Exploring the Influence of Mood on Socio-economic Decisions and Moral Judgement

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Abstract

People are usually confronted with an emotion/deliberation dilemma during the course of judgement and decision making, such that an emotional *want* is at odds with a reasoning-based *should/need*. Such dilemmas can occur at a social level and be related to others' welfare. Meanwhile, experience and activities in everyday life can often induce certain mood in people. This means a decision maker may be in a certain mood when confronted with an other-regarding emotion/deliberation dilemma. However, the potential role of mood in judgement and decision making in other-regarding emotion/deliberation dilemmas has been largely unexplored. The purpose of the current thesis is to explore the influence of mood on judgement and decision making in other-regarding emotion/deliberation dilemmas, by looking at whether and how mood affects socio-economic decisions and moral judgement. Treating such emotion/deliberation dilemmas with a dual-process approach, and building on theories of affect that suggest an informational function of mood and mood's effect on information processing strategy, we propose that mood can affect judgements and decisions in other-regarding emotion/deliberation dilemmas through its informational value.

Theoretical and empirical research suggests that mood can influence processing strategy by providing information about the situation ("affect-as-information" approach; Schwarz & Clore, 2007). Positive mood signals that the present situation is non-problematic and in turn encourages the use of a heuristic, top-down, reflexive processing strategy; in contrast, negative mood signals that the present situation is problematic and encourages the use of a more systematic, bottom-up, reflective processing strategy (Clore et al., 2001; Schwarz, 2000, 2002; Schwarz & Clore, 2007). Based on the affect-as-information theorising, we hypothesised that, when confronted with other-regarding emotion/deliberation dilemmas, positive mood would give rise to emotionally compelled judgements and decisions, whereas negative mood would give rise to more cognitively controlled judgements and decisions.

To test this idea, three studies were conducted using two experimental paradigms — one pertaining to socio-economic decisions and the other to moral judgement — both of which are assumed to incorporate an other-regarding emotion/deliberation dilemma. Study 1 examined

the influence of negative mood on socio-economic decisions using a paradigm called the "mini-ultimatum game" in which the divergence between emotion- and reasoning-based decisions corresponds to that between outcome-focused and intention-considered decisions. Studies 2 and 3 examined influences of positive and negative mood on moral judgement using a moral dilemma paradigm, in which an emotion/deliberation dilemma is posited by the fact that deontological (or, non-utilitarian) choices are at odds with utilitarian choices.

Results of Study 1 show that mood did not affect decisions in the mini-ultimatum game. A closer inspection of the behavioural economics literature suggests that this might be caused by a contextual extremity such that outcome plays a dominant role over intention in determining socio-economic decisions. Main results of Studies 2 and 3 indicate that mood may affect moral judgement by providing information about individual moral disposition; thus, whether negative/positive mood is associated with more reasoning-/emotion-based (i.e., utilitarian/non-utilitarian) judgements may be subject to individual moral inclination. Moreover, a pattern that is contrary to the initial thesis hypothesis was obtained from Studies 2 and 3, such that utilitarian judgements tended to increase with positive mood but decrease with negative mood. This suggests that mood may influence moral judgement in a different way from affecting the use of a certain processing strategy. Taken together, our findings, adding to the line of research of judgement and decision making, suggest that mood may affect judgements and decisions in other-regarding emotion/deliberation dilemmas through its informational value, and that its influence (or absence of influence) may be determined by interaction with contextual and dispositional factors. Our findings are discussed in relation to interplays between mood and contextual and dispositional factors, and to mood effects on willpower and on processing scope. They are also thought to have possible implications for legal decision making.

Dedicated to my beloved parents,
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Author's Declaration

I declare that this thesis is my own work carried out under normal terms of supervision. All collaborators are duly acknowledged.

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Chapter 1

General Introduction

Human life is filled with judgement and decision making (JDM), from simply deciding what to have for lunch to more seriously evaluating job offers. Much decision making – rather than simply making a choice based on individual preference or reaching a conclusion based on rational analysis – is hard, in that embedded in it is a *dilemma* between an emotion-based *want* and a reasoning-based *should/need*. As a result, people often struggle with the fact that a mutually satisfying trade-off is difficult or impossible to achieve. Some such dilemmas are chiefly about personal concerns, and some are of greater social significance and related to other individuals. A young graduate may be faced with a dilemma between choosing a job that is financially reliable and another that is much less so but would allow him to pursue his professional dream. In more socially serious situations such as criminal trials, jurors may find that their emotionally compelled judgements run counter to legal code (Carlsmith & Darley, 2008)

In essence, one feature of such scenarios is that people feel tempted by one option while seeing a rational for another. As I will introduce later, contemporary theorisations in psychology have in general entertained a "dual-process" perspective for JDM in such dilemma scenarios. According to the dual-process approach, both emotionally compelled processing and more deliberative, cognitively controlled processing are at work during the course of making the judgement or decision; the two types of processing interact to determine the final outcome, which is subject to the (eventually) more dominant form of processing (Kahneman & Frederick, 2002; Loewenstein & O'Donoghue, 2007). The current thesis aims to explore the influence of mood, a factor that is widely embedded in everyday life, on JDM

in other-regarding emotion/deliberation[1] dilemmas as described above (for simplicity, called emotion/deliberation dilemmas hereafter), by examining the possibility that mood can exert influence by moderating the reliance on emotionally compelled or cognitively controlled processing.

Moods, as affective states of mild intensity, are almost ubiquitous. A piece of good news in the morning can infuse the whole day with a pleasant tone; stress from work can result in a few weeks of feeling downhearted; even more subtle causes such as weather, listening to music or watching a movie can lead to a positive or negative mood that lasts for a while. Since they happens so naturally, moods provide an "underlying affective context for most of our outgoing thought processes and behaviours" (Forgas & George, 2001, p. 5). Research on JDM has seen various ways in which mood can influence JDM (Clore & Huntsinger, 2009; Forgas, 1995; Schwarz, 2000). However, to the best of our knowledge, with quite a few exceptions (Andrade & Ariely, 2009; Harlé & Sanfey, 2007; Valdesolo & DeSteno, 2006), potential roles of mood in JDM in emotion/deliberation dilemmas have been largely unexplored. This is unfortunate given the frequent occurrence of both such dilemmas and personal mood. The purpose of the current thesis is to explore whether and how mood may affect JDM when emotionally compelled and more deliberative, controlled judgements and decisions are in tension, by looking at the influence of mood on socio-economic decisions and moral judgements.

The central idea of this thesis is that positive mood would give rise to emotionally compelled judgements and decisions, whereas negative mood would give rise to more deliberative, cognitively controlled judgements and decisions. This hypothesis is built on the "affect-as-information" theoretical framework (Schwarz, 2000, 2002; Schwarz & Clore, 2003, 2007), according to which mood can influence processing strategy by providing information about the situation. Specifically, positive mood signals that the current situation is non-problematic and in turn encourages the use of a heuristic, top-down, reflexive processing strategy; in contrast, negative mood signals that the current situation is problematic and in turn encourages the use of a more systematic, bottom-up, reflective processing strategy (Clore et al., 2001; Isbell, 2004; Isbell, Burns, & Haar, 2005; Schwarz, 2000, 2002; Schwarz & Clore, 2007). As I will review later, a considerable amount of evidence has shown that moods affect JDM by exerting such processing effects. The rest of this chapter presents a general methodology of

[1]Emotion, so described, is treated as being caused by rapid, automatic rather than slow, deliberative processes. However, I do not intend to assert that emotions are evoked exclusively by automatic processing. I will discuss this further when clarifying the term emotion in Chapter 2.

studies in this thesis and an overview of the thesis structure.

It should be noted that dilemmas in this thesis, which I will introduce soon, were implemented in such a pattern that participants could take time to make judgements or decisions. This means there was neither time pressure nor any explicit requirement to ruminate on a problem, both of which, arguably, can interfere with mood effect on decision making in dilemmas. Dilemmas that in principle incorporate an emotion/deliberation tension sometimes allow no temporal space in real-life circumstances. Imagine that a small rescue troop has only one hour to save a large group while knowing that a few in the group have to be sacrificed. Under such circumstances, decision making should become highly goal-oriented. In other words, decision-relevant information is salient, which is a kind of condition wherein mood is not expected to affect decision making (Schwarz & Clore, 1987, 2007). Prolonging time may also interfere with a mood effect, as suggested by work on the cooling-off effect on emotion (e.g., Oechssler, Roider, & Schmitz, 2008). There is also evidence of the influence of temporal cost on economic decision making in social dilemmas (e.g., Smith & Silberberg, 2010). In brief, temporal factors related to dilemmas, although not studied in this thesis, could have the potential to interfere with mood effect on dilemma decision making.

In the present thesis, we adopted two experimental paradigms, namely, the "mini-ultimatum game" (Falk, Fehr, & Fischbacher, 2003) and the trolley-problem-like moral dilemma paradigm (Thomson, 1985), to represent emotion/deliberation dilemmas. To examine the hypothesised effect of mood, we conducted mood induction using the movie-watching (e.g., Gross & Levenson, 1995) or emotional-experience-writing techniques (e.g., Small & Lerner, 2008).

Regarding the two experimental paradigms, the mini-ultimatum game pertains to a socio-economic interaction between two people. The two players are faced with the task of splitting a certain amount of money, say, 10 tokens: one player (the proposer) first makes an offer by choosing from two already-set options and the other (the responder) decides to accept or reject the offer. In the case of acceptance, both players receive their shares, but in the case of rejection, both receive nothing. Importantly, in cases where both options available to the proposer are disadvantageous for the responder, e.g., 8 for the proposer and 2 for the responder (8:2), the mini-ultimatum game can incorporate an emotion/deliberation dilemma for the responder: Whereas the disadvantage inequality prompts a sense of seeming unfairness, a more objective, comprehensive processing of the situation would take into consideration the situational constraint on the proposer and the implied lack of unfair intention behind the offer. Thus, emotion- and reasoning-based decisions diverge in this scenario: An aversive emotion in response to the disadvantageous inequality would drive the decision of rejection, as a form

of punishment, whereas more deliberative, cognitively controlled processing would give rise to the decision to accept.

The moral dilemma paradigm can be illustrated by the trolley problem (Thomson, 1985), where saving five people comes at the cost of killing an innocent person. This scenario thus perceptually presents a dilemma between the welfare of the majority and that of the minority. We adopted a dual-process approach for moral judgement that was developed by Greene and his colleagues (Greene, Morelli, Lowenberg, Nystrom, & Cohen, 2008; Greene, Nystrom, Engell, Darley, & Cohen, 2004; Greene, Sommerville, Nystrom, Darley, & Cohen, 2001). The dual-process model posits that deontological/non-utilitarian choices (e.g., not killing the single person, resulting in five people dead) are driven by emotional distress in the face of harmful action, whereas utilitarian choices (e.g., saving the five while killing the one) are encouraged by more cognitively controlled processing (Greene et al., 2001, 2004, 2008). Thus, the moral dilemma setting and the mini-ultimatum game analogously incorporate emotion/deliberation tension.

The rest of the thesis proceeds as follows. Chapter 2 presents a literature review on the influence of affect on JDM; this discusses research on the role of emotion in JDM, on dual-process theoretical frameworks that differentiate between emotion-driven and cognitively controlled judgements and decisions in social preference contexts, and on the influence of mood on JDM. Chapter 3 describes an experiment that examined the thesis hypothesis by looking at the effect of negative mood on socio-economic decisions in the mini-ultimatum game (Study 1). Chapters 4 and 5 describe two experiments that explored the influences of positive and negative moods on moral judgement in the moral dilemma paradigm as described above (Studies 2 & 3). Chapter 6 discusses the empirical findings in relation to interplays between mood and dispositional and contextual factors, and to the influence of mood on the exertion of willpower and on processing scope. It then concludes with thoughts of practical implications and suggestions for future research.

Chapter 2

Literature Review

This chapter presents reviews of research demonstrating the influence of affect on JDM. For the purpose of this thesis, it focuses on two types of affect, emotion and mood. Section 2.1 provides definitions of key terms that are used in this line of research as well as the current thesis. Sections 2.2 and 2.3 review research illustrating an informative, guiding role of emotion in JDM; the latter focuses on "dual-process" perspectives that integrate emotional processing with slower, more deliberative processing. Section 2.4 presents how such dual-process models are employed in the social preference contexts that are our central interest. Section 2.5 introduces how moods impact evaluative judgement and information processing, and reviews studies suggesting mood affects reliance on emotional versus deliberative processing.

2.1 Definitions of key terms

Emotion In the current thesis, the definition of emotion adopts a "social-function" approach (Frijda, 1986, 2008; Lerner & Kelter, 2000; Parkinson, 1996, 1997). Specifically, *emotions* are defined as affective responses that represent stimuli with respect to well-being and give rise to certain behaviour (tendencies). Anger arises when perceiving injustice, and may provoke punishment; fear is felt in the presence of risk and leads to avoidance of potential harm. As such, the definition of emotion is consistent with appraisal theories of emotion, according to which emotions are consequent to appraisal processes that make stimuli be perceived with special meaning regarding value (Frijda, 1986; Lazarus, 1991).

Emotions discussed in this thesis are mostly pertaining to affective responses evoked more immediately than slowly upon confrontation of a JDM problem. This is because of the dilemma contexts of our primary interest, in which emotion is more like a "hot" response triggering an impulsive, affect-laden judgement or decision. However, as I noted earlier, this

is not intended to draw an unconditional link between emotion and immediate, automatic processing.

Appraisal theories of emotion have claimed that emotions, defined as affective responses to stimuli representing an organism-environment relationship with respect to wellbeing, can be proceded with both rapidly and slowly generated appraisals (Clore & Ortony, 2008; Ellsworth & Smith, 1988; Lazarus, 1991; LeDoux, 1998; Smith & Ellsworth, 1985; Zajonc, 1980). Giner-Sorolla (1999), in a chapter attempting to draw a distinction between what he calls "immediate affect" and "deliberative affect", also highlighted an inessential link between emotion and automaticity.

In particular, Giner-Sorolla argued that emotions, when characterised as being immediate, can be led by automatic appraisals of the current situation that is "deemed self-relevant" (e.g., anger triggered when a person is treated unfairly); or more directly, immediate emotions can be evoked through associations with previous emotional experience (e.g., fear upon seeing an image of snake; Giner-Sorolla, 1999). On the other hand, emotions are likely to arise through deliberative, relatively slower processes. Representative emotions of this kind include those led by self-regulation (Carver & Scheier, 1990, 1998; Giner-Sorolla, 1999). For example, a new, self-enforced vegetarian may deliberatively think of healthy/ethical issues regarding eating meat to overcome the craving, which then triggers disgust as an emotional outcome. It should be noted, though, such self-regulating emotions that are initially consequent on intentional control can evolve into immediate emotions (e.g., a long-term vegetarian feels disgust upon the perception of meat), as a result of the regulation being automatised after its frequent utilisation (Giner-Sorolla, 1999).

Mood In contrast to emotions, which in a more ordinary sense are "intense" and "short-lived" affective reactions to specific causal object (Forgas & George, 2001), *moods* refer to relatively less intense and long-lasting affective states for which the exact cause has become "diffuse" (Clore et al., 2001; Forgas, 2001). This contrast can be illustrated in ordinary language: a person points out that he is angry *with* someone at the moment but would express that he is *in* a bad mood after a while.

Affect In this thesis, *affect* is used as a general term for emotion and mood. But by definition, affect is a concept also covering lower-level driving states and visceral factors, such as pain and lust (Loewenstein, 1996; Loewenstein & O'Donoghue, 2007).

Integral affect, *Incidental affect* Affect can be classified as integral or incidental when considered with respect to its genuine relevance to the judgement or decision at hand (Loewenstein & Lerner, 2003; Rick & Loewenstein, 2008). *Integral affect* arises during the course of JDM (Rick & Loewenstein, 2008). A person who sees the stock he bought declin-

ing sharply in price may experience fear for future downturn and in turn decide to sell the present shares. In this example, fear is an integral affect, or, more specifically, an integral emotion, with respect to the stock investment decision. *Incidental affect* refers to affect that is experienced when making judgements or decisions but which is nevertheless "objectively" irrelevant to the task at hand (Rick & Loewenstein, 2008). In other words, incidental affect is embedded into the course of JDM due to a temporal proximation. According to this definition, mood is incidental affect.[2] Emotion can also be incidental affect when it is carried over to a subsequent instance that is unrelated to the one in which the emotion is elicited. Fear caused by watching a horror movie, for example, is an incidental emotion to the stock investment decision making.

2.2 Emotion as informational input in judgement and decision making

Classical theories of JDM, adopting a logic-based approach, assume that people behave constantly in a "rational" manner. By rationality, they mean that people make optimal choices on the basis of computational rules (see Baron, 2004 for an overview). These models are thus "consequential" in nature (Rick & Loewenstein, 2008, p. 138). For example, the expected utility theory (von Neumann & Morgenstern, 1947) assumes that people make choices by assessing both the desirability and likelihood of the outcome of option. Such "normative" models were soon criticised for unrealistic assumptions. Simon (1955), for example, compellingly emphasised that human rationality is "bounded" in that it is subject to people's motivations and capacity as well as information availability. While a great deal of research has advanced the bounded-rationality perspective (see Kahneman, Slovic, & Tversky, 1982), much of this research had not addressed the role of emotion in JDM until the role was highlighted by Damasio (1994). Scholars since have emphasised the importance of emotion with respect to JDM from an "informational input" perspective (Loewenstein, Weber, Hsee, & Welch, 2001).

Damasio (1994), for example, proposes a "somatic marker hypothesis", positing that decision are directed by emotional signals — "somatic markers". This hypothesis has been supported by neurological and behavioural studies. Bechara et al. (1997), for example, examined decisions in a gambling task among both normal participants and patients with damage in ventromedial prefrontal cortex (VMPFC; a region that functions in the process of encod-

[2]See Martin (2001) for an alternative standard upon which mood is thought to be relevant or irrelevant to JDM.

ing emotion; Damasio, 1994). The gambling task, known later as the Iowa Gambling Task (IGT; Pham, 2007), requires players to sample from four decks of cards. From each deck, clicking a card would result in a positive (gain) or negative (loss) monetary reward. Two decks of cards correspond to a larger payoff ($100) but also occasional, unpredictable, much larger losses, thus resulting in an ultimately net loss. These two decks are featured as the "disadvantageous decks". The other two decks correspond to a relative smaller payoff ($ 50) without randomly substantial loss, featured as the "advantageous decks". In Bechara et al.'s (1997) study, participants started sampling without being explicitly instructed about these traits, and had no knowledge of how many trials would be included. According to the somatic marker hypothesis, the VMPFC patients, due to their deficit in emotional processing, would be expected to behave worse than normal participants. This was exactly what Bechara et al. (1997) found. The results showed that both the normal participants and the VMPFC patients rapidly avoided the disadvantageous decks after receiving a substantial lose; however, the VMPFC patient went back to those decks much more quickly (revealed by the proportion of participants reaching the final stage defined by the researchers), resulting in a faster "bankruptcy" (Loewenstein et al., 2001).

