school/university/work	taking notes	Writing notes at a meeting	3	1	-2
16	UniWork	at school/university/work	taking notes	Taking notes in class	5	1	0
10	UniWork	at school/university/work	walking through hallways	Walking through hallways	4	2	0
16	UniWork	at school/university/work	watching videos in class	Watching class videos	3	0	1
1	UniWork	at school/university/work	working alone at own desk	Working at my desk	5	0	-1
29	UniWork	at school/university/work	working alone at own desk	Working at my desk	5	0	0
41	UniWork	at school/university/work	working with other people	Watching a presentation with a group	3	0	-1
48	UniWork	at school/university/work	working with other people	Engaging in group activities within class	4	3	-2
49	UniWork	at school/university/work	working with other people	During university joint activites	2	0	0
23	UniWork	at school/university/work	working with other people	Working in my office when other people are around	4	1	0
31	UniWork	at school/university/work	working with other people	Working with others i know well	4	1	2
38	UniWork	at school/university/work	working with other people	Being Surrounded by people	NA	NA	NA
4	UniWork	at school/university/work	working with other people	having to chart while in the same room as peers	5	0	0
4	UniWork	at school/university/work	working with other people	having to be in a room with my peers at work.	5	0	0
19	UniWork	at school/university/work	working with other people	Working side by side with my coworkers where they can see me all the time	5	0	0
23	FamRel	being intimate	being intimate with partner/spouse	Being intimate with my spouse	4	4	3
28	FamRel	being intimate	being intimate with partner/spouse	Being intimate with husband	3	4	3
46	FamRel	being intimate	being intimate with partner/spouse	Being close with partner	4	2	2
21	FamRel	being intimate	cuddling with partner/spouse	Cuddling a loved one	4	1	3
20	FamRel	being intimate	cuddling with partner/spouse	Snuggling	4	1	2
2	FamRel	being intimate	having sex	Having sex	4	3	3
6	FamRel	being intimate	having sex	Having sex	NA	NA	NA
11	FamRel	being intimate	having sex	Having sex	4	3	3
14	FamRel	being intimate	having sex	having sex	3	3	3
25	FamRel	being intimate	having sex	Having sex	3	4	3

31	FamRel	being intimate	having sex	Having sex	5	4	3
33	FamRel	being intimate	having sex	Having sex	4	4	3
55	FamRel	being intimate	having sex	Having sex	4	3	2
41	LeisHome	being intimate	having sex	Making love	4	4	3
15	NonLeis	being intimate	having sex	Sex	0	NA	NA
4	FamRel	being intimate	having sex	having sex with my husband	3	4	3
7	FamRel	being intimate	having sex	Having sexual relations with my partner	4	4	3
26	FamRel	being intimate	having sex	intercourse with partner	3	2	2
40	FamRel	being intimate	having sex	Having sex with my partner	4	2	3
57	FamRel	being intimate	having sex	Making love to my husband	3	0	3
34	LeisHome	being intimate	having sex	Having sex with my husband	3	4	3
19	FamRel	being intimate	lounging in bed after having sex with partner/spouse	Lounging in bed after having sex with my husband	4	4	3
34	FamRel	being intimate	sleeping in with partner/spouse	Sleeping in with my husband	4	1	3
26	Travel	boating	riding on a boat	riding on a boat	1	0	3
26	Health	changing/dressing	dressing oneself	dressing my self	5	0	0
47	FamRel	child care	bathing child	Bathing my daughter	4	0	3
4	Health	child care	changing baby's diaper	having to change my baby's diaper	5	0	-2
55	FamRel	child care	helping with homework	Helping children with homework	4	2	1
46	LeisHome	child care	helping with homework	Helping family with homework	4	1	2
31	FamRel	child care	playing with children	Playing with children	4	1	2
53	FamRel	child care	playing with children	Actively playing with my nieces and nephews	2	0	3
47	FamRel	child care	playing with children	Playing with my daughter	5	0	3
57	FamRel	child care	playing with children	Playing with Lego with the kids	3	1	2
20	NonLeis	child care	playing with children	Playing with my kids	5	1	2
26	NonLeis	child care	reading to baby	reading to baby	5	0	2
6	NonLeis	chore	cleaning the car	Cleaning the car	NA	NA	NA
1	LeisHome	chore	cleaning the house	Cleaning the house	3	0	-3
6	LeisHome	chore	cleaning the house	Cleaning the house	NA	NA	NA
12	LeisHome	chore	cleaning the house	Cleaning	NA	NA	NA
1	NonLeis	chore	cleaning the house	Cleaning the house	3	0	-2
3	NonLeis	chore	cleaning the house	Cleaning floor	5	0	3
11	NonLeis	chore	cleaning the house	Cleaning the house	3	2	0
12	NonLeis	chore	cleaning the house	Cleaning	NA	NA	NA
21	NonLeis	chore	cleaning the house	Cleaning bathroom	3	2	-2
23	NonLeis	chore	cleaning the house	Scrubbing or cleaning with things that wet my hands	4	3	-1
24	NonLeis	chore	cleaning the house	cleaning the house	4	0	1
25	NonLeis	chore	cleaning the house	Cleaning the house	3	2	-3
26	NonLeis	chore	cleaning the house	sweeping the floors	4	0	0
26	NonLeis	chore	cleaning the house	mopping the floors	3	0	1
28	NonLeis	chore	cleaning the house	Doing intense housework and cleaning	4	0	0
29	NonLeis	chore	cleaning the house	Cleaning the house	4	0	0
30	NonLeis	chore	cleaning the house	Cleaning the house	4	0	-1
31	NonLeis	chore	cleaning the house	Cleaning with bleach	4	2	2
40	NonLeis	chore	cleaning the house	Cleaning the bathroom	4	1	0
46	NonLeis	chore	cleaning the house	Doing housework	5	0	-1

50	NonLeis	chore	cleaning the house	Cleaning	0	NA	NA
52	NonLeis	chore	cleaning the house	Wiping the floor	4	1	-1
53	NonLeis	chore	cleaning the house	Cleaning the apartment (washing dishes, vacuuming, etc.)	4	0	-3
58	NonLeis	chore	cleaning the house	Handling sweeping or other	4	0	0
6	NonLeis	chore	cleaning windows	Cleaning windows	NA	NA	NA
4	NonLeis	chore	doing household chores	having to do chores that involves use of both my hands continously	4	0	0
15	NonLeis	chore	doing household chores	Chores	0	NA	NA
19	NonLeis	chore	doing household chores	Doing house chores	4	0	0
22	LeisHome	chore	doing laundry	Laundry	4	0	-2
7	NonLeis	chore	doing laundry	Doing laundry	4	0	-2
12	NonLeis	chore	doing laundry	Laundry	NA	NA	NA
29	NonLeis	chore	doing laundry	Doing laundry	4	0	0
48	NonLeis	chore	doing laundry	Doing laundry	4	1	1
6	NonLeis	chore	doing the ironing	Ironing	NA	NA	NA
50	NonLeis	chore	doing the ironing	Ironing	0	NA	NA
46	LeisHome	chore	gardening in garden	Gardening in my garden	2	3	2
55	LeisHome	chore	gardening in garden	Gardening in yard	2	3	3
57	NonLeis	chore	hanging out washing	Hanging out washing	4	1	-2
41	NonLeis	chore	mowing the grass	Mowing the grass	4	0	-1
10	NonLeis	chore	putting dishes away	Putting dishes away	4	2	-1
9	NonLeis	chore	tidying around the house	Tidying room	3	0	0
11	NonLeis	chore	tidying around the house	Tidying the house	3	2	-2
21	NonLeis	chore	tidying around the house	De-cluttering bedroom	4	2	2
7	NonLeis	chore	vacuuming	Having to vacuum	4	0	-1
8	NonLeis	chore	vacuuming	Vacuuming around the house	3	0	0
17	NonLeis	chore	vacuuming	Vacuuming the apartment	4	0	0
23	NonLeis	chore	vacuuming	Vacuuming the floors	4	3	-1
31	NonLeis	chore	vacuuming	Hoovering the carpets	4	1	2
33	NonLeis	chore	vacuuming	Hoovering the floor	4	0	2
36	NonLeis	chore	vacuuming	Vacuuming the carpet	4	0	-1
40	NonLeis	chore	vacuuming	Hoovering the floor	4	1	0
51	NonLeis	chore	vacuuming	Hoovering	3	0	-1
8	NonLeis	chore	washing laundry	Washing my clothes	4	1	0
55	NonLeis	chore	washing laundry	Washing clothing	4	0	0
22	LeisHome	chore	washing the dishes	Washing dishes	3	0	-3
1	NonLeis	chore	washing the dishes	Washing the dishes	5	0	-2
3	NonLeis	chore	washing the dishes	Washing dishes	5	0	-3
4	NonLeis	chore	washing the dishes	having to wash dishes	5	0	0
5	NonLeis	chore	washing the dishes	washing the dishes	NA	NA	NA
6	NonLeis	chore	washing the dishes	Washing pots	NA	NA	NA
7	NonLeis	chore	washing the dishes	Doing dishes	5	0	-1
9	NonLeis	chore	washing the dishes	Cleaning dishes	3	0	-1
11	NonLeis	chore	washing the dishes	Washing dishes	4	1	0
21	NonLeis	chore	washing the dishes	Washing dishes	4	2	-2
26	NonLeis	chore	washing the dishes	washing the dishes	3	0	0
27	NonLeis	chore	washing the dishes	Washing the dishes	5	0	-3
36	NonLeis	chore	washing the dishes	Washing the dishes	4	0	-1