Physiological data in the same study showed that both groups of participants did not generate galvanic skin conductance (GSC) before encountering the first huge loss. After the first occurrence of such penalty, whereas normal participants generated GSC right before they drew a card from the disadvantageous decks, the patients with prefrontal damage did not. This result was interpreted as patients with prefrontal damage appearing more inclined to the disadvantageous decks due to their incapability of encoding the feeling of fear that would otherwise be experienced when encountering a negative payoff. This finding is taken as evidence of the essential role of emotion as an informational input into decision making under risk (Bechara et al., 1997; Loewenstein et al., 2001; Loewenstein & O'Donoghue, 2007). In support of this emotion-signal notion , Peters and Slovic (2000) showed that participants who self-reported lower emotional reactivity were more likely to draw cards from the disadvantageous decks in the IGT; in contrast, those reporting higher emotional reactivity were more likely to draw cards from the advantageous decks. Similarly, Shiv et al. (2005) showed that patients with damage in emotional-processing associated regions were less risk-aversive than normal participants.

Very similar to the somatic marker hypothesis is the concept of "affect heuristic" proposed by Slovic et al. (2002), which highlights a guiding role of affect in JDM. The term *affect heuristic* is inherently related to the concept of heuristic introduced by Kahneman and collaborators, who proposed that one's judgement is "mediated" by heuristic when the person

assesses a judged object according to some attribute that "comes more readily to mind" than the attribute in question (Kahneman & Frederick, 2002). Central to the affect heuristic approach is that affect can be used as such a heuristic attribute. When affect refers to integral emotional reactions, the theorisation points out the role of emotion in JDM.

Evidence comes from research on risk perception. In exploring attributes contributing to lay people's risk perception, Slovic and other researchers identified one of the primary evaluative factors to be dread: the extent to which a hazard activity is perceived as risky is strongly associated with the degree to which it elicits a feeling of dread (e.g., Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978; Mullet, Duquesnoy, Raiff, Fahrasmane, & Namur, 1993; Peters & Slovie, 1996; Slovic, 1987). This finding suggests that people's assessment of a risky activity is, at least in part, determined by their emotional reaction towards the activity. Additional support is derived from the insensibility to change in probability; that is, relative to variation in consequence, changes in probability have a much smaller influence on final risk decisions (Loewenstein et al., 2001). This asymmetry is attributed to the inefficiency of a change in probability to elicit intensive emotional reactions. In support to this interpretation, Bankart and Elliott (1974) found that, whereas imaging receiving an electric shocks has an obvious effect on the level of arousal, being explicitly informed of the probability of receiving the shock did not show such an effect. Similarly, a more recent study by Weber and Hsee (1998) showed that participants' feeling of worry were independent of the probability of gain or loss associated with a risky investment (not reported by the authors, but statistical results were quoted in Loewenstein et al., 2001). Finally, the affect heuristic is also evidenced in other types of social decisions. For example, Kahneman and Ritov (1994) found that implicit emotional evaluation better explains willingness to pay for public goods than does " economic valuation". Similarly, Kahneman, Schkade, and Sunstein (1998) showed that jurors' punitive intent is strongly associated with the degree of outrage.

Summary Contemporary theorising emphasises an informational role fo emotion in JDM. Damasio's (1994) somatic marker hypothesis posits that emotions act as informational input indirectly by encoding consequences of alternative options. Similarly, Slovie et al. (2002) propose that emotion can be implemented to guide judgements and decisions by being used as an affective heuristic.

2.3 Incorporating emotion into dual-process models

The influence of emotion in JDM has been modelled using a dual-process approach that is widely accepted in contemporary psychology (e.g., Chaiken & Trope, 1999; Evans, 2008; Kahneman, 2003; Sloman, 1996, 2000). Dual-process models are embraced in many ways (see, e.g., Evans, 2008), but they all rely on the idea that there are two different types of processing responsible for people's behaviour (Kahneman & Frederick, 2002). Among different names proposed for these two types of cognitive operations, the generic labels are "System 1" and "System 2" (Stanovich & West, 2002; Sloman, 1996, 2002). System 1 is often characterised as being rapid, automatic, intuitive, heuristic and affectively compelling; System 2, by comparison, is often characterised as being slow, deliberative, analytic, systematic and reasoning-based (Evans, 2008). According to dual-process models, people's behaviour is a joint product of the two cognitive operations (Kahneman & Frederick, 2002).

In dual-process theories that explicitly or implicitly deal with emotional basis for human behaviour, the distinction between System 1 and System 2 is drawn between an affect-laden process and a colder, more deliberative process, whereby emotion is placed in the class of System 1 (e.g., Epstein, 1994; Lieberman, 2003; Loewentein et al., 2001; Loewenstein & O'Donoghue, 2007; Metcalfe & Mischel, 1999). Epstein (1994) , for example, distinguished an "experiential system" from a "rational system" with respect to informational processing. The experiential system is "intimately associated" with emotion, representing stimuli in an automatic and sensual manner. In contrast, the rational system is "relatively affect free", operating in a way consisten with logical rules.

Research in JDM, in a range of fields, proposes an idea that a hot, emotional and a colder, more deliberative process, often in conflict and working towards different outcomes, interact to form judgements and decisions (Loewenstein & O'Donoghue, 2007; Metcalfe & Mischel, 1999). For JDM under risk, for example, emotional reaction and cognitive evaluation appear to result in contrary outcomes, partly because they respond to different factors associated with focal objects (see Loewenstein et al., 2001). For example, as mentioned earlier, whereas cognitive evaluations consider both consequence and corresponding probability, emotional feelings are far less sensitive to probability than to consequence. As a result, a huge lottery win would not seem much different whether the probability is $1/10,000$ or $1/10,000,000$ (Loewenstein et al., 2001).

Another context in which emotional and cognitively controlled processes appear to operate in conflict is that of intertemporal choice; that is, choice among "alternatives whose costs and benefits are distributed over time" (Loewenstein, Rick, & Cohen, 2008), e.g., choosing between

a small immediate and a larger delayed reward. Relevant theorising suggests that emotion tends to stimulate short-term choices, whereas more deliberative, cognitively controlled processing gives rise to long-term choices (Loewenstein, 1996; Loewenstein & O'Donoghue, 2007; Metcalfe & Mischel, 1999). In support of this emotion/cognitive control distinction for intertemporal choice, McClure et al. (2004) showed that, whereas brain regions associated with higher cognitive functions (i.e., fronto-parietal regions) were activated (compared with a baseline measure) for both immediate and delayed payoffs, affect-associated regions (i.e., limbic and paralimbic cortical structures) were selectively activated when an immediate payoff was available. Further, a great activity in limbic regions than in fronto-parietal regions was predictive of the selection of small proximate rewards. In the same vein, Hariri et al. (2006) found that neural activity in the ventral striatum, an index of emotional reaction, was positively correlated with a tendency to pursue small, immediate rewards. These results suggest that, whereas emotional processing prefers present gain, deliberative processing seems to take both current and future value into consideration. Finally, the emotion/deliberation conflict is evidenced by the engagement of the anterior cingulate cortex (ACC), a conflict monitor area (Botvinick, Cohen, & Carter, 2004), during intertemporal choice tasks (McClure et al., 2004; Pine et al., 2009).

Most relevant to our purpose are emotion/deliberation conflicts in social preference contexts. For the two experimental paradigms used in this thesis, i.e., the mini-ultimatum game and the moral dilemma paradigm, research in three domains is of importance, namely, socio-economic decision making, negotiation and moral judgement. As we will see below, judgements or decisions in the three domains, similar to those in the intertemporal-choice context, involve disagreement between emotional and more cognitively controlled responses. But, different from judgements or decisions in the intertemporal-choice context, those in the social preference contexts are not only self-related but also other-regarding. Given the importance of theses contexts in relation to our research, a review of relevant literature appears separately in the following section.

2.4 Emotion/deliberation conflicts in social judgement and decision making

2.4.1 Socio-economic decision making

The consequentialist assumption of classical decision making theories was primarily developed by early economic scholars, who saw the human being as a cold-minded creature that

constantly maintains the goal of utility maximisation, and even bounded utility to material gain (see von Neumann & Morgenstern, 1947). According to the standard view, people will always make decisions in order to achieve the greatest material benefit. However, not only does everyday life exhibit a different scene, e.g., many people are willing to do volunteer work, but research in recent decades also provides evidence violating the material maximisation hypothesis. An indication is that people not only care for self-centred material gain but also carry a strong sense of fairness.

2.4.1.1 The "ultimatum game" and concern for fairness

Highly representative data come from studies using the "ultimatum game" (UG; Güth, Schmittberger, & Schwarze, 1982). The UG is an economic game in which two players, who are anonymous to each other, are dividing an amount of money. One player, called the proposer, is in the position of deciding the division. The other, called the responder, has the right to accept or reject his opponent's offer. In the case of acceptance, both sides collect their shares as divided by the proposer, whereas in the case of rejection both sides receive nothing. The UG is quite simple and often played only once between the two players. Since there is no straightforward interaction between the players, the standard economic model would predict self-interested behaviours for both of them. That is, the proposer should always offer the least amount and the responder should accept any offer. However, results from the initial study by Güth et al. (1982) clearly violated this standard solution: proposers offered 40% of the original pie on average, and most responder rejected offers of 20% (i.e., an 8:2 offer, with 8 for the proposer and 2 for the responder) or less. This result pattern is widely replicated (see Camerer, 2003), even when the original stake is as large as one month's wages (Cameron, 1999). Such an ultimate rejection of an unequal offer is taken as an indication of people's concern of fairness (Camerer, 2003).

2.4.1.2 Relativity of fairness

Speaking of fairness leads quite naturally to a more complex question: we mind not only ostensible unfairness, but also why perceived unfairness occurs in the first place (Camerer, 2003). There is plentiful evidence that causes for inequality play an essential role in societal economic decision making. For example, it is evident that the responder rejects stingy allocations less when the proposer is under "competitive pressure" (e.g., obliged to be financially competent to keep playing in a multi-trial UG; Schotter, Weiss, & Zapater, 1996). In a similar vein, it is repeated found that unfair offers are more likely to be accepted when they are

generated by a random device (e.g., computer) instead of a human proposer (e.g., Blount, 1995; Rilling, Sanfey, Aronson, Nystrom, & Cohen, 2004; Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003; van't Wout, Kahn, Sanfey, & Aleman, 2006). In parallel, some studies show that unfair offers are less often rejected when options of monetary division are constrained for the proposer (Falk et al., 2003; Sutter, 2007). As illustrated by these findings, unfair offers are more likely to be accepted when the proposer has some plausible excuse, when the offer are not deliberatively issued, or when the proposer does not have total control over the allocation (Camerer, 2003) — in brief, when the offers are justifiable. Thus, fairness interpretation is not entirely governed by the distribution of an outcome, but rather is context-dependent and sensitive to the cause of the outcome.

2.4.1.3 Incorporating fairness and emotion into behavioural economic models

To account for the above observations, theoretical models eventually incorporate the idea of fairness. These models can be classified into two types. One type of models are *inequity aversion* models that have a special emphasis on outcome (Bolton & Ockenfels, 2000; Fehr & Schmidt, 1999). The core idea of inequity aversion models is that people's punishing behaviour, e.g., rejection of unfair offers in the UG, is motivated to counter inequity in outcome. Fehr and Schmidt (1999), for example, define inequity aversion as an individual's dislike of the difference in payoff between himself and the others. They further argued that people are more aversive to negative inequity (i.e., own payoff is less than others') compared to positive inequity (i.e., own payoff is more than others'). Another type of models are *reciprocity* models that, beyond the outcome-focus line, emphasises the role of intention behind a decision. Differently from inequity aversion models, reciprocity models define fairness as self-centred reciprocity (e.g., Rabin, 1993). That is, people respond to deliberative kindness with kindness (positive reciprocity), and deliberative unkindness with unkindness (negative reciprocity; Rabin, 1993). Thus, inequity aversion models suggest that one's utility is affected by the difference between one's own and a counterpart's payoff, whereas reciprocity models suggest that one's utility is affected by one's perception of an opponent's motive.The latter then seem to better explain the foregoing findings that show the effect of manipulating circumstances under which the proposer makes an offer. Nevertheless, in both types of models, and more explicitly in the reciprocity-based one, emotion is regarded as an incentive for people to behave in a way that counters short-term material benefit. Thereby, emotion is included into the idea of utility and ultimately involved in shaping people's decisions in economic strategic interactions.

2.4.1.4 An emotion/deliberation conflict in the UG

A body of UG literature provides evidence that rejection of a perceived unfair offer is emotion-evoked, whereas accepting the offer — the rational choice from the standard perspective — is subject to cognitive control. An early study by Pillutla & Murnighan (1996) showed that self-reported anger felt by a responder in response to an offer as correlated with the degree to which he perceived the offer as unfair. Further, the degree of anger was more predictive of the final rejection than was the degree of perceived unfairness. This, consistent with the idea that decision making is guided by emotion (Damasio, 1994), leads to the idea that a person's negative emotion in response to an unfair offer drives him to make a financially sacrifice in order to punish the opponent (Sanfey & Chang, 2008). In support of this notion, O'Connor et al. (2002) showed that responders characterised their rejections in the UG as "hot-headed", "impulsive", but regarded acceptance as "cold-headed", "thoughtful".

Additional evidence comes from a set of brain imaging studies. In Sanfey et al.'s (2003) study using the functional magnetic resonance imaging (fMRI) technique, participants playing the responder were scanned while receiving fair and unfair offers from human proposers or as a result of allocation by the computer. One brain region showing great activation for the comparison between fair and unfair offers was the anterior insula (AI), an area found to be selectively implemented into negative emotion, such as anger and disgust (e.g., Phan, Wager, Taylor, & Liberzon, 2004; Phillips et al., 1997). The results from Sanfey et al.'s study showed that the activity in the AI was greater in response to unfair than fair offers, and in response to unfair offers from human proposers than those from computers, suggesting a stronger aversive emotional response to deliberative than non-deliberative offense (Sanfey & Chang, 2008). Moreover, the AI was sensitive to the unfairness degree of an offer (e.g., activation in AI was greater for a 9:1 offer than an 8:2 offer), and notably, its activation was predictive of final rejection of an unfair offer. Thus, the insula findings suggest not only an association of negative emotion with perception of unfairness, but also with final punishment.

Another region among those showing greatest activities for the fair/unfair offers comparison was the right dorsolateral prefrontal cortex (DLPFC), an area typically involved in cognitive control (Miller & Cohen, 2001). An important result with respect to the right DLPFC is that its relative activation to the AI in response to an unfair offer was associated with the final decision to the offer. Specifically, an unfair offer was rejected when activation in the AI was greater than that in the right DLPFC; in contrast, an unfair offer was accepted when activation in the right DLPFC was greater than that in the AI. This result hints at dissociation between emotion-based and deliberative decisions within economic strategic

interactions.

A set of subsequent studies also revealed the link between cognitive control and acceptance of unfair offers, or the link between emotion and the rejection of unfair offers. van't Wout et al. (2005) ran a study in which participants played the UG under two conditions. In one condition participants received repetitive transcranial magnetic stimulation (rTMS) over the right DLPFC, facilitating the right DLPFC; in the other condition they did not receive the stimulation (the "sham" condition). The authors hypothesised that facilitating the DLPFC would increase the acceptance of unfair offers. This was exactly what they found. Moreover, the results showed that for ultimately rejected unfair offers, response time was significantly higher in the rTMS than in the sham condition. Thus, the facilitation of the right DLPFC makes it more difficult to reject an unfair offer, which gives rise to the likelihood of acceptance.[3]

In another study, van't Wout et al. (2006) replicated Sanfey et al.'s (2003) design and used skin conductance (SC) as a relatively direct measure of emotional response. Likewise, the authors found that the level of SC was higher in response to unfair than fair offers, and that SC level was predictive of rejection of unfair offers. Koenigs and Tranel (2007), using a lesion method, provided evidence for a causal relationship between emotion and the decision of rejection. Specifically, they found that patients with bilateral damage in the ventromedial prefrontal cortex (VMPC), as compared to ordinary participants, were more severe in response to unfair offers. Earlier clinical work has associated VMPC damage with a deficit in regulation of emotion, especially for emotions provoked under somehow "frustrating" circumstances, for example, anger and irritation (Anderson, Barrash, Bechara, & Tranel, 2006; Barrash, Tranel, & Anderson, 2000). Thus, the more "irrational" decisions by the VMPC patients (Koenigs & Tranel, 2007) can be taken as evidence for the idea that aversive emotion elicited by offensive offers "spoils" the ultimate rejection (Frith & Singer, 2008).

[3]Evidence from rTMS studies is mixed in this regard. According to van't Wout et al.'s (2005) findings, deactivating the right DLPFC should result in fewer acceptances of unfair offers. Contrary to this prediction, Knoch et al. (2006) found that "disrupting" the right DLPFC by rTMS increased the likelihood of unfair offers to be accepted. Moreover, although participants receiving rTMS over (and thus deactivating) the right DLPFC were more likely to accept unfair offers than their counterparts receiving rTMS over the left DLPFC or those receiving a sham stimulation, their judged degree of the unfairness of the offers was no lower than the latter two groups. The authors thus concluded that the right DLPFC functions to overwhelm one's impulsive response by material-gain-focused self-interest rather than that by fairness consideration, which is in contrast to what Sanfey et al. (2003) proposed. However, it should be noted that the effect of rTMS needs to be explained with caution. This is due to the limitation of the rTMS technique, e.g., a limited "ability to spatially localize the stimulation" (Sanfey & Chang, 2008; van't Wout et al., 2005) and the simultaneous simulation of non-targeted regions (Loewenstein et al., 2008).