47	NonLeis	chore	washing the dishes	Washing the dishes	5	0	-1
48	NonLeis	chore	washing the dishes	Washing dishes	5	0	-3
50	NonLeis	chore	washing the dishes	Washing up	0	NA	NA
51	NonLeis	chore	washing the dishes	Washing up	5	0	-2
52	NonLeis	chore	washing the dishes	Doing the dishes	5	1	0
55	NonLeis	chore	washing the dishes	Washing dishes	4	1	-1
1	Travel	commuting	commuting to work	Commuting to work	5	0	-3
33	Travel	commuting	commuting to work with a friend	Travelling to work with a friend	3	0	2
17	Travel	commuting	taking in the scenery while commuting or traveling	Taking in the scenery while commuting or traveling	4	0	1
20	UniWork	computer	using the computer	Typing on the computer	5	0	0
29	UniWork	computer	using the computer	Typing on computer	5	0	0
33	UniWork	computer	using the computer	Typing on a computer	3	0	0
25	UniWork	computer	using the computer	Working on the computer	5	0	2
48	LeisHome	cooking	baking cakes and biscuits	Baking cakes and biscuits	4	2	3
1	LeisHome	cooking	cooking a meal	Cooking dinner	5	0	-1
8	LeisHome	cooking	cooking a meal	Cooking dinner	4	0	0
22	LeisHome	cooking	cooking a meal	Cooking dinner	4	0	0
34	NonLeis	cooking	cooking a meal	Cooking dinner	3	0	2
57	NonLeis	cooking	cooking a meal	Cooking dinner	5	1	-2
18	FamRel	cooking	cooking a meal	Cooking	3	1	1
12	LeisHome	cooking	cooking a meal	Cooking	NA	NA	NA
29	LeisHome	cooking	cooking a meal	Cooking meals	5	0	0
2	NonLeis	cooking	cooking a meal	Cooking meals	5	1	2
10	NonLeis	cooking	cooking a meal	Making food	5	1	0
20	NonLeis	cooking	cooking a meal	Cooking meals	5	0	1
24	NonLeis	cooking	cooking a meal	cooking	5	0	3
33	NonLeis	cooking	cooking a meal	Cooking a meal	5	0	2
46	NonLeis	cooking	cooking a meal	Cooking meals	5	0	1
50	NonLeis	cooking	cooking a meal	Cooking	0	NA	NA
21	FamRel	cooking	cooking with friends	Cooking with friends	4	2	3
31	FamRel	cooking	cooking with partner/spouse	Cooking with partner	4	1	2
20	UniWork	doing school/university/work assignments	giving a presentation	Giving a presentation	4	0	0
24	UniWork	doing school/university/work assignments	giving a presentation	giving presentations	2	0	0
34	UniWork	doing school/university/work assignments	giving a presentation	Presenting in class	1	0	-1
49	UniWork	doing school/university/work assignments	registering for the semester	Registering for the semester	1	1	-2
9	UniWork	doing school/university/work assignments	revising with other people	Revising with other students	5	0	0
5	UniWork	doing school/university/work assignments	studying with other people	studying with other people	NA	NA	NA
53	UniWork	doing school/university/work assignments	taking an exam	Taking a test on campus	3	0	-3
14	UniWork	doing school/university/work assignments	working on homework/coursework	completing assignments	5	0	0
17	UniWork	doing school/university/work assignments	working on homework/coursework	Working on my tasks when given time to do so	3	0	2

8	UniWork	doing school/university/work assignments	writing assignments	Writing or typing up an important document	3	0	0
58	UniWork	doing school/university/work assignments	writing assignments	Writing or doing a project	4	0	-1
55	Travel	driving	being a passenger in a car	Riding in the car as passenger	4	1	-1
2	Travel	driving	driving a car in general	Driving to and from shops or anywhere	4	1	0
22	Travel	driving	driving a car in general	Driving a car	4	0	2
25	Travel	driving	driving a car in general	Driving my car	5	3	0
52	Travel	driving	driving a car in general	Being in a car	4	0	0
49	Travel	driving	driving on empty freeways	Driving on empty freeways	3	0	2
21	Travel	driving	driving someone else's car	Driving someone else's car	2	0	-1
23	Travel	driving	driving while eating	Driving while eating	4	1	2
46	Travel	driving	driving while moving	Driving alone but moving	5	0	1
23	Travel	driving	driving with both hands on the wheel	Driving with both hands on the wheel	5	1	0
46	Travel	driving	driving with family/friends	Travelling Driving with a friend or partner or family	5	0	0
50	Travel	driving	driving with family/friends	No pulling when with company whilst driving	0	NA	NA
25	Travel	driving	filling car with fuel	Filling my car with fuel	4	2	-1
58	Travel	driving	preparing for entering or exiting motorway	preparing for entry or exit	2	1	0
34	Travel	driving	riding in a taxi	Taking a cab or shuttle	3	0	0
41	Travel	driving	riding in a taxi	Taking a taxi	1	0	0
6	FamRel	eating	eating a meal	Eating dinner	NA	NA	NA
7	LeisHome	eating	eating a meal	Eating dinner	5	0	2
19	LeisHome	eating	eating a meal	Eating dinner	5	0	2
20	FamRel	eating	eating a meal	Eating a meal	5	1	2
51	FamRel	eating	eating a meal	Having a meal	5	0	3
18	Health	eating	eating a meal	Eating regularly	4	0	1
9	LeisHome	eating	eating a meal	Eating food	5	0	1
32	LeisHome	eating	eating a meal	When eating	NA	NA	NA
52	UniWork	eating	eating in the break room	Eating lunch in the break room	4	0	-1
41	UniWork	eating	eating in the cafeteria	Eating in the cafeteria	4	0	1
5	UniWork	eating	eating lunch	getting lunch	NA	NA	NA
26	UniWork	eating	eating lunch	eating at lunch	5	0	1
55	UniWork	eating	eating lunch	Eating lunch at work	4	1	2
52	UniWork	eating	eating lunch	Eating lunch in my car	4	0	3
1	FamRel	eating	eating out in a restaurant	Going out for dinner	3	0	3
3	FamRel	eating	eating out in a restaurant	Dining out	3	1	3
22	FamRel	eating	eating out in a restaurant	Dinner out	3	3	3
19	FamRel	eating	eating out in a restaurant	Getting dinner with the family at a restaurant	3	0	2
24	FamRel	eating	eating out in a restaurant	going to dinner with my boyfriend	4	0	3
41	FamRel	eating	eating out in a restaurant	Going out to dinner with my husband	3	1	3
50	FamRel	eating	eating out in a restaurant	Eating out	0	NA	NA
29	Travel	eating	eating out in a restaurant	Eating at restaurant	2	0	0
20	LeisOut	eating	eating out in a restaurant	Going out for dinner	3	0	2
39	LeisOut	eating	eating out in a restaurant	eating out at a restaurant	3	NA	NA
50	LeisOut	eating	eating out in a restaurant	Eating out	0	NA	NA
7	FamRel	eating	eating with family	Having dinner with family	4	0	3
22	FamRel	eating	eating with family	Dinner with in laws	3	0	1

25	FamRel	eating	eating with family	Eating dinner with my family	4	4	-1
33	FamRel	eating	eating with family	Eating a meal with family	NA	0	3
40	FamRel	eating	eating with family	Eating dinner with family	3	0	2
43	NonLeis	eating	eating with family	Accompany family to eat	3	0	-1
40	UniWork	eating	eating with friends	Eating lunch with friends	4	0	3
5	FamRel	eating	eating with friends	eating with friends	NA	NA	NA
31	FamRel	eating	eating with friends	Meeting friends for meal	3	1	3
33	LeisOut	eating	eating with friends	Eating a meal with friends	3	0	3
41	LeisOut	eating	eating with friends	Sharing a meal with friends	3	0	3
18	LeisOut	exercise	doing exericse	Doing exercise	4	4	3
6	LeisHome	exercise	doing yoga	Doing yoga	NA	NA	NA
50	LeisHome	exercise	doing yoga	Yoga	0	NA	NA
6	LeisOut	exercise	doing yoga	Doing yoga	NA	NA	NA
26	UniWork	exercise	exercising at the gym	playing at gym	4	0	1
10	Health	exercise	exercising at the gym	Exercising in gym	3	3	0
20	Health	exercise	exercising at the gym	Working out	4	1	1
25	Health	exercise	exercising at the gym	Working out at the gym	4	4	2
6	LeisOut	exercise	exercising at the gym	Working out	NA	NA	NA
7	LeisOut	exercise	exercising at the gym	Working out at the gym	4	1	1
9	LeisOut	exercise	exercising at the gym	Exercising at gym	2	1	1
11	LeisOut	exercise	exercising at the gym	Exercising outside or at the gym	4	4	0
22	LeisOut	exercise	exercising at the gym	Going to the gym	3	0	2
24	LeisOut	exercise	exercising at the gym	going to the gym	3	2	1
25	LeisOut	exercise	exercising at the gym	Working out at the gym	3	4	2
31	LeisOut	exercise	exercising at the gym	Using equipment at the gym	4	3	3
33	LeisOut	exercise	exercising at the gym	Exercising at the gym	4	0	1
36	LeisOut	exercise	exercising at the gym	Exercising at the gym	3	0	1
46	LeisOut	exercise	exercising at the gym	Training at gym	4	3	2
52	LeisOut	exercise	exercising at the gym	Exercising at the gym	1	2	-3
1	LeisOut	exercise	exercising outside	Exercising outside of the house	3	0	-2
17	LeisOut	exercise	exercising outside	Working out in the park	3	0	-1
26	Travel	exercise	going for a run	running around town	3	1	3
26	Travel	exercise	going for a run	jogging around town	3	1	3
2	LeisOut	exercise	going for a run	Going out for runs	4	1	1
22	LeisOut	exercise	going for a run	Running outside	3	1	3
26	LeisOut	exercise	going for a run	jogging around town	3	1	3
26	LeisOut	exercise	going for a run	running around town	3	1	3
50	LeisOut	exercise	going for a run	Jogging	0	NA	NA
58	LeisOut	exercise	going for a run	Running	3	1	-1
58	LeisOut	exercise	going for a run	Running aarons	4	1	1
26	Travel	exercise	hiking up mountains	hiking up mountains	2	1	3
26	LeisOut	exercise	hiking up mountains	hiking up mountains	3	1	3
11	Health	exercise	meditating	Meditating	3	0	2
55	UniWork	exercise	playing a sport	Exercise playing sports	3	3	2
20	Travel	exercise	playing a sport	Playing a sport or activity	2	1	2
2	LeisOut	exercise	playing a sport	Training for a sport I play	4	1	3
8	LeisOut	exercise	playing team sports	Playing a team game like softball or catch	1	0	0

16	LeisOut	exercise	playing team sports	Playing volleyball	4	2	1
38	LeisOut	exercise	playing team sports	Playing softball	NA	NA	NA
38	NonLeis	exercise	playing team sports	Playing softball	NA	NA	NA
21	Health	exercise	riding a bicycle	Biking for exercise	0	3	2
49	LeisOut	exercise	riding a bicycle	Riding a bicycle	5	1	1
57	LeisOut	exercise	skiing a mountain	Skiing a mountain	2	1	3
47	Travel	exercise	swimming in a lake	Swimming in a lake	2	0	3
30	Travel	exercise	swimming in a pool	Swimming in a pool	2	0	3
41	Travel	exercise	swimming in a pool	Swimming at a pool	2	2	3
52	Travel	exercise	swimming in a pool	Swimming	3	2	1
6	LeisOut	exercise	swimming in a pool	Doing swimming	NA	NA	NA
26	LeisOut	exercise	swimming in a pool	swimming in pools	2	1	3
31	LeisOut	exercise	swimming in a pool	Swimming at the gym	4	2	2
39	LeisOut	exercise	swimming in a pool	swimming in the pool	3	NA	NA
49	LeisOut	exercise	swimming in a pool	Swimming in a pool	3	2	2
50	FamRel	exercise	taking a walk	Walking	0	NA	NA
41	Health	exercise	taking a walk	Taking a walk	4	0	2
55	Travel	exercise	walking for exercise	Walking for exercise	3	3	2
21	Health	exercise	walking for exercise	Walking for exercise	4	2	2
23	LeisHome	exercise	walking for exercise	Walking on the treadmill	4	4	-2
5	Travel	exercise	walking outside	walking outside	NA	NA	NA
9	LeisOut	exercise	walking outside	Walking in woodlands or beaches	4	0	1
21	LeisOut	exercise	walking outside	Walking for leisure	4	1	3
48	LeisOut	exercise	walking outside	Walking around park	4	3	2
11	Travel	exercise	walking to somewhere	Walking somewhere	4	2	1
24	Travel	exercise	walking to somewhere	walking to work from the train	5	0	-1
25	Travel	exercise	walking to somewhere	Walking to the barn to feed my animals	5	2	3
31	Travel	exercise	walking to somewhere	Walking to get shopping	4	1	2
20	NonLeis	finance	paying bills	Paying bills	3	0	0
8	Travel	flying	flying on a plane	Being seated in flight and not being able to move b ecause of the warning signs in place	1	0	0
21	Travel	flying	flying on a plane	Sitting on plane	2	0	-1
29	Travel	flying	flying on a plane	Sitting on plane	2	0	0
34	Travel	flying	flying on a plane	Flying on a plane	1	0	-3
52	Travel	flying	flying on a plane	Being on a plane	1	0	0
56	Travel	flying	flying on a plane	In a plane	NA	NA	NA
6	Health	general grooming	applying body cream	Applying body cream	NA	NA	NA
6	Health	general grooming	applying make-up	ApplyING make up	NA	NA	NA
9	Health	general grooming	applying make-up	Doing makeup	5	1	2
24	Health	general grooming	applying make-up	putting on makeup	5	0	2
46	Health	general grooming	applying make-up	Putting on makeup	4	2	2
50	Health	general grooming	applying make-up	Putting on makeup	0	NA	NA
47	Health	general grooming	cutting nails	Clipping my nails	4	0	0
58	Health	general grooming	grooming	Grooming	5	1	2
7	Health	general grooming	manicure and/or pedicure	Getting manicures and pedicures	3	3	3
8	Health	general grooming	manicure and/or pedicure	Giving myself a pedicure	3	0	0
24	Health	general grooming	removing make-up	taking my makeup off	5	0	0