Summary In sum, a large set of UG literature demonstrates that people have a strong sense of fairness even at a financial cost. The idea of fairness is then incorporated into recent behavioural economic models, in which fairness is defined in terms of inequity aversion or reciprocity. Both types of models imply the involvement of emotion in socio-economic decision making, with the latter making it more explicit. A body of evidence, largely from neurological research, exhibits an emotion/deliberation conflict in UG decision making by showing that rejecting unfair offers in the UG is triggered by negative emotion (e.g., anger) in response to the unfavourable stimuli, whereas accepting unfair offers is encouraged by cognitive control that can overcome the tempered response.

2.4.2 Negotiation

Psychology research on negotiation is closely related to behavioural economic research, in which negotiation is more routinely called "bargaining" (see Camerer, 2003). The UG described above, for example, can be seen as a negotiation in a take-it-or-leave manner.

2.4.2.1 The "self-serving" bias in perception of fairness

Fairness perception is crucial for forming the outcome of negotiation (Leung, Tong, & Ho, 2004). Research shows that negotiators often perform a "self- serving" evaluation of fairness (e.g., Babcock, Loewenstein, & Issacharoff, 1997; Babcock, Loewenstein, Issacharoff, & Camerer, 1995; Loewenstein, Issacharoff, Camerer, & Babcock, 1993; Thompson & Loewenstein, 1992). That is, when faced with two standards, an individual is inclined to the one serving his interest better (Xiao & Bicchieri, 2010). This leads to the self-serving bias in fairness perception such that when there is disagreement between disputants, each party confounds what is fair with what is beneficial for himself (Babcock & Loewenstein, 1997). This self-serving bias has been shown to be disruptive to negotiations (Knez & Camerer, 1995; Messick & Sentis, 1979; Thompson & Loewenstein, 1992).

In an early study, Messick and Sentis (1979) told participants that they and another person had supposedly independently worked on the same task. The design of this study involved two conditions: in one condition, participants were told they spent 10 hours completing the task and the other had spent 7 hours; in the other condition, this time-input information was reversed. The results showed that when participants were paid \$25 for their own 7-hour work, they indicated that a fair payment to the other who spent 10 hours would be \$30.29 on average. However, when participants were told that the other person was paid \$25 for 7 hours' work, they thought they should be paid \$35.24. This \$4.95 $(35.24 - 30.29)$ difference

was taken as evidence of an "egocentric" evaluation of fairness (Messick & Sentis, 1979).

In a similar vein, Knez and Camerer (1995) showed that multiple "focal points" created in a UG increased the likelihood of rejection. A focal point refers to a standout solution to a coordination problem or bargaining process (Schelling, 1960; Thompson & Loewenstein, 1992). For example, in a one-shot standard UG as mentioned above, an equal split is one focal point. Knez and Camerer modified the standard UG by replacing the neither-win result from rejection with an "outside option": \$3 for the responder and \$2 for the proposer (the original pie was \$10). This outside option led to three focal points: the equal-split one (i.e., \$5:\$5), an offer making the responder earn at least more than the outside payoff (e.g., \$3.5 for the responder), and an offer making both sides earn equally more than their outside payoff (i.e., \$5.5 for the responder and \$4.5 for the proposer). The result exhibited a markedly higher rate of rejection in this modified UG than the standard UG (50% vs. ~10-15%). This increased discrepancy is indicative of the egocentric assessment of fairness: whereas proposers thought \$5 and such offers as \$3.5 were fair enough, responders would be most likely to overweight the \$5.5 offer (Camerer, 2003).

Thompson and Loewenstein (1992) also demonstrated the self-serving bias in fairness perception with discrepancy in expected wages between union and board members, showing that each side had a better recall for information favouring themselves. Along the same line, Babcock and collaborators demonstrated the self-serving bias in a court-trial scenario where participants were paired and assigned the role of plaintiff or defendant (Babcock et al., 1995, 1997; Loewenstein et al., 1993; see Babcock & Loewenstein, 1997, for a review). In such a setting, the two sides were required to achieve a settlement as to the compensation to the plaintiff within 30 minutes; delay or failure would be financially costly. The researchers found that plaintiffs both indicated a higher settlement price than did defendants, and had a higher estimation of a judge's decision than defendants (Babcock et al., 1995, 1997; Loewenstein et al., 1993). In addition, each side overweighted arguments favouring their own position (Babcock et al., 1995). Moreover, Babcock et al. (1995) showed that a successful settlement was much more likely when participants were informed of their role after assessing the case, as compared to before doing it. This finding further suggests a causal link between the self-serving bias and impasse.

2.4.2.2 The mini-ultimatum game

One paradigm we employed in this thesis is the "mini-ultimatum game" (mini-UG; Falk et al., 2013), which is an adapted version of the UG. In a mini-UG, a proposer can only choose from

two already-set offers instead of making any offer freely as in the UG. Table 2.1 presents the four games used in Falk et al.'s and their experimental results (to avoid confusion, hereafter we call it the mini-UG when referring to the paradigm, and game when referring to a single interaction between two players). Each game included two options of dividing 10 monetary points between the proposer and responder. One option (Option 1) was an 8:2 offer, keeping eight points for the proposer and offering two points to the responder. This option was included in all four games. The other option (Option 2) varied across games. Each game was named according to the alternative option (shown in Column 1). Proportions of 8:2 offers rejected in the four games are shown in the rightmost column of Table 2.1.

An important feature of the mini-UG is that evaluation of the same ostensibly unfair offer can be different, depending on the alternative option paring it. An 8:2 offer in the Fair game is indisputably unfair given the availability of a fair offer. But it could be somewhat understandable in the Hyper-fair game, since no one wants to be the victim. The same move is completely compulsory in the No-alternative game and is even optimal in the Hyper-unfair game. In short, the *intention* [4] behind an 8:2 offer is evaluated differently (Camerer, 2003; Falk et al., 2003). Consistent with this notion, Falk et al. (2003) showed that the rejection rate of an 8:2 offer was higher in the Fair game than in the other three games.

With respect to rejection, two different motives are possible among the four games: inequality aversion and negative reciprocity. The former is purely outcome-based whereas the latter considers intention. The positive value of rejection rate in the No-alternative game revealed an inequality aversion motive. For the Fair and Hyper-fair games, both motives are possibly included, although the degree of negative reciprocity can be lower in the Hyper-fair game than in the Fair game. The fact that 8:2 offers were more likely to be rejected in these two games than in the No-alternative game provides support for the inclusion of the negative reciprocity. There are mixed motives in the Hyper-unfair game as, on the one hand, the inequality aversion motive gives rise to rejection, while on the other hand, positive reciprocity

[4]Intention in the mini-UG is defined from a strategy perspective. That is, a proposer's motive is inferred based on the strategic space he allowed. A chosen offer can be reasonable or not, depending on the alternative. Thus, in the mini-UG, saying that a proposer has good or bad intentions when making an 8:2 offer is justifiable or indefensible. This way of inferring intention is not the same as the way we infer intentions when a person has "free will" (Stanca, Bruni, & Corazzini, 2009). The effect of the latter kind of intention on reciprocity behaviour, as reviewed earlier, is evidenced by greater acceptance of unfair offers when they result from a computer's random than a human proposer's allocation (Blount, 1995; Rilling et al., 2004; Sanfey et al., 2003; van't Wout et al., 2006). Presumably, the free-will-based path draws more heavily on agency, and the other path draws more heavily on situational constraints. To avoid confusion, hereafter we refer to *intentionality* when speaking of the former inferential path, and *intention* when speaking of the latter.

Table 2.1: Mini-UG used by Falk et al. (2013).

Game	Option 1	Option 2	8:2 offers rejected
Fair	8:2	5:5	44%
Hyper-fair	8:2	2:8	27%
No-alternative	8:2	8:2	18%
Hyper-unfair	8:2	10:0	9%

gives rise to acceptance. Falk et al. (2003) found that the rejection rate was indistinguishable between the Hyper-Fair and No-alternative games, suggesting that rejection in the former is also caused by inequality aversion.

Acceptance of 8:2 offers can also be caused by two motives: monetary self-interest (i.e., maximising monetary gain) and positive reciprocity. In theory, self-interest should entirely determine acceptance in the Fair game and to a less extent contribute to acceptance in other games. In the Hyper-unfair game, positive reciprocity may also have been involved.

The current thesis makes an extension by contending that the rejection in contexts like the above 8:2/10:0 condition is a manifestation of the self-serving mannered perception of fairness. In such a context, fairness assessment based on the outcome, and that taking situational forces into consideration, are in tension. The former is self-serving or egocentric because it only cares for the distributive disadvantage. It thus leads to aversion, and the decision based on it is emotion- loaded. In contrast, the context-minded assessment of fairness is more objective, giving rise to a more reasoning-based decision. Following this rationale, we propose that the contrast between the egocentric bias and the situational ascription is a form of dissociation between emotion and cognition. That is, a person's self-serving biased perception of unfairness is associated with a negative emotion arising from unfavourable offers. The negative emotion can be anger when the opponent is fully responsible for his offensiveness, as suggested by UG studies; or, it can be discomfort or frustration in cases where the other party does not have complete control. In contrast, taking account of external constraints on the opponent's choice is a cognitively controlled process.

This perspective is highly related to theories mapping the contrast between self-serving behaviour and corresponding adjustment onto that between automatic and controlled processing. For example, Messick & Sentis (1979) claimed that preference comes first whereas assessment of fairness may come at a later step. Related to this, Epley and Caruso (2004) suggested that self-biased understanding of an event is automatic, but correction for it requires additional effort. Similarly, Moore and Loewenstein (2004) and Lowenstein and O'Donoghue (2007) alike proposed that self-protective interest comes automatically and is often emotionally compelled,

whereas consideration of fairness needs to be evoked by more controlled processing.

In addition to these theoretical positions, three lines of empirical work lend support to the proposition that the egocentric biased perception of unfairness is associated with negative emotion whereas assessment of external force requires cognitively controlled processing. These include: (1) research on emotion and fairness perception in negotiation (e.g., Hegtvedt & Killian, 1999; O'Connor & Arnold, 2001); (2) research on de-biasing technique aimed at the egocentric assessment of fairness (e.g., Babcock et al., 1995); and (3) research on the "correspondence bias" in attribution (e.g., Gilbert & Malone, 1995; Gilbert, Pelham, & Krull, 1988; Jones & Harris, 1967; Lupfer, Clark, & Hutcherson, 1988).

2.4.2.3 Research on emotion and fairness perception in negotiation

As seen from the UG literature, perception of unfairness is associated with negative emotion, such as anger. The more one sees an offer as unfair, the more likely that feels angry in response to it and rejects it. This source of evidence provides partial support for the notion that egocentric perception of unfairness is related to negative emotion. More convincing evidence comes from a recent study by Guroglu et al. (2010), who examined neural correlates of the responder's decision in the mini-ultimatum game. Because the No-alternative game includes two identical highly unfair offers (i.e., 8:2), it makes the unfair offer purely result from an external force on the proposer. The brain imaging data showed that the decision of rejection in this mini-UG, as compared to that of acceptance, was associated with greater activity in the AI. Guroglu et al. (2010) took this result as support for the notion that a rejection showed greater activity in the AI because it signalled a violation of social norm (i.e., in the No-alternative situation, accepting the offer complies with a reciprocity-based social norm, while rejecting it violates it). However, given that the AI is especially activated when experiencing negative emotions such as anger and disgust (e.g., Phan et al., 2004; Phillips et al., 1997), the result of Guroglu et al.'s (2010) research is plausibly suggestive of an emotional drive to reject an objectively acceptable but subjectively disadvantageous offer.

Additional evidence comes from a study by Hegtvedt and Killian (1999), who used a more natural negotiation paradigm (i.e., bargaining is instigated by disagreement in initial offers). In this study, participants worked in pairs on a task of solving five-letter anagrams within 15 minutes (though ostensibly they were told to be working in a three-member group, which is aimed to mimic real life multi-member groups in negotiation). Each group was paid according to its overall performance that was assessed by summing up the performance of each member, who performed at a different level. Participants then reached a settlement through negotia-

tion on how to divide the group's earnings. Once a settlement was achieved, the experimenter measured (by questionnaire), among others items, participants' negative emotional experience (i.e., how much they felt, e.g., angry, agitated and resentful) and their perception of the fairness of the final division for themselves and for their partners. One important result was that whereas perception of unfairness regarding the earning of self reliably predicted intensity of negative emotion, that regarding the earnings of others had no relationship with emotional experience. This finding implies that, whereas perception of self-regarding unfairness is emotion-laden, a more comprehensive evaluation, such as the perception of other-regarding unfairness, has no additional effect on emotional experience. It thus suggests an association between the egocentric assessment of fairness and emotional reaction.

2.4.2.4 Research on de-biasing technique for the self-serving bias

Few published work exploring de-biasing technique provides an insight that situational ascription can attenuate the self-serving bias in fairness assessment. Babcock et al. (1997) found that asking participants to reflect on their own weakness eliminated the otherwise systematic discrepancy between plaintiffs and defendants. While not explicitly tested, it is plausible that the self-questioning reflection involves inspection of external factors, making the opponent defendable. Another line of (indirect) evidence comes from a study by Leung et al. (2004), which showed that situational ascription attenuated perceived interpersonal injustice. Interpersonal injustice is the opposite of interpersonal justice, which refers to fairness at the level of "interpersonal treatment" (Leung et al., 2004; Colquitt, 2001). That is, one perceives interpersonal justice when e.g., the opponent expresses willingness to listen and provide explanations if requested, and shows understanding (Leung et al., 2004), whereas one perceives interpersonal injustice when the opposite behaviour is shown. Interpersonal justice has been suggested as an "interactional" aspect of distributive fairness by directing people's response to the final outcome (Greenberg, 1993). There is also evidence that the two sub-categories of fairness are positively correlated (Colquitt, 2001). Thus, although Leung et al.'s work does not directly test for the effect of situational ascription on the self-biased perception of fairness, it does suggest that situational attribution should reduce the egocentric bias in fairness perception.

2.4.2.5 Research on the "correspondence bias" in attribution

Research on causal attribution indicates that when assigning attribution for an actor's behaviour, people tend to overweight internal factors and underestimate the effect of external factors (Gilbert & Malone, 1995; Ross, 1977). Researchers refer to this systematic tendency

as the "fundamental attribution error" (Ross, 1977) or the "correspondence bias" (Gilbert & Malone, 1995). Given that it is debatable whether the tendency qualifies as a fundamental error (see, e.g., Harvey, Town, & Yarkin, 1981), the latter label is used here.

The correspondence bias is illustrated particularly well by the observation that people attribute an actor's behaviour to his predisposition in the presence of a situational force or an environmentally induced disadvantage to the behaviour. In a now classic study, Jones and Harris (1967) found that participants inferred a pro- or anti-Castro (ex-president of Cuba) attitude of a hypothetical essayist from an essay supporting or not supporting Castro; and this happened whether the essayist was under the guidance of his debate coach or was free from influence. Similarly, Ross, Amabile, and Steinmetz (1977) showed that participants rated their own level of general knowledge according to their performance in answering a inconclusive questionnaire — a questionnaire created by a "questioner" who purposely involved items that were based on his own general knowledge and that were expected to be very unlikely to be solved. Such a questionnaire was not representative of a commonly accepted test of general knowledge because it was prepared using individual-specific expertise. However, although contestants in Ross et al.'s study were informed of this limitation, they still attributed their performance to personal capacity.

A bias-then-correction interpretation Some researchers suggested that the correspondence bias is due to people's unawareness of external factors (e.g., McArthur & Baron, 1983). However, it is found that people still draw overly dispositional inferences even when they are aware of situational forces (e.g., Quattrone, 1982). In a related vein, research suggests that people often attribute behaviour to traits in an automatic, intentional manner (e.g., Lupfer et al., 1990; Winter & Uleman, 1984; Winter, Uleman, & Cunniff, 1985; but see Bassili & Smith, 1986). Drawing on these findings, Gilbert, Pelham, and Krull (1988) proposed a framework according to which people make dispositional attributions spontaneously when explaining others' behaviour; only after this step may they correct for the initial judgement by assessing external factors that may also contribute to the observed behaviour. When this correction is absent or attenuated, the tendency for people to draw dispositional inferences would be stronger.

Gilbert et al. (1988) demonstrated this notion in a cognitive-load study, in which participants watched via video a woman who looked very nervous when talking with a stranger (Experiment 1). Participants knew from subtitles that the conversation was about the woman's hobbies (neutral topic) or sexual activity (anxiety-evoking topic). Some participants watched the video whilst being required to remember some word strings and were thus cognitively loaded (cognitively loaded participants); and some participants did not receive this manip-

ulation (control participants). The results showed that whereas control participants judged the woman as less characteristically anxious when the topic was about personal hobbies than when it was about sexual activity, cognitively loaded participants did not differentially rate the woman as characteristically anxious for the two topics. A similar result was obtained in the follow-up study that ruled out an artifactual explanation that cognitively loaded participants were too busy remembering the words to attend to the subtitles (see, Gilbert et al., 1988; Experiment 2). In support of the correction model, Lupfer et al. (1990) showed that, whereas the facilitating effect of dispositional information on recall of trait was independent of cognitive busyness, that of situational informational on situation-relevant recall was interfered with when cognitive capacity was limited.

Summary We proposed that when egocentric, payoff-distribution-based decisions and more objective, situation-considered decisions are in conflict, the former are emotionally compelled whereas the latter are subject to cognitive control. Three lines of research provide support to this proposition. First, research on emotion and fairness perception suggests that the self-serving bias in fairness assessment is closely related to emotional reaction such that egocentric perception of unfairness is associated with negative emotion (e.g., anger and resentfulness). Second, research on de-biasing technique for the self-serving bias suggests that situational ascription can reduce the bias in fairness perception. Finally, research on attribution demonstrates situational ascription is subject to controlled processing that enables the correction for the correspondence bias.

2.4.3 Moral judgement

Like the classical view of economic decision making, the tradition of moral psychology also took a rationalist perspective, proposing that people base their moral judgements chiefly on reasoning by which they reach arguments supporting their judgements (see Kurtines & Gewirtz, 1991). From this perspective, making a moral judgement is a conscious process of analysis (Kohlberg, 1981). Thus, one would not disapprove of a morally relevant decision or behaviour until opposing arguments are made apparent (Haidt, 2001).