9	Health	general grooming	shaving body hair	Shaving legs	3	1	1
49	FamRel	going out	family outings	During family outtings	3	1	3
28	LeisOut	going out	gambling at a casino	Gambling at casino	4	1	3
5	FamRel	going out	going on a date	going on a date	NA	NA	NA
18	FamRel	going out	going out	Going out	2	2	2
11	LeisOut	going out	going out dancing/partying	Dancing/partying	3	3	3
12	LeisOut	going out	going out dancing/partying	Parties	NA	NA	NA
31	LeisOut	going out	going out dancing/partying	Dancing at the pub	3	2	2
30	FamRel	going out	going out with partner/spouse	Going out with spouse	4	0	3
7	LeisOut	going out	going to a museum	Going to the museum	2	0	3
16	Travel	going out	going to concerts	Going to concerts	2	2	3
12	FamRel	going out	going out dancing/partying	Parties	NA	NA	NA
7	LeisOut	going out	going to the arcade	Going to the arcade	3	0	3
1	FamRel	going out	going to the pub	Going to the pub	3	0	1
30	Travel	going out	riding amusment park rides	Riding amusement rides	2	0	3
57	Travel	going out	riding amusment park rides	Riding amusement park rides	1	1	3
29	LeisOut	going out	sitting at a sports event	Sitting at a sports event	2	0	0
6	FamRel	going out	watching a film at the cinema	Cinema or theatre	NA	NA	NA
5	LeisOut	going out	watching a film at the cinema	going to the movies	NA	NA	NA
8	LeisOut	going out	watching a film at the cinema	Watching a new movie at the theater	3	0	0
12	LeisOut	going out	watching a film at the cinema	Movies	NA	NA	NA
21	LeisOut	going out	watching a film at the cinema	Watching movie at cinema	3	0	3
30	LeisOut	going out	watching a film at the cinema	Watching a movie at the theaters	3	0	3
34	LeisOut	going out	watching a film at the cinema	Visiting a movie theatre	2	0	1
46	LeisOut	going out	watching a film at the cinema	Watching film at cinema	2	1	2
47	LeisOut	going out	watching a film at the cinema	Watching a movie in a theater	2	0	3
48	LeisOut	going out	watching a film at the cinema	Sitting in cinema	2	1	2
1	Health	hair grooming	brushing hair	Brushing my hair	5	0	-1
16	Health	hair grooming	brushing hair	Brushing my hair	5	0	0
17	Health	hair grooming	brushing hair	Brushing hair in the mornings/evenings	5	0	1
26	Health	hair grooming	brushing hair	brushing my hair	4	0	1
34	Health	hair grooming	brushing hair	Brushing my hair	5	0	0
6	Health	hair grooming	drying hair	Drying g hair	NA	NA	NA
33	Health	hair grooming	drying hair	Drying my hair	4	0	0
48	Health	hair grooming	drying hair	Letting hair air dry	3	0	-1
19	Health	hair grooming	fixing my hair in front of others	Fixing my hair in front of others	5	0	-2
7	Health	hair grooming	having a haircut	Getting my hair trimmed	2	3	3
49	LeisHome	hair grooming	having a haircut	Getting a haircut	3	0	1
34	LeisOut	hair grooming	having a haircut	Visiting the hair salon	2	0	2
6	Health	hair grooming	styling hair	Straightening hair	NA	NA	NA
52	Health	hair grooming	styling hair	Straightening my hair	4	1	0
20	Health	hair grooming	styling hair	Styling my hair	4	0	0
11	Health	hair grooming	washing hair	Washing or grooming hair in any way	5	1	0
31	Health	hair grooming	washing hair	Washing hair	4	2	1
33	Health	hair grooming	washing hair	Washing my hair	4	1	1

47	Health	hair grooming	washing hair	Washing my hair	5	0	0
48	Health	hair grooming	washing hair	Washing hair	3	0	2
51	Health	hair grooming	washing hair	Washing hair	4	0	2
7	Health	health appointments	being at the dentists	Going to the dentist	2	3	3
22	Health	health appointments	being at the doctors	Doctors visits	3	0	-3
33	Health	health appointments	being at the doctors	Talking to a doctor/ healthcare professional	3	0	0
49	Health	health appointments	being at the doctors	Getting a doctors checkup	3	0	1
52	Health	health appointments	being at the doctors	Going to the doctor	2	0	-1
22	Health	health concerns	picking up medication	Picking up medication	3	0	-3
25	Health	health concerns	taking medication	Taking my medications	5	2	-2
49	Health	health concerns	taking medication	Taking alergy meds	5	0	0
7	FamRel	holiday	celebrating holidays	Celebrating holidays	2	0	3
19	Travel	holiday	going on a family vacation	Going on vacation with family	1	0	3
56	Travel	holiday	going on a family vacation	My husband's family vacation house full of carpets	NA	NA	NA
12	FamRel	holiday	going on holiday	Holidays	NA	NA	NA
18	UniWork	holiday	going on holiday	Going for retreat	1	2	3
7	Travel	holiday	going on holiday	Going on vacations	2	1	3
15	Travel	holiday	going on holiday	Vacations	0	NA	NA
18	Travel	holiday	going on holiday	Visiting new places	2	2	3
31	Travel	holiday	going on holiday	Going on holiday	2	2	3
46	Travel	holiday	going on holiday	Holidays I don't pull hardly at all	2	3	2
16	Travel	holiday	sightseeing	Sightseeing	2	1	2
40	Travel	holiday	sightseeing	Sight-seeing in another country	2	1	3
48	Travel	holiday	travel during vacation	Travelling outside on holiday	1	3	3
1	Travel	holiday	travelling to destination	Travelling abroad	2	0	1
22	FamRel	holiday	weekend away with someone	Weekend away with someone	2	4	3
46	Health	ill	being ill in general	Feeling poorly	3	0	-2
30	Health	ill	staying in bed due to illness	Laying in bed sick	2	0	-1
58	LeisHome	internet	browsing the internet	surfing the web and both hands are buzy or one hand and full interest in activity or focus	5	0	2
2	Health	personal hygiene	brushing your teeth	Brushing my teeth	5	0	0
5	Health	personal hygiene	brushing your teeth	brushing my teeth	NA	NA	NA
16	Health	personal hygiene	brushing your teeth	Brushing my teeth	5	0	1
41	Health	personal hygiene	brushing your teeth	Brushing my teeth	5	0	0
57	Health	personal hygiene	brushing your teeth	Brushing my teeth	5	0	-1
3	LeisHome	personal hygiene	brushing your teeth	Brushing teeth	5	0	2
24	Health	personal hygiene	having a bath	having a bath	4	0	3
29	Health	personal hygiene	having a bath	Taking a bath	5	0	0
20	LeisHome	personal hygiene	having a bath	Taking a bath	2	0	2
29	LeisHome	personal hygiene	having a bath	Bathing	5	0	0
31	LeisHome	personal hygiene	having a bath	Relaxing in the bath	4	1	3
31	LeisHome	personal hygiene	having a bath	Relaxing in the hottub	3	3	3
46	LeisHome	personal hygiene	having a bath	Bathing bath time	4	1	1
1	Health	personal hygiene	having a shower	Having a shower	5	0	0
5	Health	personal hygiene	having a shower	taking a shower	NA	NA	NA
9	Health	personal hygiene	having a shower	Washing in the shower	4	1	1