Moral psychologists of the rationalist school often make reference to the observation that people provide justifications for their moral judgements in a judgement-consistent fashion (see Kurtines & Gewirtz, 1991). For example, people who judge abortion as wrong quote harmful instances consequent to abortion, whereas those who do not disapprove of abortion quote harmless consequences (Turiel, Hildebrandt, & Wainryb, 1991). However, this approach has

been criticised as being invalid to draw a causal arrow from reasoning to moral judgement (e.g., Haidt, Koller, & Dias, 1993). A concurrence of judgement and evaluative reasoning is no more than a correlation. Thus, it is equally plausible to say that one's quoted reasons are prompted by one's manifest judgement; for example, a "gut feeling" that abortion is just not right gives consideration to reasons defending this proposition (Haidt, 2001).

2.4.3.1 The social intuitionist model

Haidt (2001), by extension, proposed what he called the social intuitionist model (SIM), according to which moral judgements are mainly driven by moral intuition rather than reasoning. In the SIM, moral intuition is defined as a process producing an immediate moral judgement "without any conscious awareness" of having searched through inferential steps that lead to the judgement; reasoning is by contrast a process that runs in a slow, cognitively controlled, accessible and intentional pattern. Building on Zajonc's (1980) demonstration that affective evaluations occur speedily and prevalently, Haidt (2001) explicitly states that moral intuition includes affective valence, i.e., a positive/negative evaluation; it can be a judgement of, for example, good/bad, like/dislike, or appropriate/inappropriate.

Support for this perspective comes (partly) from a series of studies by Haidt and colleagues. Haidt et al. (1993) conducted one study in which participants made judgements on "offensive" yet "harmless" morally relevant activities (e.g., a woman used a national flag to wash a home toilet; a family ate their own dog that was already dead). While not causing objective harm, these activities are "affectively loaded" (Haidt et al., 1993). One important finding from this study is that a participant's aversive emotional response to an activity (i.e., the extent to which he would be "bothered" to watch it) predicted his moral judgement (i.e., whether the activity was wrong) better than did the participant's evaluation of consequential harmfulness. Haidt and Hersh (2001) obtained a similar result regarding moral judgement on sexual morality issues (e.g., insect). Moreover, this latter study showed that participants often failed to provide explanations for their moral judgements, challenging Kolhberg's (1971) claim that people are often capable of articulating reasons for their moral choices. As Haidt et al. (2000) observed, participants were "morally dumbfounded"; that is, they were themselves astonished by their inability to explain their own judgements. In brief, these studies suggest that people's moral judgements emerge as a result of moral intuition that comes in the form of emotion, instead of an analytic, reasoning-focus process.

Note that SIM does not entirely deny the role of reasoning in forming moral judgements but accounts it to be limited. Specifically, the SIM posits that the causal link from reasoning

to moral judgement is rare and that reasoning is mostly established according to already-expressed opinions. As Haidt (2001) states, it happens more often to a certain population, such as philosophers, who have been trained to engage in analysis and habitually rely on reasoning-based conclusions. However, most of the time, reasoning comes after, and forms justifications for, already-stated moral judgements. The fact that such justifications are post hoc raises the problem that they are possibly arguments for which people search to support their voiced opinions, rather than real causes for their judgements. This is consistent with the argumentative theory (Mercier & Sperber, 2011), according to which people's everyday reasoning is strongly intended to defend their standpoints. Thus, when pressed to explain why they report what they report, people probably search for plausible points that are nevertheless not the real reasons (Haidt, 2001; Nisbett & Wilson, 1977).

2.4.3.2 A dual-process model for moral judgement

Although the SIM is influential in framing emotion into the process of making moral judgements, it is criticised for overemphasising the role of emotion as a form of moral intuition and understating the role of reasoning in making moral judgements (see Paxton & Greene, 2010). There is now mainstream acceptance of a "dual-process" model for moral judgement, according to which both an intuitive, automatic, often emotionally impulsive process and an analytic, deliberate, more cognitively controlled process are involved in making moral judgements (Cushman, Young, & Hauser, 2006; Greene et al., 2001, 2004, 2008; Valdesolo & DeSteno, 2008). Thus, the dual-process model is a synthesised form of the traditional rationalist and modern intuitionist accounts (Greene et al., 2008).

The "trolley problem" The dual-process model for moral judgement is primarily developed by Greene et al. (2001, 2004, 2008) using hypothetical moral dilemmas characterised by tension between group and individual well-being. This can be exemplified by the "trolley problem" (Thomson, 1985). The trolley problem has two versions. One is called the switch dilemma and the other the footbridge dilemma. In both dilemmas, a trolley is heading towards five workmen who will be killed if the trolley is not stopped in time. In the switch dilemma, one can save those workmen only by pressing a switch to divert the trolley onto another track where one workman will be killed. In the footbridge dilemma, one can save the five workmen only by pushing a giant person off a footbridge and onto the track to stop the trolley, killing the huge person. In both versions, a dilemma is posited: either sacrificing one to save another five, or protecting an innocent despite five deaths. If one approves of sacrificing one to save five, the person's solution is referred to as a "utilitarian" judgement; disapproving of this

solution is referred to as a "non-utilitarian" or "deontological" judgement (Greene et al., 2001, 2008). It is widely found that people are more likely to provide a utilitarian judgement in the switch dilemma than in the footbridge dilemma (e.g., Cushman et al., 2006; Greene et al., 2001; Moore, Clark, & Kane, 2008; Petrinovich, O'Neill, & Jorgensen, 1993).

A personal/impersonal distinction To explain this finding, Greene et al. (2001) proposed, from a psychological perspective, that the difference in moral judgement is a result of the difference in the extent to which individuals are engaged in "emotional processing". Specifically, whereas the killing in the switch dilemma stems from "deflecting an existing threat" (Greene, 2009), in the footbridge dilemma it appears to be more personally involved. Due to this difference in vividness with which the hostility is imaged, the footbridge dilemma elicits a more negative emotion than does the switch dilemma. As a result, people are less likely to make a utilitarian judgement in the former dilemma than in the latter. Building on this rationale, Greene et al. (2001) raised a "personal/impersonal" distinction according to which the footbridge dilemma exemplifies personal dilemmas and the switch dilemma exemplifies impersonal dilemmas. Further, it is suggested that while pertaining to the same harmful consequence, a personal dilemma is more emotion-loaded than its impersonal counterpart.

Two clarifications are needed here before going further. First, both terms — personal and impersonal — concern the killing of a minority (e.g., the single victim in the footbridge or switch dilemma). Although it is also plausible to say, for example, that one can cause the death of the five workmen impersonally by doing nothing, such and other alternative understandings are not taken here. Second, the personal/impersonal distinction is apparently not the only way to differentiate the switch and footbridge dilemmas. Greene et al. (2001) used it as a "shortcut" to explore the idea that the footbridge dilemma elicits fewer utilitarian judgements because it is more emotionally loaded. The researchers stress it as a preliminary concept while maintaining diverse attributes upon which the two dilemmas can be distinguished. These include the involvement of intent (Cushman et al., 2006; Moore et al., 2008; Schaich Borg, Hynes, Van Horn, Grafton, & Sinnott-Armstrong, 2006), the involvement of "personal force" (Greene et al., 2009) and the "locus of intervention" (Waldmann & Dieterich, 2007). Our studies (Studies 2 & 3) adopted the moral dilemma paradigm. We also borrow Greene et al.'s simplicity without looking into radical causes for the difference in emotional cost. Hence, the following review will focus on evidence showing how the dual-process model is developed using the moral dilemma context with the personal/impersonal approach.

An emotion/deliberation conflict in moral judgement Initial evidence for the notion that moral judgement in personal and impersonal dilemmas involves emotional processing to different extents comes from the pioneering fMRI study by Greene et al. (2001). The authors

created two sets of moral dilemmas based on the personal/impersonal distinction (including the footbridge and switch dilemmas) and also involved a set of morally neutral judgement questions called "non-moral dilemmas". Participants were scanned while being presented with all three types of dilemmas and providing moral judgements to the dilemmas (i.e., responding to the question "is it appropriate to x", where x stands for, in a moral dilemma, an action similar to the killing in the trolley problem). The imaging data (Experiment 1) showed that brain regions implicated in emotional processing (e.g., the angular gyrus) showed greater activation for moral personal dilemmas, as compared to moral impersonal and non-moral dilemmas. In contrast, brain regions involved in cognitively controlled processing (e.g., middle frontal gyrus) were less active for moral personal dilemmas than for the other two types. And moral impersonal and non-moral dilemmas were not significantly different in prompting activation of both emotional and cognitive processing related regions. These results suggest that moral personal dilemmas, compared to moral impersonal (and non-moral) dilemmas, involve an engagement in emotional processing to a larger extent but an engagement in cognitively controlled processing to a smaller extent.

In addition, response time (RT) data in the same study exhibited a Stroop-like behavioural pattern: for moral personal dilemmas, utilitarian judgements took longer than non-utilitarian judgements. This effect of judgement pattern was, however, not observed for moral impersonal dilemmas. Combined with the imaging data, the researchers proposed a "behavioural interference" pattern that can be described as follows. A non-utilitarian judgement for a moral personal dilemma is impulsive due to a salient negative emotional response to the dilemma; on the other hand, an effortful, cognitively controlled process can overcome the prepotent response and reach a non-utilitarian judgement. However, there is no such intensive emotional response to moral impersonal dilemmas, making the emotion/deliberation conflict less likely (Greene et al., 2001). Thus, it is more difficult and takes longer to make a utilitarian judgement for a moral personal dilemma.[5]

A subsequent brain imaging study by Greene et al. (2004) further suggests a link between judgment pattern and emotional versus cognitive processing. Building on the notion that moral personal dilemmas elicit intense conflict, the study specifically compared utilitarian and non-utilitarian judgements within moral personal dilemmas. The results showed that

[5]McGuire et al. (2009) re-analysed these RT data and found that the interaction reported by Greene et al. (2001) was driven by a small set of stimuli that nevertheless largely skew the data. However, as argued by Greene (2009) in his reply to McGuire et al., this is not sufficient to deny the dual-process model given supportive evidence from other studies that do not rely on the personal/impersonal distinction (e.g., Greene et al., 2004, 2008).

utilitarian judgements, as compared to non-utilitarian ones, were associated with greater activity in the DLPFC, suggesting the involvement of cognitive control in shaping utilitarian judgements for moral personal dilemmas. Based on these results, Greene and colleagues (2004, 2008) proposed a dual-process model for moral judgement, according to which non-utilitarian judgements result from salient emotional response, whereas utilitarian judgements are encouraged by cognitively controlled processing (Greene et al., 2008).

The dual-process model for moral judgement is supported by a body of evidence beyond correlation revealed by the above fMRI studies. For example, Mendez et al. (2005) found that patients with frontotemporal dementia (FTD), who typically lose empathy, had an impaired ability to make a non-utilitarian judgement for the footbridge dilemma. Similarly, Koenigs et al. (2007) found that patients with focal bilateral damage in the VMPC (as mentioned earlier, VMPC is an area that is crucial for generating social emotion; Anderson et al., 2006) were much more inclined to make a utilitarian judgement for the footbridge dilemma than normal participants. These neuropsychological findings suggest that emotional processing is essential in making non-utilitarian judgements. In a similar vein, Valdesolo and DeSteno (2006) showed that inducing a happy mood in participants before they made moral judgements increased the likelihood of utilitarian judgements for the footbridge dilemma, supposedly because the positive affect weakened the negative emotion elicited by the dilemma.

Other studies also support the dual-process model by implicating cognitive processing in utilitarian judgements. Greene et al. (2008) conducted a cognitive-load study in which participants were presented with moral personal dilemmas while under cognitive load (load condition) or not (control condition). Consistent with the dual-process model, whereas response time for a non-utilitarian judgement was not different between the two conditions, that for a utilitarian judgement was longer in the load condition than in the control one. The fact that cognitive load "selectively" interrupts utilitarian judgements suggests that effortful, cognitive processing is implemented in making utilitarian judgements. Consistently, Paxton, Ungar, and Greene (2012) obtained increased ratings of "moral acceptability" for personal killing by inducing prior reflection using a non-moral task. Along the same line, Moore et al. (2008) found that working memory ability was positively predictive of utilitarian judgements. Finally, Bartle (2008) demonstrated that a higher "need for cognition" gave rise to utilitarian judgements.

Summary Based on a series of studies using the moral dilemma context, Greene and colleagues developed a dual-process model for moral judgement (Greene et al., 2001, 2004, 2008). According to the model, utilitarian judgements are driven by impulsive emotion,

whereas non-utilitarian judgements are fostered by cognitive control. Substantial evidence is supportive of the dual-process model by implicating the emotional path in non-utilitarian judgements or by implicating the cognitively control path in utilitarian judgements.

2.4.4 Bridging the paradigms

As the above review suggests, the two paradigms used in the current thesis, i.e., the mini-ultimatum game and the trolley-problem-like moral dilemma paradigm, are analogous on the grounds of a dual-process account of JDM. Both paradigms incorporate an emotion/deliberation dilemma such that emotion-driven, impulsive, and reasoning-based, cognitively controlled, judgements and decisions appear to conflict. Specifically, in the mini-ultimatum game, where a disadvantageous offer is caused by situational force, emotional distress in response to the offer would lead to rejection of it, whereas a more objective, context-responsive process would increase the likelihood of acceptance. In the moral dilemma paradigm, where the welfare of the majority is at odds with that of the minority, emotional aversion to sacrificing the minority would prompt deontological/non-utilitarian judgements, whereas cognitively controlled processing would encourage utilitarian judgements.

2.5 Influence of mood on judgement and decision making

2.5.1 A mood-congruent pattern of judgement

Numerous studies in the affect literature have found a mood-congruent pattern of judgement: people in a positive mood tend to make positive judgements on an evaluated object whereas those in a negative mood show the opposite. Research along this line shows that people in a positive mood, compared to their negative-mood or/and neutral-mood counterparts, rate blind date partners as more attractive (Clark & Waddell, 1983), form a better impression of a person described with mixed information (Forgas & Bower, 1987; Erber, 1991), rate their life in general as more satisfying (Schwarz & Clore, 1983, 1988), show a decreased estimation of risk (Johnson & Tversky, 1983) and have a more optimistic perception of their health (Salovey & Birnbaum, 1989). Two theoretical approaches are raised to explain such mood-congruent judgements — one conceptualises mood as a node within an associative network and one focuses on experiential aspect of mood.

2.5.1.1 The state-dependent-priming approach

According to the state-dependent-priming approach (Bower, 1981, 1991; Forgas, 1995; Isen, Shalker, Clark, & Karp, 1978), a person's mood facilitates his encoding or retrieval of mood-congruent information, giving rise to mood-congruent judgements. From this perspective, mood affects judgement indirectly by facilitating mood-congruent recall. A body of studies provides support for this account (e.g., Erber, 1991; Forgas, 1992; Forgas & Bower, 1987; Forgas & Moylan, 1991). For example, Forgas and Bower (1987) showed that happy-mood participants, compared to sad-mood participants, formed a better impression of an evaluated person after reading both positive and negative information about the person. Moreover, the authors found that whereas happy-mood participants learned more slowly and had a better, faster recall of the positive versus negative information, sad-mood participants showed the opposite. This interaction between mood and information valance was thought to evidence the mood-dependent-recall notion. Similarly, Erber (1991) found that positive mood not only increased the estimation of a person's engagement in behaviour consistent with his positive traits, but also increased the accessibility of the positive traits; in contrast, negative mood increased the estimation of negative-trait-consistent behaviour and the accessibility of negative traits.

On the other hand, some studies suggest that mood-congruent judgements are subject to contexts. Specifically, it shows that the mood-congruent effect disappears when people are quite familiar with the object (e.g., Schwarz, Strack, Kommer, & Wagner, 1987) and when they are highly motivated to achieve a certain goal (e.g., mood repair; Erber & Erber, 1994), but is stronger when people are faced with unfamiliar tasks that presumably require "substantive" processing (e.g., Forgas, 1992; see Forgas, 1995 for a comprehensive review). Drawing on these findings, Forgas (1995) proposed the "affect infusion model" (AIM), which highlights a moderating role of mental processing style in mood effect on judgment. According to the AIM, judgements are particularly likely to be affected by mood-congruent information retention when people are faced with unfamiliar, complex tasks; this is because people would engage in substantive processing, which allows mood-facilitated retrieval and encoding to come into the process of shaping the final judgement. In contrast, this effect would be absent when people are highly familiar with the judged object because relevant information or criteria would be spontaneously retrieved. Also, mood is quite unlikely to influence judgements when people are highly motivated to reach a goal (unless mood itself is relevant to the goal, e.g., mood repair) because their information processing would be highly goal-oriented.

2.5.1.2 The "affect-as-information" approach

Unlike the state-dependent-priming approach, which conceptualises mood as a node linking to relevant mood-congruent information within an associative work, the "affect-as-information" (AAI) approach (Clore et al., 2001; Schwarz & Bless, 1991; Schwarz & Clore, 1983, 1988, 2007) focuses on the experiential aspect and informational value of mood. The central assumption of the AAI model is that peoples affect can provide information about the object they are dealing with. In this theorisation, the information is conveyed by the feeling of affect, which is defined as an "experiential representation of value" (Clore et al., 2001). For example, when one feels that he likes another person, this affective reaction can provide inner feedback that the perceived person is valuable; as a result, the simple liking can generate a quite positive evaluation of the person (Schwarz & Clore, 1983). This notion is quite similar to Damasio's (1994) somatic marker hypothesis and Slovic et al.'s (2002) affective heuristic mentioned earlier.

The above example is about integral affect, that is, the liking reaction is evoked by the evaluated subject. For incidental affect, e.g., mood, the AAI model proposes that it can work in the same way by being erroneously perceived to inform about the present object. Based on the "aboutness principle" (Higgins, 1998), i.e., people often perceive experience as being about what is within focus, Schwarz and Clore (1993) argued that the feeling of mood can easily be "misattributed" as feedback with respect to what people are focused on, and it is this misattribution that contributes to the mood-congruent judgements.

In support of this perspective, research shows that when the misattribution is avoided, mood would not exert the mood-congruent effect on judgement (see Schwarz & Clore, 2007 for a review). For example, in their well-known "weather" study, Schwarz and Clore (1983) found that weather, an external factor presumably affecting people's mood, affected judgement on satisfaction with life in general. Relative to those interviewed on a rainy day, people interviewed on a sunny day reported higher levels of satisfaction with life. However, the results in the same study also showed that the effect of weather disappeared when the experimenter mentioned weather before the life-satisfaction question and thus reminded the interviewees of the real source of their feelings. A subsequent work (Schwarz et al., 1987) showed that whereas mood affected judgement on satisfaction with life in general, it did not affect that on satisfaction with a specific life domain (i.e., income). As the authors reasoned, when considering a specific domain of life, information regarding the domain would be relatively more accessible, discounting the use of the momentary feeling as information. Along the same line, it is evident that mood-congruent judgements are much less likely among experts in the

field of judgement (Ottati & Isbell, 1996), presumably because experts are highly efficient in distinguishing between relevant and irrelevant information with respect to the question at hand.

Closer analyses of present evidence, though limited, provide support to the AAI versus the mood-priming approach. First, research shows that mood-congruent recall does not necessarily occur when mood has an effect on judgement (e.g., Fiedler, Pampe, & Scherf, 1986). Second, Johnson and Tversky (1983) showed that inducing a negative mood by reading about cancer affected judgements on the risk of cancer, accident and divorce at the same level, suggesting a generalised mood effect on evaluative judgement, regardless of topic (see also Mayer, Gaschke, Braverman, & Evans, 1992). This is contradictory to the mood-congruent-recall model. As Schwarz and Clore (2007) argued, the recall-based model would predict a stronger effect of mood when concepts activated through mood induction are related to the topic of judgement. Accordingly, a negative mood induced by reading about cancer should have exerted a stronger effect on judgement on risk of cancer.

Summary Mood can influence judgements in a mood-congruent pattern. The state-dependent-priming approach proposes it as a result of mood-congruent information retrieval (Bower, 1981; Forgas, 1995). This approach is further modified into the AIM (Forgas, 1995), which integrates a boundary condition for the mood- congruent priming. An alternative approach, the AAI model focuses on the experiential component of mood, i.e., feeling, and its informational value, suggesting that mood sparks mood-congruent judgements by being regarded as feedback about the evaluated object. Little evidence suggests that the mood effect on judgement is due to the informative role of feeling but not mood-congruent recall.

2.5.2 Influence of mood on information processing

Most relevant for our purpose is the influence of mood on information processing. Research in a variety of domains shows that positive mood is associated with heuristic, top-down, relational processing, and in contrast, negative mood is associated with systematic, bottom-up, detail-oriented processing (see Clore & Huntsinger, 2009 for a review). For example, the persuasion literature shows that people in a positive mood, relative to those in a neutral or negative mood, rely more on "peripheral cues" such as expertise (Bless, Bohner, Schwarz, & Strack, 1990) and are less affected by the quality of arguments (e.g., Bless, Mackie, & Schwarz, 1992; Mackie & Worth, 1989; Worth & Mackie, 1987). Analogously, when in the position of persuader, sad-mood people produce stronger and more effective arguments than do happy-mood

counterparts (Forgas, 2007). Research on personal perception provides converging evidence that happy-mood people tend to rely on more category-reflected (e.g., stereotypic, trait) information whereas sad-mood people rely on more individual-specific information (Bless & Fiedler, 1995; Bless, Schwarz, & Wieland, 1996; Bodenhausen, Kramer, & Süsser, 1994; Bodenhausen, Sheppard, & Kramer, 1994; Isbell, 2004; Isbell et al., 2005; see Bless, Schwarz, & Kemmelmeier, 1996 for a review). Similarly, Bless et al. (1996a) found that happy-mood participants focused mainly on scripted information whereas sad-mood ones also carefully processed more detailed information. Finally, research on forensic psychology demonstrates that people in a good mood are gullible whereas those in a sad mood are more sensitive to false information; as a result, sad people showed a higher accuracy of witness memory (Forgas, Laham, & Vargas, 2005).

For the influence of mood on processing, three theoretical assumptions have been raised with respect to the mediating process: (1) a deficit in processing capacity when in a positive mood(Mackie & Worth, 1989); (2) a deficit in motivation when in a positive mood (Bodenhausen et al., 1994a; Schwarz, 1990; Wegener, Petty, & Smith, 1995) and (3) a "cognitive tuning" function by mood (Schwarz, 2002; Schwarz & Clore, 2007).

2.5.2.1 The deficit-in-capacity assumption

The deficit-in-capacity assumption holds that the influence of positive mood on information processing is due to a deficit in processing capacity (Mackie & Worth, 1989). The underlying rationale is that positive events happen more frequently in everyday life than negative ones, thus there are more positive materials than negative materials in one's memory store. Further, due to mood-congruent recall (Bower, 1981; Isen et al., 1978), people in a positive mood would have a higher cognitive load than those in a negative mood; as a result, positive mood would limit the capacity of processing in a careful manner. In support of this view, Mackie and Worth (1989) showed that happy-mood participants were less sensitive to the quality of persuasive arguments than were neutral-mood ones when time to process the arguments was limited. In the absence of this limitation, however, happy-mood participants processed the information no less thoroughly than the neutral-mood ones; but notably, happy-mood participants spent more time on the task. The authors took this result as evidence for the deficit-in-capacity hypothesis, interpreting the extra processing time as compensation for the deteriorated processing ability. Another source of evidence comes from a study by Bless et al. (1990; Experiment 2), who showed that the effect of strong versus weak persuasive arguments on attitude change under negative mood was removed when negative-mood participants were

doing another task while processing the arguments.

2.5.2.2 The deficit-in-motivation assumption

The deficit-in-motivation assumption holds that positive mood makes people less motivated to process carefully. This notion, however, is suggested by two different approaches. One approach focuses on the hedonic consequence of different processing strategies ("hedonic-contingence"; Wegener et al., 1995; Wegener & Petty, 1994; see also Isen, 1984 for a similar perspective). According to the hedonic-contingence view, people are often concerned about maintaining a positive affective state. For positive-mood people, engaging in other activities is risky due to the potential of feeling down; in contrast, for negative-mood ones, doing so is likely to uplift their affective states. Therefore, negative-mood people tend to process a given task in a systematic and careful manner whereas positive-mood people do the opposite. Support for this view comes from a study by Wegener et al. (1995; Experiment 2). In this study, participants, most of whom were university students, were induced into a happy or sad mood before being presented with strong or weak arguments regarding joining a certain university-related programme. One programme was about reducing tuition and another programme was about increasing tuition. The hedonic-contingence assumption implies that if engaging in a task can be affectively rewarding, people in a happy mood would be motivated to do so. Thus, happy-mood participants should process the arguments carefully when faced with the tuition-reduction programme but not the tuition-increase one. Consistent with this prediction, happy participants were persuaded more by strong arguments than weak ones in the tuition-decrease case, but were equally influenced by both types of arguments in the tuition-increase case. In contrast, for negative-mood participants, the advantage of strong versus weak arguments was independent of which programme participants were subject to.

Another approach that likewise assumes a shortfall in motivation is based on the AAI approach. As seen earlier, the AAI approach holds that affective feeling can provide information about an evaluated target. Beyond this, and at a more general level, it also assumes that affect, via its feeling, can provide information about the current situation (Schwarz, 1990). This is building on the common view in affect research that "emotions exist for the sake of signalling states of the world that have to be responded to, or that no longer need response and action" (Frijda, 1988, p. 354). Accordingly, it is assumed that negative mood signals that there is something wrong with the surroundings; people then realise that they need to be careful before making a judgement or decision and thus are motivated to process information in a systematic, analytic and careful fashion. In contrast, positive mood suggests the current

situation is benign; people then see their ongoing thoughts or actions as reliable and thus are less motivated to process information carefully (Schwarz, 1990). The informational value of mood is also subject to the misattribution principle mentioned earlier. Thus, when the real source of mood is made salient, the mood effect disappeared (e.g., Sinclair, Mark, & Clore, 1994).

Consistent with this AAI-approach-based motivation notion, Bless et al. (1990, Experiment 1) showed that an explicit requirement for attending to argument quality led happy participants, like sad ones, to be differently affected by strong and weak arguments. This suggests a functional equivalence of being in a negative mood to being motivated to carefully process information (Schwarz, Bless, & Bohner, 1991). Note that this result is against the deficit-in-ability assumption because in the absence of capacity, the external requirement would not show the overriding effect. Similarly, in a personal perception study, Bodenhausen et al. (1994a) found that, whereas happy-mood participants made more stereotypic judgements than did neutral-mood ones when only information about the target object was presented, this difference was eliminated when participants received external instructions emphasising the accountability of their judgements. Note that these studies, on the other hand, imply a more flexible processing strategy by happy participants than sad ones. In fact, the AAI approach to the influence of mood on information processing is modified later and does not assume a general deficit in motivation when being in a positive mood. I will return to the revised theorisation later.

2.5.2.3 Evaluation of the ability- and motivation-deficit assumptions

Closer analyses of the available evidence and further research show that neither the ability nor the motivation notion is sufficient to explain the commonly observed mood effect on information processing. For example, the persuasion study by Bless et al. (1990; Experiment 1) showed that mood manipulation had an effect on attitude change such that sad-mood participants' attitudes were affected more by strong than weak arguments whereas happy-mood ones' attitudes were not affected by argument strength. However, from the same study, data of argument quality rating showed that happy participants differentiated between strong and weak arguments no worse than their sad counterparts. Thus, it seemed that happy participants paid attention to the strength of arguments at least when encoding information. Similarly, Bless et al. (1996a; Experiment 1) found that although happy participants' judgements reflected a higher reliance on stereotypic than individuating information, their recall of the two types of information was not quantitatively different from that by sad participants. Apart from

these ambiguous results, Bless et al. (1996c; Experiment 1) also found that the commonly observed more stereotypic judgements by happy-mood participants than sad-mood ones were eliminated when a large portion of the given information was stereotype-inconsistent. This contradicts the deficit-in-ability or -motivation assumption because if there was any deficit, it would block the effect of the information extremity.

Contradicting evidence also comes from Bless et al.'s (1996a) studies on how mood affects the use of scripted information. In their first experiment, the researchers induced participants into happy, sad or neutral moods and then asked them to listen to a "going-out-for-dinner" story that included behaviours consistent or inconsistent with a "restaurant script". After a filler task, participants did a recognition task in which they were presented with script-consistent and - inconsistent items and indicated whether each item was heard in the story. The results showed that happy-mood participants more frequently misidentified unheard but script-consistent items than did neutral-mood and sad ones, thus suggesting an increased reliance on scripts when in a positive mood. In the second experiment, the procedure was the same except that participants were asked to do a concentration-test task while listening to the story. This was aimed to test for the deficit-in-ability or -motivation assumption. The logic is that if either of the two assumptions was valid, the deficit should also be seen in the "secondary" task and thus happy participants should perform worse than neutral and sad ones (Bless et al., 1996a). However, the results exhibited the opposite result.

Taken together, the research suggests that the influence of mood on information processing cannot be simply attributed to a deficit in ability or motivation that was assumed to be consequent to positive mood. Rather, as seen in Bless et al.'s (1996c) study that involves an extremity of stereotype-inconsistent information, people in a positive mood would not rely on a heuristic solution when it is obviously inappropriate in the current situation. Such an interplay of mood and situation leads to a "cognitive tuning" theorising.

2.5.2.4 A cognitive-tuning perspective

The cognitive-tuning theory (Schwarz, 2000, 2002; Schwarz & Clore, 2007) is based on the AAI approach. Like the deficit-in-motivation assumption based on the AAI approach, the cognitive-tuning theory also holds that mood can "tune" cognitive processes to match the situation it has picked up on (Schwarz, 1990; 2002). However, unlike the old theorising, it does not assume any lack of ability or motivation in general as a result of being in a positive mood. Rather, it points out that mood per se would not decide the final processing strategy people use. Moods provide cues about the situation, giving rise to certain processing strategies

whose appropriateness is nevertheless subject to an overall examination of the task at hand. This is particularly the case for positive moods. Thus, when the inclined processing strategy and task requirement are not found incompatible, as is the case in most studies without manipulation of task requirement, people in a positive mood rely on heuristic processing. On the other hand, when they are found incompatible, as seen in the above studies involving manipulation of task requirement — explicit demand of noticing the quality of arguments (Bless et al., 1990), presenting participants with mostly non-stereotypic information (Bless et al., 1996c), informing participants that they would be held accountable for judgement (Bodenhausen et al., 1994a) — positive-mood people also adopt an analytic, detail-oriented processing strategy. From this perspective, positive mood engenders a flexible processing style (see Fredrickson, 2001 and Isen, 2008 for similar perspectives). In contrast, people in a negative mood would tend to adopt an analytic, careful processing strategy in a less flexible way because the warning signal provided by a negative mood is not limited to the presently perceived scope (Schwarz, 2000, 2002).

This conceptualisation is evidenced in the finding that, whereas negative mood is advantageous for analytic tasks, positive mood appears so for eliciting creative solutions (see Schwarz & Skurnik, 2003, for a review). With respect to analytic tasks, because negative mood tunes systematic, analytic processing, it should improve performance in such tasks. On the contrary, unless the importance of analytic processing is made salient, positive mood should decrease performance in analytic tasks because it fosters a less careful processing strategy. Consistent with this prediction, Sinclair and Mark (1995) showed in covariation-detection tasks that relative to participants in a neutral mood, those in a sad mood used more digits from scatterplots and showed more accurate estimations of correlation coefficients, whereas those in a happy mood showed the opposite. Further, whereas happy participants were self-reported to concentrate less on the task and wrote less comprehensive explanations for coefficient estimation than neutral-mood participants, sad participants outperformed neutral-mood ones in both regards (Sinclair & Mark, 1995; Experiment 2). Similarly, Melton (1995) found that happy-mood participants performed worse in syllogism tasks than neutral-mood ones. Moreover, the happy participants tended to spend less time, suggesting that they adopted a less effortful processing strategy when solving the tasks. Thus, consistent with the cognitive-tuning theory, negative or positive mood is advantageous or disadvantageous for analytic tasks because it tunes a processing strategy that is compatible or incompatible with the requirements to achieve good performances in this type of task.

On the other hand, for creative tasks or tasks for which solutions can be assessed in terms of innovation, less systematic and detail-focused processing should help in that it can facilitate

some "unusual" association between given items (Isen, 2008). In light of this, a top-down, relational processing style fostered by positive mood is expected to facilitate performance in creative tasks. In support of this notion, Isen, Daubman, and Nowicki (1987) showed that participants in a positive mood, compared to those in a neutral or negative mood, were more likely to successfully solve the Duncker's (1945) candle problem, a creative task in which given items need to be used in an unusual way to solve the problem. Similarly, Isen and Daubman (1984) found that, relative to neutral-mood participants, happy participants were more likely to draw some innovative categorical link, e.g., placing "foot" and "camel" into a group of vehicles.

The cognitive-tuning theory also explains the aforementioned finding that although happy participants relied more on scripts when encoding information than did sad participants, they outperformed the latter in a meantime concentration test (Bless et al., 1996a). According to the cognitive-tuning theory, because happy participants adopted a less detail-oriented processing strategy for one task than did sad participants, they had more available cognitive effort for the secondary task, and consequently outperformed their sad counterparts in the task.

Similar perspectives The "tuning" function of mood is similarly seen in some other AAI-approach-based theories. One theory is the rely-on-general-knowledge-structures theory proposed by Bless and colleagues (Bless et al., 1996a, 1996b, 1996c; Isbell, 2004; Isbell et al., 2005; Ruder & Bless, 2003; see Bless, 2001 for a review). It posits that people in positive affect perceive the current situation as non-problematic and thus see general knowledge structures as adaptive, whereas those in negative affect do the opposite. Consequently, positive mood increases reliance on general knowledge structures whereas negative mood decreases reliance on them. Likewise, the rely-on-general-knowledge-structure theory states that moods do not necessarily alter the quality of processing. By reading heuristic processing as adopting general knowledge structures into a specific case, the rely-on-general-knowledge-structures theory fits the empirical findings discussed above (Bless, 2001). Additional evidence comes from the literature of perception and processing scope. Research on visual perception shows that global-scoped attention is dominant over local-scoped attention (e.g., forest versus tree; cf. Navon, 1977). Thus, according to the rely-on-general-knowledge-structures theory, positive mood should prompt reliance on global versus local perception whereas negative mood should decrease it. In support of this prediction, Gasper and Clore (2002; Experiment 2) showed that when figures can be matched in terms of either structural element or overall shape (e.g., three squares are structured into a triangle), participants in a positive mood made the match more on the former standard whereas those in a negative mood more on the latter. Similarly,

Storbeck and Clore (2005) showed that positive mood encourages global, relational processing whereas negative mood encourages item-focused processing; as a result, participants in a positive mood made more relation-lured mistakes than those in a negative mood.

Another theory is the "affective immediacy principle" raised by Clore and colleagues (Clore & Huntsinger, 2007, 2009; see also Clore et al., 2001). According to the affective immediacy principle, the affective feeling of mood conveys information about the value of ongoing thoughts; because what the ongoing thoughts are depends on what comes to mind when faced with a given task, positive mood entails a "go" signal and negative mood a "stop" signal to thoughts or tendencies that are most accessible at the moment (Clore et al., 2001). In support of this perspective, a great deal of research shows that the often observed differential effects of positive and negative moods on processing are reversed when incoming thoughts are inconsistent with assumed general knowledge or default beliefs (see Clore & Huntsinger, 2007, 2009 for reviews). For example, Huntsinger et al. (2010) found that for people who are disposed toward "egalitarian" responses, positive mood decreases but negative mood increases stereotypic judgements. Similarly, Briñol, Petty, and Barden (2007) showed that in the condition where participants thought about the quality of arguments before experiencing mood induction, the advantage of strong versus weak arguments was more profound for positive-mood participants than negative-mood ones. These results are nicely illustrative of the idea that positive mood validates while negative mood invalidates the most accessible thoughts when responding to tasks. The affective immediacy principle is thus consistent with the rely-on-general-knowledge-structures position most of the time when general knowledge structures or heuristics are most accessible.

In their later articles, Clore and Huntsinger (2007, 2009) claimed that the mood effect on most accessible cognitive responses is direct, through conferring valence-congruent value, rather than indirect, through providing information about the current situation. However, the above empirical evidence is not necessarily incompatible with the information-about-situation idea: A feeling led by a positive/negative mood can serve as an experiential signal of the fit/not-fit between initial thoughts or action tendency and the current situational requirement (de Vires et al., 2008a, 2012). Also, it should be noted that the most-accessible-thought approach is criticised for its invalidity when easily accessible answers are not available, as was the case in the covariation-estimation study where the solution relied on computation (Schwarz, 2001).