10	Health	personal hygiene	having a shower	Showering	5	1	0
20	Health	personal hygiene	having a shower	Taking a shower	4	1	2
23	Health	personal hygiene	having a shower	Showering or taking a bath	5	2	2
26	Health	personal hygiene	having a shower	taking a shower	4	0	1
27	Health	personal hygiene	having a shower	Taking a shower	5	2	3
29	Health	personal hygiene	having a shower	Showering	5	0	0
31	Health	personal hygiene	having a shower	Showering body	5	1	0
34	Health	personal hygiene	having a shower	Taking a shower	4	0	1
36	Health	personal hygiene	having a shower	Taking a shower	4	0	2
46	Health	personal hygiene	having a shower	Bathing and showering	4	2	1
50	Health	personal hygiene	having a shower	Showering	0	NA	NA
52	Health	personal hygiene	having a shower	Taking a shower	4	1	3
55	Health	personal hygiene	having a shower	Showering and shaving	4	4	-1
58	Health	personal hygiene	having a shower	Showering	5	1	3
3	LeisHome	personal hygiene	having a shower	Taking a shower	4	0	2
26	LeisHome	personal hygiene	having a shower	taking a shower	4	0	1
38	LeisHome	personal hygiene	having a shower	Taking a shower	NA	NA	NA
25	NonLeis	personal hygiene	having a shower	Taking a shower	5	3	2
8	Health	personal hygiene	washing your face	Washing my face	4	0	0
47	NonLeis	pets	cleaning cat litterbox	Cleaning the litterbox	4	0	-3
52	NonLeis	pets	cleaning cat litterbox	Scooping the cat litter	4	1	-3
33	NonLeis	pets	cleaning out the rabbits	Cleaning out the rabbits	4	0	-1
5	NonLeis	pets	feeding a pet	feeding the pets	NA	NA	NA
25	NonLeis	pets	feeding a pet	Feeding my dogs	5	0	-1
34	NonLeis	pets	grooming a dog	Grooming my dog	4	0	0
5	LeisHome	pets	petting a cat	letting cats	NA	NA	NA
8	LeisHome	pets	petting a cat	Petting my cat	5	1	1
25	LeisHome	pets	petting a cat	Petting my animals	5	2	3
36	LeisHome	pets	petting a cat	Petting my cat	5	0	3
10	LeisHome	pets	playing with a dog	Playing with dog	4	2	2
11	LeisHome	pets	playing with a dog	Playing with pets	5	2	2
39	LeisHome	pets	playing with a dog	playing with the animals	5	NA	NA
6	LeisHome	pets	walking a dog	Walking the dog	NA	NA	NA
6	LeisOut	pets	walking a dog	Walking the dog	NA	NA	NA
10	LeisOut	pets	walking a dog	Walking dog	5	3	1
9	LeisOut	pets	walking with cats	Walking with my cats	3	2	2
27	LeisHome	playing	playing board games	Playing a game	4	0	3
41	LeisHome	playing	playing board games	Playing board games	3	0	2
55	LeisHome	playing	playing card games	Playing cards or games	3	1	2
16	FamRel	playing	playing games with friends	Playing games with friends	4	1	2
51	LeisHome	playing	playing on your phone	Playing on phone	5	0	2
52	LeisHome	playing	playing on your phone	Playing games on my phone	5	0	3
16	LeisHome	playing	playing online games	Playing online games	5	1	3
30	LeisHome	playing	playing puzzles e.g. word search puzzles, jigsaws etc.	Putting together a puzzle	3	0	2
30	LeisHome	playing	playing video games	Playing video games	4	0	3
34	LeisHome	playing	playing video games	Playing video games	5	0	3
38	LeisHome	playing	playing video games	Playing video games	NA	NA	NA
49	NonLeis	playing	playing video games	Playing non violent video games	5	3	3

17	Travel	public transport	having filthy hands while waiting for the bus	Having filthy hands while waiting for the bus	4	0	-2
10	Travel	public transport	traveling on the train	Riding train to school	4	2	-1
21	Travel	public transport	traveling on the train	Riding subway/train	1	1	1
51	Travel	public transport	traveling on the train	On a train	2	0	2
8	Travel	public transport	travelling on a bus	Riding a bus	3	1	1
9	Travel	public transport	travelling on a bus	Travelling on bus with a lot of people	5	0	-1
48	Travel	public transport	travelling on a bus	Sitting on bus while travelling	4	1	0
46	Travel	public transport	using public transport	Travelling on public transport	3	0	-1
33	LeisHome	reading	reading a book	Reading a book	4	0	3
57	Travel	relaxing	drinking cocktails on the beach	Drinking cocktails on the beach	1	1	3
7	Health	relaxing	getting massages	Getting massages	3	3	3
37	Travel	relaxing	listening to music	Listening to music	NA	NA	NA
16	LeisHome	relaxing	listening to music	Listening to music	5	1	3
40	LeisHome	relaxing	listening to music	Listening to music	5	1	2
39	LeisOut	relaxing	listening to music	listening to music	5	NA	NA
40	LeisHome	relaxing	lying in bed	Relaxing in bed	4	0	2
58	FamRel	relaxing	relaxing in general	Relaxing and spending time with	4	0	1
18	LeisHome	relaxing	relaxing in general	Relaxing	5	0	3
12	LeisOut	relaxing	relaxing on the beach	Beach	NA	NA	NA
7	Travel	relaxing	relaxing on the beach	Going to the beach	2	1	3
22	Travel	relaxing	relaxing on the beach	On the beach	2	1	3
40	Travel	relaxing	relaxing on the beach	Relaxing on a beach	2	0	3
41	NonLeis	relaxing	relaxing outside	Spending time in my garden	4	0	3
49	LeisHome	relaxing	relxing on the couch	Relaxing on the couch	5	0	1
21	FamRel	relaxing	smoking for leisure	Smoking for leisure	5	0	3
1	LeisOut	shopping	shopping for clothes	Shopping for clothes	3	0	-1
5	LeisOut	shopping	shopping for clothes	shopping at the mall	NA	NA	NA
19	LeisOut	shopping	shopping for clothes	Shopping at the mall	3	0	2
30	LeisOut	shopping	shopping for clothes	Shopping for clothes	3	0	2
41	LeisOut	shopping	shopping for clothes	Shopping at the mall	3	0	3
53	LeisOut	shopping	shopping for clothes	Going clothes shopping	2	0	3
55	LeisOut	shopping	shopping for clothes	Shopping for clothing	2	3	2
57	LeisOut	shopping	shopping for clothes	Shopping for clothes	3	1	3
21	Health	shopping	shopping for groceries	Shopping for groceries	4	2	2
55	LeisOut	shopping	shopping for groceries	Shopping for food	4	3	-1
23	LeisOut	shopping	shopping in a store with someone else to accompany me	shopping in a store with someone else to accompany me	3	3	2
10	LeisOut	shopping	shopping in general	Shopping	3	2	0
11	LeisOut	shopping	shopping in general	Shopping	3	2	2
15	LeisOut	shopping	shopping in general	Shopping	0	NA	NA
16	LeisOut	shopping	shopping in general	Going shopping	3	2	2
24	LeisOut	shopping	shopping in general	shopping	3	0	3
28	LeisOut	shopping	shopping in general	Shopping at stores	5	0	3
29	LeisOut	shopping	shopping in general	Shopping at stores	3	0	0
32	LeisOut	shopping	shopping in general	When shopping	NA	NA	NA
46	LeisOut	shopping	shopping in general	Shopping	4	2	-1
47	LeisOut	shopping	shopping in general	Shopping in a store	4	0	0

50	LeisOut	shopping	shopping in general	Shopping	0	NA	NA
51	LeisOut	shopping	shopping in general	Shopping	3	0	3
52	LeisOut	shopping	shopping in general	Shopping at any store	4	1	0
50	FamRel	shopping	shopping in general	Shopping	0	NA	NA
33	LeisOut	shopping	shopping with friends	shopping with friends	3	0	3
23	LeisHome	sleeping	falling asleep in bed	Laying in bed, falling asleep	5	0	3
26	Health	sleeping	sleeping	taking a nap	3	0	1
40	Health	sleeping	sleeping in bed	Sleeping in bed	5	0	2
52	Health	sleeping	sleeping in bed	Sleeping	5	0	0
12	LeisHome	sleeping	sleeping in bed	Sleeping	NA	NA	NA
25	LeisHome	sleeping	sleeping in bed	Sleeping at night	5	1	3
47	LeisHome	sleeping	sleeping in bed	Sleeping at home	5	0	3
18	NonLeis	sleeping	sleeping in bed	Sleeping	5	0	1
58	NonLeis	sleeping	sleeping in bed	Sleeping or going to	5	1	1
55	Health	sleeping	taking a nap	Napping and sleeping	5	1	0
26	LeisHome	sleeping	taking a nap	taking a nap	3	0	1
11	FamRel	socialising	consoling a friend/family member/partner	Consoling a friend/family member/partner	3	1	-1
9	LeisHome	socialising	drinking fluids	Drinking fluids	5	0	0
6	FamRel	socialising	drinking socially	Drinking	NA	NA	NA
50	FamRel	socialising	drinking socially	Having a drink out	0	NA	NA
57	LeisHome	socialising	drinking socially	Drinking alcohol with friends	3	1	3
21	LeisOut	socialising	drinking socially	Drinking at bars or parties	4	2	3
29	FamRel	socialising	entertaining family & friends	Entertaining family & friends	4	0	0
37	FamRel	socialising	having all eyes on me	Having all eyes on me	NA	NA	NA
8	FamRel	socialising	having an argument with family	Having a argument with my mother	2	0	1
2	FamRel	socialising	meeting family who do not know about hair pulling	Meeting with family members who do not know about hair pulling	2	1	1
49	FamRel	socialising	resolving family conflicts	Resolving family conflicts	2	0	-1
26	FamRel	socialising	socialising with family	going to sisters house	3	0	1
29	FamRel	socialising	socialising with family	Visiting family & friends	4	0	0
41	FamRel	socialising	socialising with family	Visiting my mom	3	0	2
46	FamRel	socialising	socialising with family	Visiting family	4	2	2
58	Travel	socialising	socialising with family	Visiting family during holiday or work or aarons	5	1	1
15	FamRel	socialising	socialising with family	Family gatherings	0	NA	NA
17	FamRel	socialising	socialising with family	Spending time with mother's side of family	3	0	1
5	Travel	socialising	socialising with family	spending time with family	NA	NA	NA
32	Travel	socialising	socialising with family	When family are round	NA	NA	NA
47	Travel	socialising	socialising with family	Socializing with family	2	0	3
34	FamRel	socialising	socialising with friends	Visiting a friend	4	0	3
46	FamRel	socialising	socialising with friends	Visiting friends	3	1	1
18	Travel	socialising	socialising with friends	Visiting friends	2	1	3
15	LeisOut	socialising	socialising with friends	Visiting friends	0	NA	NA
46	LeisOut	socialising	socialising with friends	Visiting friends or family	4	2	2
24	FamRel	socialising	socialising with friends	hanging out with friends	4	0	3
32	FamRel	socialising	socialising with friends	When sitting with family Or friends	NA	NA	NA
38	FamRel	socialising	socialising with friends	Hanging out with friends	NA	NA	NA
39	FamRel	socialising	socialising with friends	talking to friends in real time	4	NA	NA