Summary A great deal of research has shown that where positive mood tends to be associated more with a heuristic, top-down, relational processing strategy, negative mood

tends to be associated with a systematic, bottom-up, detailed-focused processing strategy (Bless, 1990; Bless et al., 1996a, 1996b, 1996c; Bless & Fiedler, 1995; Bodenhausen et al., 1994a, 1994b; Forgas et al., 2005; Isbell, 2004; Isbell et al., 2005; Mackie & Worth, 1989; Sinclair & Mark, 1995). Early theorisations attributed such mood effects on information processing to either a deficit of ability (Mackie & Worth, 1989) or a deficit of motivation (Wegener et al., 1995; Wegener & Petty, 1994; Schwarz, 1990) in systematic processing when in a positive mood. However, a more careful analysis of empirical evidence suggests that both accounts inadequately explain the processing effect of mood. A more advanced idea, adopting an affect-as-information approach, is that mood encourages the use of a certain processing style by tuning about the current situation, whilst not affecting motivation or ability to process carefully in general (Schwarz, 2000, 2002; Schwarz & Clore, 2007). More recent theories, such as the rely-on-general-knowledge-structures theory (Bless, 2001) and the affective-immediacy-principle theory (Clore & Huntsinger, 2009), also emphasised an interaction between the tuning effect of mood and the most accessible thought.

2.5.3 Mood and intuitive versus deliberative decision making

Research has tracked the influence of mood on JDM in a variety of contexts. As reviewed above, a number of studies have illustrated mood-congruent judgements in evaluative judgement settings (e.g., Clark & Waddell, 1983; Erber, 1991; Forgas & Bower, 1987; Johnson & Tversky, 1983; Schwarz & Clore, 1983). Empirical evidence also shows an information-processing effect of mood on judgement formation in the contexts of personal perception (Bodenhausen et al., 1994a) and persuasion (Bless et al., 1990, 1992; Mackie & Worth, 1989), suggesting that positive mood encourages the use of a heuristic, top-down processing strategy whereas negative mood encourages the use of a systematic, bottom-up processing strategy. Such informational-processing effects of moods are also shown to be implemented in decision making in different contexts. Forgas (1991), for example, showed that when choosing working partners, sad participants' decisions were more reflective of a fit between individual feature and situational requirement than happy participants' decisions. Hertel et al. (2000) also demonstrated a more deliberative decision pattern under a negative than positive mood in a social allocation setting: Whereas happy participants tended to simply go along with others' choices, sad participants made decisions based more on careful analyses of the situation.

Most relevant to the current thesis, de Vries and colleagues (de Vries, Holland, Corneille, Rondeel, & Witteman, 2012; de Vries, Holland, & Witteman, 2008a, 2008b; Holland, de Vries, Hermsen, & van Knippenberg, 2012) showed in a series of studies that, whereas positive mood

gives rise to intuitive decisions, negative mood gives rise to more deliberative decisions. In one of these studies, de Vries et al. (2008b) used the IGT, where players can distinguish between advantageous and disadvantageous decks by a "gut feeling" in the early stage of the game. Based on the AAI framework and the cognitive-tuning theory regarding moods' processing effects, de Vries et al. (2008a) reasoned that happy-mood participants should outperform sad-mood participants in the early stage of the gambling game because the former would rely more on emotional, less deliberative processing than the latter. This is exactly what they found. Consistent with this finding and the cognitive-tuning rationale, de Vries et al. also showed, in another study (de Vries et al., 2012), that, in a gambling task where a rule-based, more deliberative strategy is advantageous, sad-mood participants outperformed happy-mood ones. Similarly, in another recent study, Holland et al. (2012) found that even for simple decisions such as choosing a snack, happy-mood participants appeared to go with their implicit preference, whereas sad-mood participants tended to rely on their explicit belief.

The idea that positive mood gives rise to intuitive decisions whereas negative mood gives rise to deliberative decisions is also illustrated by de Vries et al. (2008b) using a "fit" approach (Avnet & Higgins, 2003; Idson, Liberman, & Higgins, 2004). According to the "fit" approach, consistency or inconsistency between initial thought/action tendency and explicitly required decision strategy increases or decreases the subject value of the final decision (Avnet & Higgins, 2003). De Vries et al. (2008a) reasoned that, given the association between positive/negative mood and intuitive/deliberative decisions, participants' subjective valuation of their decisions should be greater when their mood fit the instructed decision strategy. Results in the study met this prediction: Happy-mood participants rated their chosen flasks as more monetarily valuable when asked to make choices based on their "first feelings" than when asked to make choices after a careful comparison between options; in contrast, sad-mood participants rated their choice as more valuable following the careful-decision instruction (de Vries et al., 2008a). Taken together, de Vries et al.'s research informs our studies by suggesting that positive mood gives rise to emotion-based processing whereas negative mood gives rise to more deliberative processing.

2.6 Chapter summary

Research on JDM shows that emotion can guide JDM by acting as an information input (Damasio, 1994; Loewenstein et al., 2001; Slovic et al., 2002). Contemporary theories integrate emotion into a dual-process framework, according to which an emotion-loaded process and a more cognitively controlled process, often in conflict, can lead to diverging judge-

ments and decisions (Kahneman & Frederick, 2002; Metcalfe & Mischel, 1999; Loewenstein & O'Donoghue, 2007). This position is evidenced in a variety of contexts, including decision making under risk (Loewenstein, 2001), intertemporal choice (e.g., Metcalfe & Mischel, 1999; McClure et al., 2004) and, more importantly for the current thesis, socio-economic decision making (e.g., Sanfey et al., 2003), negotiation (e.g., Hegtvedt & Killian, 1999) and moral judgement (e.g., Greene et al., 2001, 2004, 2008). Conflicts between emotion-based and more cognitively controlled judgements and decisions in the three social preference contexts inform the use of two experimental paradigms in our studies, i.e., the mini-ultimatum game and the moral dilemma paradigm. In the mini-ultimatum game, emotionally compelled decisions focus on outcome in socio-economic exchanges, whereas more deliberative, cognitively controlled decisions take into consideration the intentions of other individuals. For moral judgement in moral dilemmas relevant to others' welfare, non-utilitarian judgements are primarily driven by emotion, whereas utilitarian judgements are encouraged by cognitive control (Greene et al., 2001, 2004, 2008). These two paradigms are thus assumed to similarly incorporate other-regarding emotion/deliberation dilemmas.

Meanwhile, research shows that mood, as an incidental affect that is thought to be objectively irrelevant to JDM tasks at hand, can also influence JDM. Mood can affect evaluative judgements in a mood-congruent pattern (e.g., Johnson & Tversky, 1983; Schwarz & Clore, 1983, 1988). It can also affect judgement formation by encouraging use of different processing strategies (e.g., Bless, 1990; Bless & Fiedler, 1995; Bodenhausen et al., 1994a, 1994b; Isbell, 2004; Isbell et al., 2005; Mackie & Worth, 1989). The AAI theoretical framework (Clore et al., 2001; Clore & Schwarz, 2007) suggests that mood encourages the use of a certain processing style by providing information about the current situation. Whereas positive mood signals that the current situation is non-problematic and gives rise to a heuristic, top-down, reflexive processing style, negative mood signals that the current situation is problematic and gives rise to a more systematic, bottom-up, analytic processing style (Clore & Schwarz, 2007). This position is also evidenced in decision making in different contexts, such as working-partner-choice (Forgas, 1991), social resource allocation (Hertel et al., 2000), and — most importantly for our purpose — intuitive versus deliberative decision making under risk (de Vries et al., 2008a, 2008b, 2012; Holland et al., 2012). Essentially, de Vries et al.'s studies demonstrate that whereas positive mood gives rise to intuitive, emotion-based decisions, negative mood gives rise to more deliberative, reflective decisions. This research, along with the AAI theoretical framework, in particular informs the central idea of this thesis, that positive mood would give rise to emotionally compelled judgement and decisions, whereas negative mood would give rise to more deliberative, cognitively controlled decisions in other-regarding emotion/deliberation

dilemmas.

Chapter 3

Exploring the Influence of Sad Mood on Socio-economic Decision Making (Study 1)

3.1 Introduction

3.1.1 An emotion/deliberation conflict perspective on the mini-ultimatum game

Study 1 aimed to explore the influence of a sad mood on economic decision making in an emotion/deliberation dilemma context. We used the mini-ultimatum game (mini-UG; Falk et al., 2003) as the decision making paradigm. As introduced in Chapter 2 the mini-UG allows for different evaluations of the same offer in terms of the intention behind it. Using the paradigm, Falk et al. (2003) showed that an 8:2 offer was more likely to be rejected when it is paired with an absolutely fair offer (refer back to Table 2.1 for the structure of the mini-UG).

Another notable observation from Falk et al.'s (2003) results is that there were still rejections of 8:2 offers in the No-alternative and Hyper-unfair games, even though it was the only or a better choice. Falk et al. took this as evidence of an effect outcome, i.e., the distribution of a payoff. Following this rational, as introduced in Chapter 2, we proposed that such rejections, as opposed to objective evaluations of the situation, manifest the self-serving bias in fairness perception (Babcock & Loewenstein, 1997).

In particular, two opposing forces appear in the No-alternative, Hyper-fair and Hyper-unfair games: aversion towards disadvantageous inequality and taking into account external constraints on the proposer. We argued that the two forces provoke an emotion/deliberation

conflict in the mini-UG. Specifically, disadvantageous inequality, which is emotionally salient, makes the egocentric assessment of fairness impulsive and drives the decision of rejection. In contrast, considering situational force for an 8:2 offer is a cognitively controlled process that gives rise to the decision to accept. As analysed in previously, three lines of research in combination provide support for this proposition. First, research examining the role of emotion in fairness perception suggests an association between negative emotion and self-serving biased assessment of fairness (e.g., Guroglu et al., 2010; Hegtvedt & Killian, 1999). Second, research on de-biasing techniques suggests that situational attribution can attenuate the egocentric bias in fairness perception (Babcock et al., 1997; Leung et al., 2004). Third, research on attribution shows that situational attribution is an effortful, cognitively controlled process (e.g., Gilbert et al., 1998; Lupfer et al., 1990). Building on these streams of research, we proposed that the mini-UG paradigm involves an emotion/deliberation tension as described above.

3.1.2 Mood and decision making in the mini-UG — the present study

The present study aimed to explore the influence of a sad mood on the responder's decision making in the mini-UG. As reviewed in Chapter 2, research has revealed a reliable link between mood and processing style. Whereas positive mood associates with more heuristic, intuitive processing, negative mood gives rise to more systematic, deliberative processing (e.g., Bless et al., 1990, 1992, 1996a, 1996b, 1996c; Bodenhausen et al., 1994a; Forgas, 1991, 1998, 2007; Forgas et al., ,2005; Isbell, 2004; Isbell et al., 2005; Mackie & Worth, 1989; de Vries et al., 2008a, 2008b, 2012; Holland et al., 2012). The AAI approach posits that the differential effects of positive and negative moods on processing style are rooted in their informational value regarding the current situation. Whereas positive mood signals that the current situation is agreeable, negative mood informs that the surroundings are problematic; in turn, positive and negative moods exert contrasting effects on information processing (Schwarz & Clore, 2007).

As reviewed in Chapter 2, research on affect and decision making has shown mood effects that are consistent with the AAI account (e.g., Bless et al., 1996a, 1996b, 1996c; Forgas, 1995, 2005; Isbell, 2004). Especially related to the present study, for decision making where intuitive, emotion-driven responses and deliberative, thoughtful processing lead to contrasting outcomes, a happy mood increases people's reliance on intuitive, emotional responses whereas a sad mood gives rise to deliberative decisions (de Vries et al., 2008b, 2012). This line of research suggests that in the mini-UG, a sad mood would encourage the responder to think more carefully before making decisions, and be less tempted to follow spontaneous, emotional

responses. As a result, responders in a sad mood prior to the mini-UG should be less likely to reject an 8:2 offer in the Hyper-fair, No- alternative and Hyper-unfair games (referred to as non-Fair games hereafter), where there are situational forces acting on the proposer.

This prediction also draws support from evidence of an enhancing effect of sad mood on situational attribution (Forgas, 1998b). Forgas (1998b) reasoned that because overcoming the correspondence bias (i.e., the propensity to dispositional inference whilst insufficiently attending to situational causes) demands effortful processing (Gilbert et al., 1988; Gilbert & Malone, 1995) and because negative mood makes people tend to rely on systematic, careful processing, negative mood should reduce the extent of the correspondence bias; in contrast, positive mood should heighten the extent of the correspondence bias because it makes people rely more on heuristic and less attentive processing. Consistent with this prediction, Forgas (1998b) found that, relative to neutral-mood participants, sad-mood ones showed the correspondence bias to a lower degree, whereas happy-mood ones showed the bias to a higher degree.[6] This advanced influence of sad mood on situational attribution suggests that a sad mood would promote responders' consideration of external restraints and in turn reduce the likelihood of rejecting 8:2 offers in non-Fair games.

Evidence also comes from research on mood and JDM concerning justice (e.g., Inness, Desmarais, & Day, 2005; Sinclair & Mark, 1991). Sinclair and Mark (1991) assessed participants' attitudes to statements that embody a distribution- based ("equality") principle (e.g., "there should be a minimum income guaranteed for everyone") or a more individual-specific ("equity") principle (e.g., "each person's income should be based on how hard he or she works relative to others"). Results from the study showed that participants in a negative mood, relative to those in an elated mood, were less subject to the equality principle. Inness et al. (2005) obtained similar results while having participants make real allocations between themselves and a working partner. Participants were informed about their contribution to the task relative to their partner's. Whereas a majority of neutral- or positive-mood participants made equality-based allocations, most negative-mood participants made equity-based allocations, i.e., according to each person's contribution. As argued by Sinclair and Mark (1991; also quoted in Inness et al., 2005), the endorsement of the equity versus equality principle by sad-mood participants could be attributed to the influence of negative mood on processing

[6]Keltner, Ellsworth, and Edwards (1993) also showed that a sadness induction led to a stronger situational than individual attribution (Experiment 2), though it should be noted that this research was based on appraisal theories of emotion. Specifically, the authors argued that because sadness is associated with the appraisal that certain undesired results are caused by external factors beyond control, this emotion should lead to judgements representing more weight on situational versus personal attribution.

style. People in a negative mood are prompted to adopt a systematic, deliberative processing style, thus focusing more on individuating but less on aggregate-level information (Isbell, 2004; Isbell et al., 2005; Sinclair & Mark, 1991). In turn, those in a negative mood are prone to making equity-based judgements and decisions. Following this rationale, a sad mood should promote consideration of circumstantial information in the mini-UG. Hence, responders in a sad mood, relative to those in a neutral affective state, should be more attentive to the justifiability of an 8:2 offer in different games, which also suggests fewer rejections of 8:2 offers in non-Fair games.

Moreover, in support of the idea that mood can affect decision making in economic interactions, recent research shows that incidental affect can influence responders' decisions in the UG, although existing work mainly concerns specific emotions. For example, Harlé and Sanfey (2007) showed that responders induced into sadness were more likely to reject unfair offers in the UG than those induced into a neutral affective state. Moretti and di Pellegrino (2010) found that, relative to participants exposed to neutral pictures, those exposed to disgusting pictures showed a higher rejection rate for unfair offers in the UG (but see Bonini et al., 2011). According to these results that negative emotion inductions made responders' decisions more severe in the UG, one might expect that negative mood could have a similar effect in the mini-UG. However, we reason that this prediction was not supported if taking the inter-paradigm difference into account. The essential difference between the mini-UG and UG is in light of whether there are conflicting factors in the game which affect the responder's perception of an offer. While the actual allocation in an offer in the UG reveals the motive of the proposer, there are cases in the mini-UG where evaluation of fairness cannot be entirely based on the distribution. Thus, whereas the effect of incidental affect on responders' decisions in the UG can be argued to happen through modulating the emotional processing (Moretti & di Pellegrino, 2010), the hypothesised effect of a sad mood on responders' decisions in the mini-UG considers a trade-off between emotional and more cognitively controlled processing.

In summary, the AAI theorising (Schwarz, 2000, 2002; Schwarz & Clore, 2007) suggests that responders in a sad mood tend to make more comprehensive decisions in the mini-UG. Supportive evidence comes from empirical work showing the advanced effect of a sad mood on deliberative versus intuitive decision making (de Vries et al., 2012), on situational ascription (Forgas, 1998b) and on equity versus equality endorsement (Inness et al., 2005; Sinclair & Mark, 1991). Meanwhile, there is evidence that incidental affect can influence socio-economic decisions (Harlé & Sanfey, 2007; Moretti & di Pellegrino, 2010). Building on this theoretical implication and empirical evidence, we predict that a sad mood in responders in the mini-UG should be associated with a more comprehensive decision making pattern; specifically,

responders in a sad mood should be less likely to reject 8:2 offers in non-Fair games in the mini-UG.

3.2 Study overview

Study 1 used a 2 (mood: neutral, sad) × 4 (game type: Fair, Hyper-fair, No-alternative, Hyper-unfair) × 2 (split: 8:2, 6:4) factorial design. Mood was a between-subject variable and game type a within-subject variable. The third variable, split, referred to the degree to which the offer was unfair, maintained across games. Split was a within-subject variable and had two levels, 8:2 and 6:4 (8 or 6 for the proposer). The four game types were tested at each level of split. Thus, two mini-UGs, i.e., the 8:2 mini-UG and 6:4 mini-UG, were tested (eight game in total). We induced moods using movie clips and measured mood by assessing change in general feeling after watching the movie clip and by using a 16-item mood questionnaire.

The 6:4 mini-UG was included as a control for responders' intensive emotion in response to an disadvantageous inequality, and thus a control for an emotion/deliberation conflict. Existing data show that 5:5 and 6:4 offers are almost evenly likely to be accepted in the UG (Dunn, Makarova, Evan, & Clark, 2010; Ma et al., 2012; Moretti & di Pellegrino, 2010).[7] It thus seems that, when faced with such minor inequality, people might not feel emotionally compelled to reject the offer. This presumed absence of intense emotion suggests no or a very low emotion/deliberation conflict when confronted with a 6:4 offer. Accordingly, we predicted that there would be no mood effect on responders' decisions in the 6:4 mini-UG.