52	FamRel	socialising	socialising with friends	Hanging out with friends	4	2	2
49	Travel	socialising	socialising with friends	Racing with my friends	3	0	1
19	LeisOut	socialising	socialising with friends	Going out with friends	3	0	2
38	NonLeis	socialising	socialising with friends	Hanging out with friends	NA	NA	NA
49	NonLeis	socialising	socialising with friends	Having nights out with friends	3	1	2
5	LeisHome	socialising	socialising with other people	being around other people	NA	NA	NA
29	LeisHome	socialising	socialising with other people	Sitting with others	5	0	0
4	LeisOut	socialising	socialising with other people	having to be out around people without anywhere to hide.	3	0	1
37	LeisOut	socialising	socialising with other people	Singing at a gathering	NA	NA	NA
32	LeisHome	socialising	socialising with partner/spouse	When sitting with partner	NA	NA	NA
33	UniWork	socialising	talking in a group	Talking in a group situation	3	0	-3
19	FamRel	socialising	talking in a group	Talking in groups of people at a get together	4	0	2
8	FamRel	socialising	socialising with other people	Talking with them face to face	2	0	0
9	FamRel	socialising	socialising with family	Talking in close range to family/friends	5	0	1
17	FamRel	socialising	socialising with family	Talking to my mother	4	0	2
26	FamRel	socialising	socialising with friends	talking to best friend	4	0	2
26	FamRel	socialising	socialising with other people	talking to neighbors	4	0	0
30	FamRel	socialising	socialising with friends	Talking with a friend or spouse	5	0	3
37	FamRel	socialising	socialising with family	Talking to my sister	NA	NA	NA
46	FamRel	socialising	socialising with family	Chatting with family at home	5	2	2
58	FamRel	socialising	socialising with other people	Conversating	4	0	1
8	UniWork	socialising	talking on the phone	Talking on the phone	3	0	0
6	UniWork	socialising	talking over coffee	Chatting and having coffee	NA	NA	NA
58	UniWork	socialising	talking while busy	Conversating or while busy otherwise	4	0	1
39	Travel	travel	travelling in general	travelling in general	2	NA	NA
58	LeisHome	watching tv/a film	watching a film	Watching movies	3	0	1
49	NonLeis	watching tv/a film	watching tv	Watching romantic series	3	1	1
9	FamRel	watching tv/a film	watching tv with family	Watching TV in close range to family	5	0	1
52	FamRel	watching tv/a film	watching tv with partner/spouse	Watching TV with my husband	5	0	3
29	LeisHome	watching tv/a film	watching with other people	Watching with others	5	0	0
16	LeisHome	writing creatively	writing stories	Writing stories	4	0	2

Note: Rated frequency was on a scale 0(never)-5(once or more a day); Rated arousal was on a scale 0(no bodily arousal)-4(intense bodily arousal); Rated valence was on a scale -3(highly unpleasant)-3(highly pleasant).

Appendix B Supplementary materials for Chapter 3

SM 1
Supplementary Materials 1

Regression analysis pipeline

The primary goals of our analysis pipeline were to: (1) identify effects, (2) establish their effect sizes, and (3) assess their generalizability across participants and situations. The dependent variables (social connectedness and social support) and their predictors (e.g., closeness, shared identity, social engagement, valued relationships, emotional support, informational support, instrumental support and feedback) were all standardized so that we could specify each predictor's effect in standard deviation units. Thus, each estimated regression coefficient provides a measure of effect size, indicating the standard-deviation-unit change in the dependent variable associated with each standard-deviation-unit change in the predictor. The sign of these standardized coefficients further indicates the direction of the relationship. If, for example, a standardized coefficient for the relation between closeness and social connectedness happened to be .60, this meant that social connectedness increased positively by .60 of a standard deviation for each standard deviation increase in closeness. The larger the absolute value of a coefficient, the larger its effect size.

For each regression analysis, we implemented a sequence of three multilevel mixed-effect models (using the lme4 package in R; (Bates et al., 2015). We will refer these models as *Model 1*, *Model 2*, and *Model 3*. These models were *multilevel* because they predicted a dependent variable such as social connectedness using both situation-level predictors (closeness, shared identity, social engagement, valued relationships, emotional support, informational support, instrumental support and feedback) and individual-level random effects (participants, situations). These models were *mixed effect* because they simultaneously assessed both fixed effects (predictors at the individual and situation levels) and random effects (random intercepts and slopes at the individual and situation levels). Assessing random slopes is essential for generalizing results beyond a current sample of participants and habits (Barr et

al., 2013b). Multilevel mixed-effect modelling offers a powerful approach for establishing generalizability across participants and situations simultaneously.

In the first stage of our analysis pipeline, Model 1 identified predictors likely to have meaningful effects on the dependent variable (just the main effects). Model 1 included all predictors of interest at the situation and individual levels and random intercepts for situations and participants. This relatively liberal model served to identify potentially important predictors that were subsequently examined more closely and conservatively in Models 2 and 3. For a predictor to pass this initial screening, the *t* for its estimated regression coefficient had to be greater than |1.96| (associated with a *p*-value ≤ .05). We assumed that any effect that failed this initial screening would be unlikely to have a meaningful impact on the dependent variable.

For each potentially important predictor identified in Model 1, we then assessed it more conservatively in a unique Model 2 that tested it *maximally* (Barr et al., 2013b). Specifically, maximal testing established whether a predictor's effect in Model 1 generalized beyond participant-level and situation-level variability for the effect in the underlying population of possible observations. Imagine, for example, that the .60 estimated regression coefficient for closeness survived initial screening in Model 1. If large individual differences in participants and situations are present, then the observed effect may not generalize to the broader populations of participants and situations. To test an observed effect in Model 1 maximally, Model 2 included one empirically-determined random slope for each participant that modeled the effect for that participant. Additionally, Model 2 included one empirically-determined random slope for each situation that modeled the effect for that situation. Of interest was whether the *t* for the fixed effect in Model 2 remained greater than |1.96| once the variances of the random effects for participants and situations were accounted for simultaneously. If the fixed effect passed this maximal testing, we concluded that it generalizes beyond the current samples of participants and situations. If the effect failed maximal testing, we assumed that it does not generalize and can be explained in terms of individual-level and habit-level variability.

Unfortunately, including appropriate random slopes simultaneously in Model 2 for each and every predictor that survives initial screening in Model 1 is typically

not possible, as the sheer complexity of the model disrupts optimization and convergence. To circumvent this problem, Barr et al. (2013, p. 276) suggested maximally testing each effect of interest one at a time (i.e., including appropriate random slopes for participants and situations associated with the fixed effect of interest, while not including random slopes for any remaining fixed effects). Thus, when maximally testing the effect of (say) closeness, a unique Model 2 was constructed by adding random slopes for closeness to Model 1 but not adding random slopes for any other fixed effect. In this manner, a unique Model 2 was constructed for each fixed effect that passed Model 1 screening.