3.3 Experimental hypotheses

Two predictions were most important for the purpose of Study 1. First, we predicted an interaction between game type and mood for responders' decisions in the 8:2 mini-UG. Specifically, we expected that the neutral and sad mood conditions would not differ in response to an 8:2 offer in the Fair game, given the salience of selfishness implied by the offer. In contrast, based on the rationale mentioned earlier, we expected that the sad mood induction would be associated with fewer rejections of an 8:2 offer than the neutral mood induction. Second, we

[7]To our knowledge, there has been no study purposely investigating the comparable likelihood of accepting 5:5 and 6:4 offers, presumably because most people have implicitly agree with this judgement. This is manifested by such designs that 5:5 and 6:4 offers were both treated as *fair* offers (Harlé & Sanfey, 2007). The studies we refer to here did no explicitly compare the two offers either; however, the comparability of acceptance rate can be easily derived from their published data.

predicted that for all types of games in the 6:4 mini-UG, mood induction would not influence the likelihood of rejecting a 6:4 offer, because the slightly unequal split was not expected to posit an intense emotion/deliberation conflict. The two predictions, in combination, predicted a three-way (i.e., game type × mood × split) interaction.

In addition, while less important for our purpose, we expected an effect of game type that was consistent with previous research results (Falk et al., 2003), such that the likelihood of rejecting an 8:2 or 6:4 offer would be higher in a Fair game than in non-Fair games. Finally, we expected a split effect such that the likelihood of rejecting 8:2 offers would be higher than that of rejecting 6:4 offers.

3.4 Method

3.4.1 Participants

Twenty-three volunteers (11 females, 12 males; aged 9 to 44) participated in the experiment. Nineteen of the 23 participants were students at the University of Glasgow. Participants were recruited through posters across the university campus, an email list from the lab subject pool or word of mouth. Because other studies in our lab involved strategic economic games (e.g., the UG and mini-UG), each participant was confirmed as not having participated in such experiments run in the lab before (based on the lab database record). Each participant was paid £1 as a show-up fee, and, on the top of this, received money earned from the mini-UGs. One participant played the role of the proposer and 22 played the role of the responder. Of the responders, 12 were randomly allocated into the neutral mood condition and 10 into the sad mood condition.

3.4.2 Materials

3.4.2.1 Mood manipulation (mood induction and check of manipulation)

The movie clip used to induce a negative mood was edited from the movie "Sophie's Choice" (the length of the clip was 3 minutes, 38 seconds). The movie clip used to induce a neutral mood was either a segment from a documentary about the history of the Christmas holiday (5 minutes, 30 seconds) or a segment form a documentary about Roman history (5 minutes, 25 seconds).[8]

[8]We switched to Roman history clip after finding that the Christmas-history clip induced a slightly high level of happiness (instead of a neutral mood) in the first six participants.

The three clips were originally downloaded from the public video website Youtube and were edited by the movie editing software MediaEdit. Participants wore headphones when watching the movie clip.

To check the effectiveness of the mood induction, we measured change in feeling after watching the movie clip compared to before it, using an 11-point (from -5 to 5) scale. The change-in-general-feeling questionnaire was as follows:

- *On a scale from -5 to 5, please indicate how you felt after watching the movie clip:*

  -5 – *The clip made me feel much worse than before watching it.*
  0 – *There was no change in my mood.*
  5 – *The clip made me feel much better than before watching it.*

We also measured mood using a 16-item mood questionnaire; each emotional item was measured on a 0-8 scale. The questionnaire asked participants how strongly they felt each emotion *when watching the movie clip*:

- *On a scale from 0 to 8, please indicate how strongly you felt x (x represented an emotional item)*

  0 – *Did not feel this emotion at all.*
  8 – *Felt this emotion very strongly.*

Of the 16 emotional items, two (*sadness*, *pain*) measured a sad mood and three (*happiness*, *amusement*, *contentment*) measured a relative positive mood. Anger and disgust, as two discrete emotions related to moral decisions, were also included because they are known to influence economic decisions involving a concern for fairness (e.g., Chapman, Kim, Susskind, & Anderson, 2009; Moretti & di Pellegrino, 2010; Sanfey et al., 2003). The remaining nine emotions named in the questionnaire were: *interest*, *fear*, *tension, relief*, *contempt*, *embarrassment*, *confusion*, *surprise* and *arousal*. These diverse emotions were involved to make it less obvious to participants that the movie clips were intended to induce certain affective states. This questionnaire was based on that used by Gross and Levenson (1995).

3.4.2.2 The mini-UG stimuli

Table 3.1 shows the eight games included in the experiment. In each game, the amount to be divided between the proposer and responder was £1. Allocations were made in 10p increments. For example, an 8:2 offer meant 80 pence for the proposer and 20 pence for the responder. The 2nd and 3rd columns in the table correspond to the 8:2 mini-UG. In each of the four

games, one option was an 8:2 offer. The alternative options in the 8:2-Fair, -Hyper-fair and -No-alternative games were the same as those in Falk et al. (2003). In the 8:2-Hyper-unfair game, we used a 9:1 offer instead of the 10:0 offer in Falk et al.'s study. This was to ensure that the comparison between options in each game was subject to the fact that the responder could receive money from either option. If the alternative option in the 8:2-Hyper-unfair game was 10:0 offer, due to the extremity of unfairness, the comparison between options in this game could be more sensitive than that in other games. The two rightmost columns correspond to the 6:4 mini-UG, in which the same option across games was a 6:4 offer. Alternative offers in the 6:4-Fair, -Hyper-fair, -No-alternative and -Hyper-unfair games were 5:5, 4:6, 6:4 and 8:2.

Table 3.1: The 8:2 and 6:4 mini-UGs in the experiment.

Game Type	8:2 mini-UG		6:4 mini-UG	
	8:2 offer	The alternative option	6:4 offer	The alternative option
Fair	8:2	5:5	6:4	5:5
Hyper-fair	8:2	2:8	6:4	4:6
No-alternative	8:2	8:2	6:4	6:4
Hyper-unfair	8:2	9:1	6:4	8:2

Figure 3.1 shows the appearance of a game displayed on the computer screen during the experiment. The two options available to the proposer were shown as Options A and B. To minimise demand characteristics of the game, we described the roles of proposers and responders as *Participant 1* and *Participant 2*; we showed the label "Amount for Participant 1 (2)" on the left (right) top of the option rows. Option A was an 8:2 or 6:4 offer in each game (depending on the split version); thus, the value of x (shown in the Option A panel) was 80 or 60. The value of y depended on both split version and game type. For example, in the 8:2-Fair game, x was 80 and y was 50; in the 6:4-Hyper-fair game, x was 60 and y was 40.

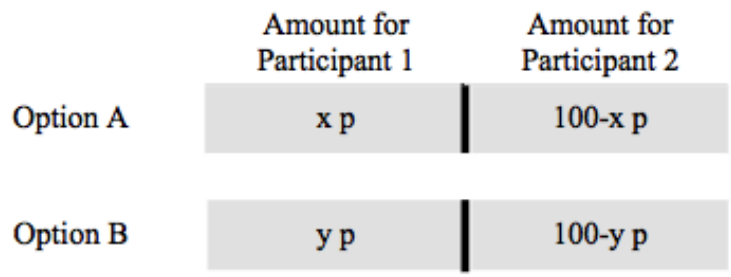

Figure 3.1: Diagram of the appearance of one game displayed on the computer.

3.4.3 Procedure

Each participant was tested in an individual experiment booth. During the experiment, participants were seated in front of an iMac computer terminal in the booth. On the wall inside the booth, there was a switch button controlling a light in the room where the experimenter stayed. Participants could call the experimenter for help using this equipment throughout the experiment.

After arriving in the experiment booth, participants read a content form that stated that the whole session included two "unrelated" experiments because the duration of each was short. They were informed that "Experiment 1" investigated memory for feelings and "Experiment 2" involved several decision making tasks. The "first" and "second" experiments were in fact the mood induction and mini-UG procedures. This guise was intended to reduce the demand effect of knowing that the experiment examined mood effect on decision making. After signing the consent form, participants read an instruction form explaining the whole procedure. They were told that the task of Experiment 1 was to remember their feelings evoked by a movie clip after 15 minutes, and that during this interval they would take part in Experiment 2. They were told that doing Experiment 2 also ensured that all participants were occupied with the same task while trying to remember their feelings. Participants were then instructed to learn the mini-UG whilst being told that this prior learning was to ensure that they could finish Experiment 2 within the 15-minute time window.

At the learning session, the mini-UG was described as a task of dividing Âč1 between two participants. Participants were presented with the diagram as shown in Fig 3.1 as well as details and rules of the mini-UG on the instruction form. At this learning stage, the diagram showed only "x", "100-x", "y" and "100-y" to represent possible values instead of showing specific numbers. This was to avoid participants making decisions prior to the mini-UG procedure. Participants were told that they had been randomly assigned as Participant 1 or 2. They were told that they would perform the division task eight times and each time they would be partnered with a different person. After reading these instructions, participants answered four questions on the computer (shown below) to check whether they had understood the mini-UG properly. The four questions and correct answers (in parentheses) were as follows:

What is the least you can earn in one round? (0)
What is the least the other participant can earn in one round? (0)
What is the most you can earn in one round? (100 pence)
What is the most the other participant can earn in one round? (100 pence)

Note that the above instruction was an attempt to ensure that participants' decisions were not affected by the concern that they were repeatedly interacting with the same player. Also, when playing the games within the following experimental session, participants were not really playing with another person (which was explained during the debriefing session at the end of the experiment).

Before participants started to watch the movie clip, they were reminded that after the 15-minute period they would be answering questions about their feelings when watching the movie clip. Participants in the role of the responder watched either the negative- or neutral-mood induction movie clip. The participant in the role of the proposer was randomly allocated into the sad mood condition and watched the sad-mood movie clip.

The mini-UG procedure started immediately after the movie clip finished playing. The eight games were presented in a random order. For the presentation of each game, the game diagram was shown in the middle of the page, with x and y being specific values, according to the game. On the top of the diagram were instructions for submitting responses. The participant in the role of the proposer was asked to press "A" or "B" on the keyboard to choose Option A or B. Participants in the role of the responder were asked to indicate their decisions regarding both options in each game before learning the final offers. Specifically, they could chose Option A or B by pressing the "A" or "B" key, and could accept either option by pressing "C" or reject both by pressing "D". This strategic method prevented us from missing small-likelihood events (e.g., an 8:2 offer in the Fair game) and guaranteed the collection of responders' decisions to 8:2 or 6:4 offers in all types of game. Previous research indicates that responders' decision patterns in the mini-UG did not differ between such a strategic data collection method and a sequential-response method (Ohmura & Yamagishi, 2005). Upon completion of the eighth (last) game, participants answered the change-in-general-feeling question and the 16-item mood questionnaire in sequence. At the end of the experiment, participants completed a questionnaire asking for demographic information (age, nationality, profession). Finally, participants were carefully debriefed (both verbally and with

a debriefing form) and paid.[9]

3.5 Results

Because the experiment purpose was to examine mood's influence on responders' decisions, results were on data from the 22 participants in the role of the responder in the mini-UG.

3.5.1 Results for mood manipulation

3.5.1.1 Changes in general feeling

Figure 3.2 shows the change in general feeling after watching the movie clip. A positive value shows the extent of feeling better, and a negative value the extent of feeling worse; the value of zero means no change. The black and grey bars correspond to the sad and neutral mood conditions. On average, participants in the sad mood condition felt worse ($M = -2.60$) after watching the sad movie clip, whereas those in the neutral mood condition felt no different after watching the neutral mood clip (indicated by the error bars overlapping with zero). Qualifying this observation, one-sample t-test revealed that change in general feeling was significantly different from zero in the sad mood condition ($t(9) = 3.62$, $p = .006$) but not in the neutral mood condition ($t(11) = 1.91$, $p = .082$). In addition, Welch t-test revealed that the sad movie clip induced a worse feeling than the neutral movie clip ($t(17.12) = 4.05$, $p < .001$). Thus, the mood manipulation procedure had the desired effect, as measured on the change-in-general-feeling scale.

3.5.1.2 Emotion ratings

Figure 3.3 shows mean values on the positive and negative emotions rated in the mood questionnaire. The grey and white bars correspond to the neutral and sad mood conditions. For the three emotions measuring a positive mood (*happiness*, *amusement*, *contentment*; the left-most three groups of bars), ratings were above zero but at levels lower than the midpoint

[9]Decision binding and earning calculation in the mini-UG: For each game, the proposer and responder's decisions were binding. That is, if the proposer chose, e.g., Option A, and the responder had previously indicated he would accept the offer, both sides received money as divided in Option A; otherwise, both received nothing. Each party's final payment from the mini-UGs was the sum of earnings from the eight games. The one participant playing the role of the proposer was recruited later than those playing the role of the responder; he was thus paired randomly with eight responders. Participants playing the role of the responder were all paired with the same proposer. This was different from the experimental instructions and was thus explained in the debriefing.

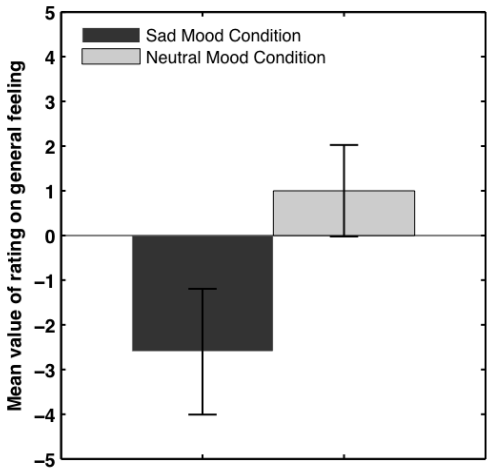

Figure 3.2: Mean values of change in general feeling after the mood induction in the sad and neutral mood conditions. The hash-markded bars represent 95% confidence intervals (CIs).

of the scale in the neutral mood condition; they were non-significantly different from zero in the sad mood condition, as indicated by the zero-overlapping 95% CIs. Welch t-test showed that all three positive emotions were significantly different between the two mood conditions ($ps < .018$), suggesting that participants in the sad mood condition felt less positive than those in the neutral mood condition.

Of the eight negative emotions (see the rightmost eight groups of bars), six were rated above the scale midpoint in the sad mood condition, whereas in the neutral mood condition, they were either undifferentiated from zero or rated below the midpoint of the scale. Welch t-test revealed that except for *contempt* and *embarrassment* ($p = .218$ and .444, respectively), the negative emotions were rated significantly higher in the sad mood condition than in the neutral mood condition ($ps < .032$). Despite the desirable effect on the scales of the two emotions measuring a sad mood (i.e., *sadness* and *pain*), the induction of a sad mood lacked discreteness given the similar intensity reported for other negative emotions by sad-mood-condition participants. Specifically, of the six negative emotions differentiated between the two mood conditions, sadness, pain, anger, disgust and tension were induced at an indistinguishable level within the sad mood condition (one-way repeated measures ANOVA: $F(5, 45) = 2.89$, $p = .024$; $\eta^2 = .05$; pairwise comparisons with Bonferroni correction showed only a marginally significant difference between sadness and fear, $p = .057$). These results indicate that the worse feeling reported after watching the sad movie clip was induced by multiple negative emotions, including both sadness and those that are qualitatively different from sadness. More importantly, this leads to the issue that qualitatively different negative emotions might have counteracted in affecting responders' decisions in the mini-UG. I will

address this problem later.

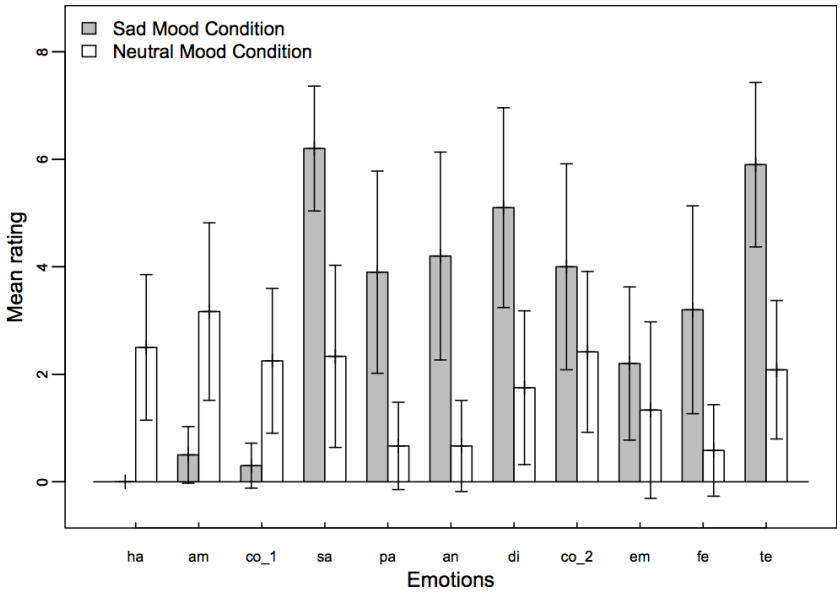

Figure 3.3: Mean ratings on the postive and negative emotions. The hash-marked bars represent 95% CIs. Emotions labeled on the x-axis, from left to right, are: happiness, amusement, contentment, sadness, pain, anger, disgust, contempt, embarrassment, fear and tension.

3.5.2 Results for decisions in the mini-UGs

Figure 3.4 shows the proportions of 8:2 (left panel) or 6:4 (right panel) offers rejected in the four types of game in the two mood conditions. The dark and light grey bars correspond to the neutral and sad mood conditions. In each panel, the bar groups, from left to right, correspond to the Fair, Hyper-fair, No- alternative and Hyper-unfair games (labelled on the figure as "F", "HF", "NA" and "NU"). Comparison of the two panels shows the expected pattern that rejection rate was on average lower for 6:4 than 8:2 offers (20% vs. 49%). Also, in both mini-UGs, the rejection rate was highest in the Fair game, where a 5:5 offer was available, and was lower in non-Fair games, where there were situational forces. This is consistent with previous research (Falk et al., 2003; Sutter, 2007). It is also notable that the difference between the 6:4 non-Fair games and the 6:4-Fair game (45% vs. 12%) was greater than that between the 8:2 non-Fair games and the 8:2- Fair game (63% vs. 43%). This comparison indirectly but essentially suggests an effect of outcome, i.e., distribution of a payoff. That is, in comparable conditions in terms of situational force, a seemingly unfair offer was more

likely to be accepted when the disadvantage was smaller.