If a predictor passed maximal testing in Model 2, it was evaluated one more time in a unique Model 3 that established how much unique variance in Model 2 was associated with it. In each Model 3, we dropped the main effect being tested from its Model 2, along with any associated random slopes, while keeping everything else the same as in Model 2. We then subtracted the total variance for the predictor's Model 3 from the total variance for its Model 2. The difference in R^2 (ΔR^2 expressed as a percentage) established how much unique variance the predictor captured when included *as a fixed effect together with associated random effects* in Model 2.

Using this analysis pipeline, we established predictors associated with effects that generalize across participants and situations (i.e., predictors that survived maximal testing in Model 2). For each predictor that generalized, we obtained two measures of its effect size: (1) its standardized regression coefficient in Model 2, and (2) its ΔR^2 derived from Model 3.

SM 2
Supplementary Materials 2
Regressions exploring sociality and valence across situations

For discovery analysis, presented here are the results of mixed-effect regressions that assessed sociality (social vs. non-social), valence (positive vs. negative), and their interaction as predictors for social connectedness, social support, and the eight predictors.

Table 1. For each of the ten measures as the dependent variable (DV), mixed-effect regressions with sociality, valence, and their interaction as fixed effects, and with participants and situations as random effects (both random intercepts and random slopes).

DV	Predictor	Estimate	SE	*t*
Social Connectedness				
	social vs. non-social	.117	.038	3.12**
	positive vs. negative	.489	.040	12.27***
	social vs. non-social * positive vs. negative	.194	.035	5.46***
Social Support				
	social vs. non-social	.139	.045	3.09**
	positive vs. negative	.266	.048	5.49***
	social vs. non-social * positive vs. negative	.171	.043	3.94**
Closeness				
	social vs. non-social	.173	.042	4.09***
	positive vs. negative	.461	.044	10.46***
	social vs. non-social * positive vs. negative	.244	.041	5.98***
Shared Identity				
	social vs. non-social	.129	.035	3.71**
	positive vs. negative	.389	.038	10.31***
	social vs. non-social * positive vs. negative	.194	.033	5.87***
Social Engagement				
	social vs. non-social	.183	.040	4.55***
	positive vs. negative	.457	.040	11.31***
	social vs. non-social * positive vs. negative	.194	.037	5.29***
Valued Relationships				
	social vs. non-social	.142	.042	3.39**
	positive vs. negative	.396	.044	8.95***
	social vs. non-social * positive vs. negative	.224	.040	5.62***
Emotional Support				
	social vs. non-social	.187	.055	3.42**
	positive vs. negative	.186	.058	3.23**
	social vs. non-social * positive vs. negative	.204	.054	3.80**
Informational Support				
	social vs. non-social	.166	.059	2.80*
	positive vs. negative	.160	.061	2.61*
	social vs. non-social * positive vs. negative	.159	.058	2.73*
Instrumental Support				
	social vs. non-social	.056	.043	1.31
	positive vs. negative	.228	.045	5.04***
	social vs. non-social * positive vs. negative	.159	.041	3.86**
Feedback				
	social vs. non-social	.159	.057	2.81**
	positive vs. negative	.167	.058	2.87**
	social vs. non-social * positive vs. negative	.135	.056	2.42*

Note. All regressions were performed on standardised measures. An Estimate is the estimate of a standardised regression coefficient in the respective model, with SE and *t*, being the standard error and *t* value of the estimate, where * $p < .05$, ** $p < .01$, *** $p < .001$. Statistical significance was established using the lmer function from the lmerTest package in R, which provides *p*-values via Satterthwaite's degrees of freedom method.

Appendix C Supplementary materials for Chapter 4

SM 1
Supplementary Materials 1

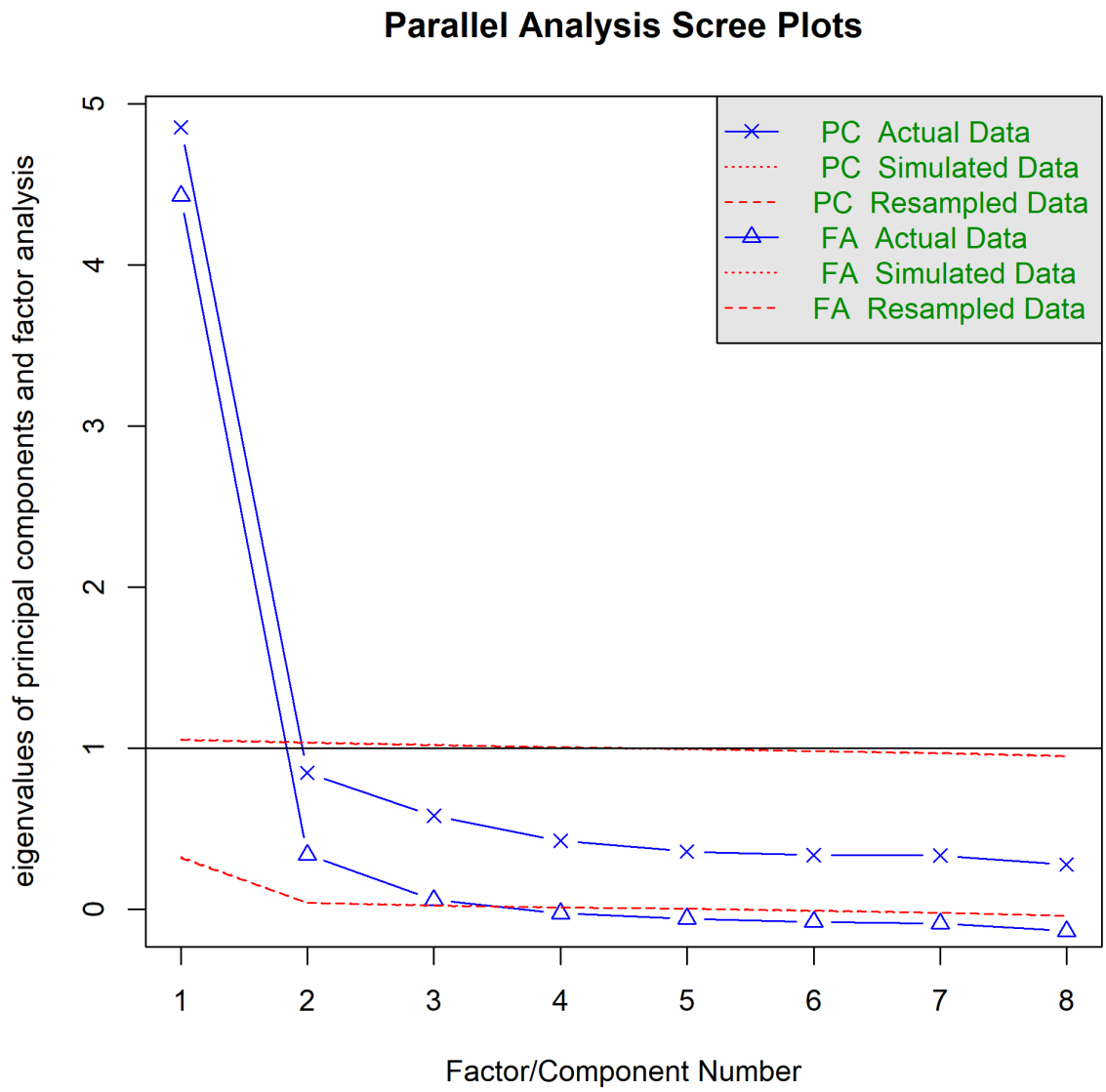
Exploratory Factor analysis

For hypothesis 2 we predicted that the predictors for social connectedness and social support would load on different factors in an exploratory factor analysis. To assess this prediction, we ran an exploratory factor analysis on the eight predictor variables using a promax rotation (due to a likely correlation between factors).

Table 1. The full factor loadings for both two- and three- factor analysis models

Measure	Factor 1	Factor 2	Factor 3
Two-factor model			
Closeness	.846	.023	
Shared Identity	.754	.041	
Social Engagement	.813	-.030	
Valued Relationships	.715	.109	
Emotional Support	.459	.374	
Informational Support	-.029	.868	
Instrumental Support	.022	.561	
Feedback	.076	.732	
Three-factor model			
Closeness	.682	.019	.202
Shared Identity	.719	.090	.013
Social Engagement	.825	.033	-.048
Valued Relationships	.446	-.033	.465
Emotional Support	.183	.213	.491
Informational Support	-.017	.819	.058
Instrumental Support	.083	.587	-.075
Feedback	-.011	.624	.222

Figure 1. Scree plot



SM 2
Supplementary Materials 2

Regression analysis pipeline

The primary goals of our analysis pipeline were to: (1) identify effects, (2) establish their effect sizes, and (3) assess their generalizability across participants and situations. The dependent variables (social connectedness and social support) and their predictors (e.g., closeness, shared identity, social engagement, valued relationships, emotional support, informational support, instrumental support and feedback) were all standardized so that we could specify each predictor's effect in standard deviation units. Thus, each estimated regression coefficient provides a measure of effect size, indicating the standard-deviation-unit change in the dependent variable associated with each standard-deviation-unit change in the predictor. The sign of these standardized coefficients further indicates the direction of the relationship. If, for example, a standardized coefficient for the relation between closeness and social connectedness happened to be .60, this meant that social connectedness increased positively by .60 of a standard deviation for each standard deviation increase in closeness. The larger the absolute value of a coefficient, the larger its effect size.

For each regression analysis, we implemented a sequence of three multilevel mixed-effect models (using the lme4 package in R; (Bates et al., 2015). We will refer these models as *Model 1*, *Model 2*, and *Model 3*. These models were *multilevel* because they predicted a dependent variable such as social connectedness using both situation-level predictors (closeness, shared identity, social engagement, valued relationships, emotional support, informational support, instrumental support and feedback) and individual-level random effects (participants, situations). These models were *mixed effect* because they simultaneously assessed both fixed effects (predictors at the individual and situation levels) and random effects (random intercepts and slopes at the individual and situation levels). Assessing random effects is pivotal for generalizing results beyond a current sample of participants and habits (Barr et al., 2013b). Multilevel mixed-effect modelling offers a powerful approach for establishing generalizability across participants and situations simultaneously.

In the first stage of our analysis pipeline, Model 1 identified predictors likely to have meaningful effects on the dependent variable (just the main effects). Model 1 included all predictors of interest at the situation and individual levels and random intercepts for situations and participants. This relatively liberal model served to identify potentially important predictors that were subsequently examined more closely and conservatively in Models 2 and 3. For a predictor to pass this initial screening, the *t* for its estimated regression coefficient had to be greater than |1.96| (associated with a *p*-value ≤ .05). We assumed that any effect that failed this initial screening would be unlikely to have a meaningful impact on the dependent variable.

For each potentially important predictor identified in Model 1, we then assessed it more conservatively in a unique Model 2 that tested it *maximally* (Barr et al., 2013b). Specifically, maximal testing established whether a predictor's effect in Model 1 generalized beyond participant-level and situation-level variability for the effect in the underlying population of possible observations. Imagine, for example, that the .60 estimated regression coefficient for closeness survived initial screening in Model 1. If large individual differences in participants and situations are present, then the observed effect may not generalize to the broader populations of participants and situations. To test an observed effect in Model 1 maximally, Model 2 included one empirically-determined random slope for each participant that modeled the effect for that participant. Additionally, Model 2 included one empirically-determined random slope for each situation that modeled the effect for that situation. Of interest was whether the *t* for the fixed effect in Model 2 remained greater than |1.96| once the variances of the random effects for participants and situations were accounted for simultaneously. If the fixed effect passed this maximal testing, we concluded that it generalizes beyond the current samples of participants and situations. If the effect failed maximal testing, we assumed that it does not generalize and can be explained in terms of individual-level and habit-level variability.

Unfortunately, including appropriate random slopes simultaneously in Model 2 for each and every predictor that survives initial screening in Model 1 is typically not possible, as the sheer complexity of the model disrupts optimization and convergence. To circumvent this problem, Barr et al. (2013, p. 276) suggested maximally testing each effect of interest one at a time (i.e., including

appropriate random slopes for participants and situations associated with the fixed effect of interest, while not including random slopes for any remaining fixed effects). Thus, when maximally testing the effect of (say) closeness, a unique Model 2 was constructed by adding random slopes for closeness to Model 1 but not adding random slopes for any other fixed effect. In this manner, a unique Model 2 was constructed for each fixed effect that passed Model 1 screening.

If a predictor passed maximal testing in Model 2, it was evaluated one more time in a unique Model 3 that established how much unique variance in Model 2 was associated with it. In each Model 3, we dropped the main effect being tested from its Model 2, along with any associated random slopes, while keeping everything else the same as in Model 2. We then subtracted the total variance for the predictor's Model 3 from the total variance for its Model 2. The difference in R^2 (ΔR^2 expressed as a percentage) established how much unique variance the predictor captured when included *as a fixed effect together with associated random effects* in Model 2.

Using this analysis pipeline, we established predictors associated with effects that generalize across participants and situations (i.e., predictors that survived maximal testing in Model 2). For each predictor that generalized, we obtained two measures of its effect size: (1) its standardized regression coefficient in Model 2, and (2) its ΔR^2 derived from Model 3.

SM 3

Supplementary Materials 3

Regressions exploring sociality, valence, modality and time period across situations.

For discovery analysis, presented here are the results of mixed-effect regressions that assessed sociality (social vs. non-social), valence (positive vs.

Table SM-3. Mixed effect regressions to assess differences in situations as a function of sociality (social vs. non-social), valence (positive vs. negative), interaction mode (online vs. offline), and time period (before-COVID vs. during-COVID).

DV	Predictor	Estimate	SE	*t*
Social Connectedness				
	social vs. non-social	.192	.067	2.85*
	positive vs. negative	.365	.067	5.48***
	online vs. offline	.131	.066	1.98
	before vs. during	.063	.010	6.08***
Social Support				
	social vs. non-social	.142	.061	2.32*
	positive vs. negative	.221	.061	3.63**
	online vs. offline	.089	.060	1.47
	before vs. during	.056	.010	5.56***
Loneliness				
	social vs. non-social	.012	.050	.24
	positive vs. negative	-.231	.051	-4.49***
	online vs. offline	.018	.049	.38
	before vs. during	.114	.013	9.08***
Closeness				
	social vs. non-social	.261	.086	3.03**
	positive vs. negative	.357	.086	4.16**
	online vs. offline	.153	.085	1.79*
	before vs. during	.086	.010	8.43***
Shared Identity				
	social vs. non-social	.148	.074	2.10
	positive vs. negative	.325	.073	4.43***
	online vs. offline	.150	.073	2.07
	before vs. during	.104	.011	9.81***
Social Engagement				
	social vs. non-social	.265	.066	4.01**
	positive vs. negative	.306	.064	4.75***
	online vs. offline	.134	.064	2.11
	before vs. during	.085	.011	8.05***
Valued Relationships				
	social vs. non-social	.268	.081	3.29**
	positive vs. negative	.253	.081	3.13**
	online vs. offline	.125	.080	1.56
	before vs. during	.085	.009	9.20***
Emotional Support				
	social vs. non-social	.244	.072	3.41**
	positive vs. negative	.147	.072	2.04
	online vs. offline	.099	.071	1.40
	before vs. during	.100	.011	8.94***
Informational Support				
	social vs. non-social	.055	.072	.75
	positive vs. negative	.124	.072	1.73
	online vs. offline	.109	.071	1.54
	before vs. during	.074	.011	6.93***
Instrumental Support				
	social vs. non-social	-.133	.052	-2.53*
	positive vs. negative	.181	.052	3.50**
	online vs. offline	.136	.051	2.66*
	before vs. during	.002	.012	.20
Feedback				
	social vs. non-social	.084	.069	1.21
	positive vs. negative	.123	.069	1.76
	online vs. offline	.077	.068	1.12
	before vs. during	.068	.011	6.01***

Note. All regressions were performed on standardised measures with sociality, valence, interaction mode, and time period as fixed effects, with random intercepts for participants and situations (intercepts and slopes), and no interactions. Social, positive, online, and during-COVID were coded as +1; non-social, negative, offline, and before COVID were coded as -1. An Estimate is the estimate of a standardised regression coefficient in the respective model, with SE and *t*, being the standard error and *t* value of the estimate. Statistical significance was established using the lmer function from the lmerTest package in R, which provides p-values via Satterthwaite's degrees of freedom method, with * p < .05, ** p <.01, *** p <.001.

negative), modality (online vs. offline) and time period (before vs. during COVID-19) as predictors for social connectedness, social support, loneliness, and the eight predictors.

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