More important for our purpose is the comparison between the two mood conditions across game types in each mini-UG. We first look at the 8:2 mini-UG panel. Based on research showing a facilitating effect of negative mood on deliberative processing, we predicted that the likelihood of rejecting an 8:2 offer in the non-Fair games would be smaller among sad- than neutral-mood participants. However, the present data show quite the opposite. It seems that a greater proportion of sad-mood than neutral-mood participants rejected an 8:2 offer in the Fair, Hyper-fair and No-alternative games, and the two mood conditions were similar in term of the proportion of rejecting an 8:2 offer in the Hyper-unfair game. A very similar pattern was observed for the 6:4 mini-UG (right panel). Considering the diminishing effect shown by the 6:4 versus 8:2 split, this higher proportion of sad-mood participants rejecting 6:4 offers implies that sad-mood participants might be more sensitive to inequality than neutral-mood ones. In this respect, the sad mood condition shows an overall more dominant outcome effect than the neutral mood condition.

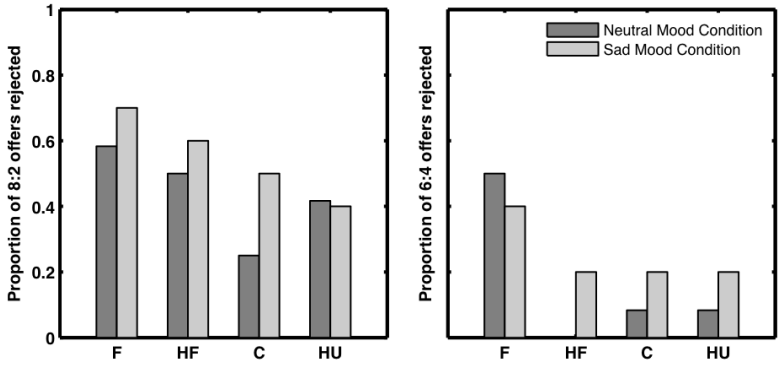

Figure 3.4: Proportion of 8:2 offers rejected as a function of game type and mood condition

Participants in both mood conditions responded to all games; thus, decision data were both binary and within-subject correlated. Also, none of those in the neutral mood condition made a rejection decision in the 6:4 Hyper-fair game. This means we had a "quasicomplete" issue (Albert & Anderson, 1984): there would be an empty cell if we drew a three-way table implied by the three experimental factors (i.e., split, game type and mood). Since the three-way interaction was within our interest, the separation caused a problem in parameter estimation using archetypical logistic regression: the coefficient for the three-way interaction and its standard error would be infinite. Considering this technical problem as well as the feature of data, we conducted Bayesian generalised linear mixed model analysis using a Markov

Chain Monte Carlo (MCMC) sampling method. Generally, this approach follows the rationale of Bayesian estimation, whereby a parameter in a model is given its prior distribution first, representing a prior belief of the parameters. With data at hand, a posterior distribution of the parameter is then obtained through computation following Bayes' rule (for a comprehensive introduction, see, e.g., Kruschke, 2011). The posterior represents an updated belief about the parameter given the evidence (i.e., data). Thus, the Bayesian estimation of a parameter upon its posterior is assessed in terms of *credibility* instead of significance in the conventional "null hypothesis significance testing" (NHST; Kruschke, 2011, 2012). The MCMC sampling is performed to generate a large representative sample of the posterior distribution, given the prior and the available data.[10]

Our model was a binomial mixed-effect model, including split, game type and mood as fixed factors, and participants as a random factor. All the three fixed factors were set as categorical variables, with 8:2 split, Fair game and neutral mood condition as reference categories, respectively. The model estimated coefficients for the three fixed factors and all implied interactions. It used the logit link function. For each fixed effect, the prior distribution was a normal distribution with a mean of zero and a variance of $(1+\pi^2/3)$; this variance was chosen to ensure the prior distribution was flat on the probability scale (Hadfiled, 2010). The prior distribution for the variance-covariance matrix of residuals and that for random effect were inverse-Wishart distributions (V = 1, nu = .002). The MCMC sampling was with 30,000 burn-in steps,[11] 1,000,000 iteration steps and a thin rate of 10 (i.e., one of every ten steps was saved). So, for each fixed effect, we obtained a 100,000 sized sample of its posterior distribution. The analysis was conducted using the MCMCglmm package in R (Hadfield, 2010)

Figure 3.5 shows posterior distributions of coefficients tested in the model above. The coefficients were in terms of log odds ratio and were relative to a certain reference level (or a combination of reference levels). Thus, the top left panel, showing the intercept, corresponds to the 8:2 Fair game in the neutral mood condition. The "Hyper-fair" panel (Row 2, Column 1) corresponds to the effect of the 8:2 Hyper-fair game relative to the 8:2 Fair game in the neutral mood condition. The "6:4 Game" panel (Row 1, Column 2) corresponds to the effect of the 6:4 Fair game relative to the 8:2 Fair game in the neutral mood condition. The "Sad"

[10]Introduction of the technique is far beyond the scope of the thesis. See Gelman, Carlin, Stern & Rubin (2004) and Kruschke (2011) for comprehensive introductions.

[11]Initial steps of an MCMC sampling chain are usually not stable. Burn-in refers to discarding these initial steps.

panel (Row 1, Column 3) corresponds to the effect of the 8:2 Fair game in the sad mood condition relative to the 8:2 Fair game in the neutral mood condition. The remaining panels correspond to non-additive (i.e., interactive) effects of factors concerned.

In each panel, the mean of the distribution is shown at the top of the histogram. The green text below shows the proportion of the distribution that was smaller or larger than zero. The bold line at the bottom shows the 95% High Density Interval (HDI), with its range labeled at each end of the line. The 95% HDI is an interval of the distribution in which each point has a credibility level higher than 5%. If the 95% HDI contains zero, it means that zero is more than 5% believable and is counted as a credible value of the estimate. This is shown to be the case in all panels in Fig 3.5, suggesting that for all these coefficients, zero cannot be excluded as an incredible estimate. However, for $\beta_{64Split}$ (Row 1, Column 2) and $\beta_{No-alternative}$ (Row 3, Column 1), zero can be considered as an incredible estimate if one slightly increased the credibility level to 6% (corresponding ranges of 94% HDI were $[-4.78, -.027]$ and $[-4.65, -.028]$ for $\beta_{64Split}$ and $\beta_{No-alternative}$, respectively).

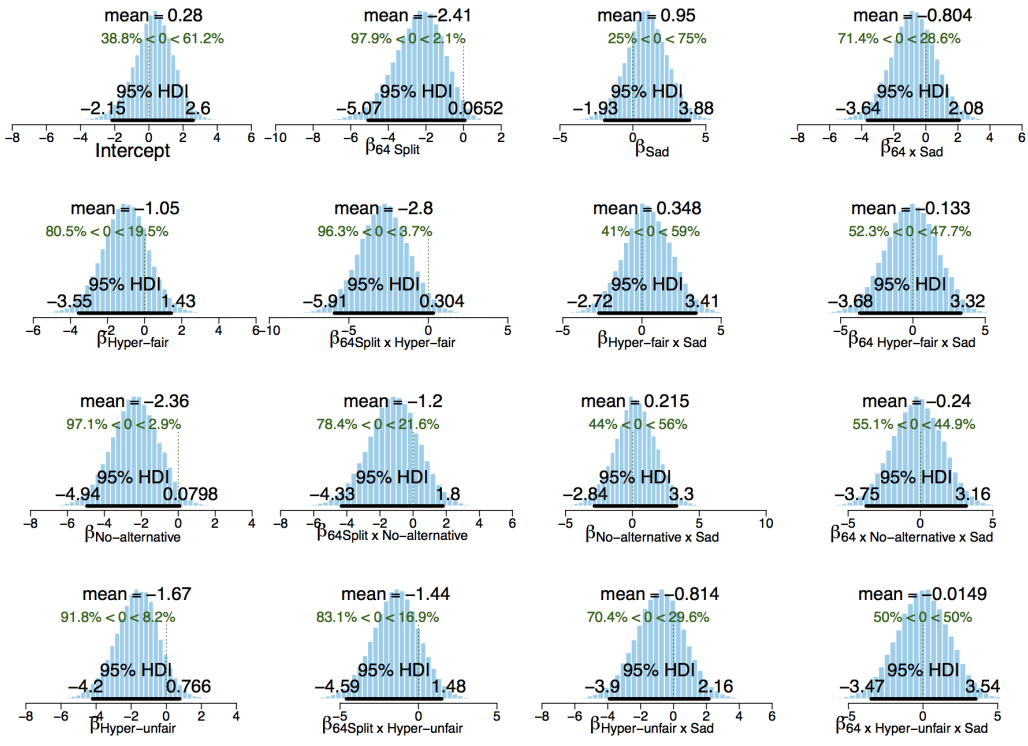

Figure 3.5: Posterior distributions of coefficients in the binomial mixed-effect model for decision data.

The above results suggest 1) that the likelihood of rejecting unfair offers in Hyper-fair and Hyper-unfair games was not credibly different from that in the Fair game, and 2) that, more

importantly for our purpose, the likelihood of rejection was not credibly different between the sad and neutral mood conditions in any tested game. Figure 3.6 demonstrates the latter point more directly. The figure shows the posterior distributions of the differences in rejection likelihood between sad and neutral mood conditions in the eight games. The top and bottom panels correspond to 8:2 and 6:4 games. Each panel presents a 95% HDI including zero, suggesting, again, the two mood conditions were not credibly different in terms of the likelihood of rejecting an unfair offer. (a same pattern was revealed by Fisher Exact Test on each game; see Table 3.2). While the results for the 8:2 Fair game and the 6:4 mini-UG were consistent with our initial hypotheses, those for the 8:2 non-Fair games were not.

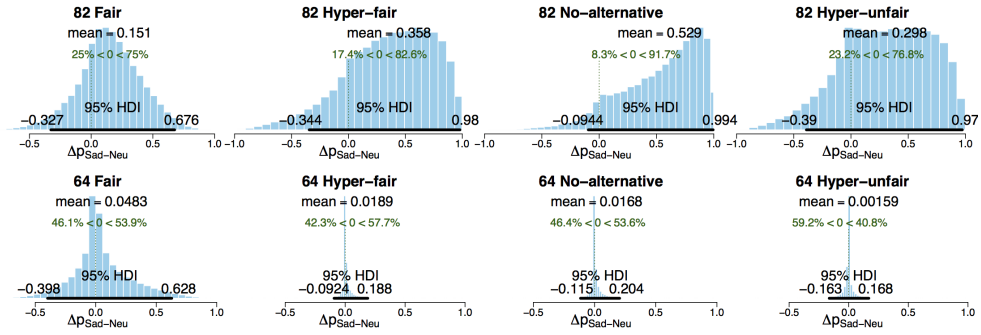

Figure 3.6: Posterior distributions of the difference in rejection likelihood between the sad and neutral mood conditions.

Nevertheless, for the 8:2 non-Fair games, the posterior distributions show a trend that rejection of unfair offer was more likely in the sad mood condition than in the neutral one. Considering the small sample size, we conducted a power analysis with respect to the hypotheses that rejection was more likely in the sad than neutral mood condition in the 8:2 Hyper-unfair, 8:2 No-alternative and 8:2 Hyper-unfair games, respectively. The power analysis used the method proposed by Kruschke (2011, 2012) in the Bayesian framework, by which the power was approximated from the posterior distribution of parameters rather than from point estimates as in NHST. The procedure was as follows: 1) data simulation based on the posterior estimates, with a planned number of subjects; 2) running the Bayesian binomial regression, as above, on the simulated data; 3) assessing whether the hypothesis was met; statistically, the hypothesis would be that the smaller end of the 95% HDI was larger than zero; 4) repeat steps 1-3 many times (N_t = 200 in our analysis). Using this method, power referred to the proportion of times the hypothesis was met. When the planned sample size in Step 2 imitated the actual sample size in this experiment ($N_{neutral}$ = 12, N_{sad} = 10), the power was zero for the 8:2 Hyper-fair and Hyper-unfair games, and the power for the 8:2

Table 3.2: Results of Fisher Exact Test (two-tailed) on comparisons of proportion of 8:2 or 6:4 offers rejected between the neutral and sad mood conditions.

Game Type	8:2 mini-UG	6:4 mini-UG
Fair	.675	.691
Hyper-fair	.691	.195
No-alternative	.378	.571
Hyper-unfair	1	.571

No-alternative game was rather low (0.5%, i.e., only 1 of the 200 simulations achieved the hypothesis). Simulating data with a large sample size ($N_{neutral}$ = 200, N_{sad} = 200) did not increase the power of the experiment for any of the three games. This extremely low/zero power of the experiment gives consideration to problems of both the initial hypothesis of Study 1 and the experimental design. I will discuss the two aspects in the discussion section and the thesis discussion chapter.

Despite the above results, the sad mood condition shows an overall higher rejection rate than the neutral mood condition (40% (32/80) vs. 30% (29/96)), giving rise to the idea that the sad mood induction increased one's sensitivity to distributional inequality. A straightforward implication would be that sad-mood responders' decisions were relatively insensitive to intention variation across different types of games. Broadly, this had been met by the above results of non-significant effects of game type and mood-game interaction.

To further test for the proposed insensitivity to intention, we performed Cochran Q test on decisions to 8:2 offers in the 8:2 mini-UG and on 6:4 offers in the 6:4 mini-UG. The null hypothesis was that rejection likelihood was the same across different types of games. Analyses were performed for each mood condition. In the neutral mood condition, only for the 6:4 mini-UG was there a statistically reliable difference in rejection likelihood across game types ($Q(3)$ = 12.00, p = .007). Pairwise comparison showed the rejection rate was lower in each of the 6:5 non-Fair games than in the 6:4-Fair game (ps < .032). In contrast, the likelihood of rejecting an 8:2 offer did not differ between games in the 8:2 mini-UG ($Q(3)$ = 3.75, p = .273). In the sad mood condition, responders' decisions were insensitive to intention in both mini-UGs (8:2 mini- UG: $Q(3)$ = 3.74, p = .290; 6:4 mini-UG: $Q(3)$ = 3.6, p = .308).

These results have two important implications. First, the disparity between the two mini-UGs in the neutral mood condition essentially suggests a dominant role of payoff distribution in responders' decisions. In other words, responders might not be as concerned with the varying justifiability of an offer as presumed. In this respect, responders' decisions could have been chiefly based on emotional processing. Second, and accordingly, sad-mood participants'

indistinguishable decisions among 6:4 games are in line with research illustrating the influence of negative affect on strategic economic decision through modulating emotional processing (Harlé & Sanfey, 2007; Moretti & di Pellegrino, 2010), suggesting an increased sensitivity to distributional inequality. However, this pattern was possilbly due to that both sadness and anger/disgust were induced by watching the "sad" movie clip.

3.5.3 Mediation analysis for an indirect effect of mood induction

As seen in the results section for mood rating, six negative emotions, i.e., sadness, pain, anger, disgust, fear and tension, were rated significantly higher in the sad mood condition than in the neutral mood condition. Meanwhile, these six negative emotions were induced indistinguishably within the sad mood condition. Although sadness was expected to decrease rejections of (highly) unfair offers, as in our initial hypothesis, anger and disgust would be expected to have an opposite effect, based on both the UG research and the "appraisal-tendency" framework for the influence of incidental emotions on decision making (Han, Lerner, & Keltner, 2007; Lerner & Keltner, 2001; Lerner & Tiedens, 2006). Both anger and disgust have been shown to be associated with rejections in the archetypical UG (Chapman et al., 2009; Moretti & di Pellegrino, 2010; Sanfey et al., 2003). Moreover, the "appraisal-tendency" framework posits that an incidental emotion affects subsequent decisions by carrying over appraisals characterising the emotion. Anger is associated with the appraisal of certainty and individual control over the situation (Han et al., 2007); it would in turn give rise to dispositional attribution and punitive decisions (Small & Lerner, 2008). In support of the proposition, research has shown that angry people tend to emphasise dispositional versus situational factors when making responsibility attribution (Keltner et al., 1993; Small & Lerner, 2008) and that preceding anger can lead to greater punitiveness in subsequent but irrelevant scenarios (Goldberg, Lerner, & Tetlock, 1999). The contrast between sadness and anger/disgust in terms of their influences on responders' decisions suggests that these emotions might have counteracted each other, which resulted in a null effect of the mood induction. To examine this possibility, we conducted a multiple mediation analysis in which the indirect effect of mood induction was modeled to be through the mediation of different emotions operating in parallel.

To begin with the emotion data, Table 3.3 shows pairwise correlations between the six negative emotions that were reported higher in the sad mood condition than the neutral mood condition. The star symbol indicates that bootstrap (resampling time: 25,000) 95% CI of a correlation coefficient does not contain zero, thus suggesting the statistical significance

of the correlation (though this inference should still be taken with caution given the small sample size). Sadness, pain, fear and tension were significantly correlated with each other and the correlations were of at least moderate levels. We thus created a composite variable by averaging the four items (called *sad mood score*).[12] For anger and disgust, although their correlation was not significant, given the sizeable coefficient and their lexical closeness (Marzillier & Davey, 2004; Nabi, 2002) when responding to moral issues,[13] we also averaged them into a single item (called *averse*). Sad mood score and averse were then entered into the following mediation analysis.

Table 3.3: Intercorrelations between the six negative emotions being differentiated between the two mood conditions.

	sadness	pain	anger	disgust	fear
sadness					
pain	0.69*				
anger	-0.03	0.19			
disgust	0.00	0.16	0.70		
fear	0.62*	0.75*	0.27	0.15	
tension	0.58*	0.74*	0.20	0.44	0.58*

Figure 3.7 illustrates the model we proposed when running the mediation analysis. The model integrated an indirect effect of the sad (relative to neutral) mood induction on responders' rejections through the elicitation of a sad mood and an emotion of aversion (corresponding to the sad mood score and averse mentioned above), with the two mediators operating in parallel. In addition, the model specified the path from elicited emotions to responders' rejections as moderated by the extent of unfairness (i.e. *split version*). For the independent variable (i.e., mood condition) and moderator, we set the neutral mood condition and the 6:4 split as the reference level, respectively. We used the bootstrapping method to do the statistic test, with the bootstrap percentile 95% CI of an indirect effect as the inferential statistic (Preacher & Hayes, 2008; Hayes & Scharkow, in press). That is, if the bootstrap 95% CI does not overlap with zero, the indirect effect was significant. We did the analysis

[12] Although fear and sadness are, strictly, qualitatively different emotions, both of them are associated with the appraisals of uncertainty and a lack of control over the current situation. Thus both sadness and fear would be expected to decrease responders' rejections and are comparable in terms of the direction of effect.

[13] In the current experiment, anger and disgust were induced perhaps by the racist content contained in the movie clip.

with 5,000 resamples. The mediation analysis was done using the PROCESS macro written by Hayes (2013) for the statistical analysis software SPSS.

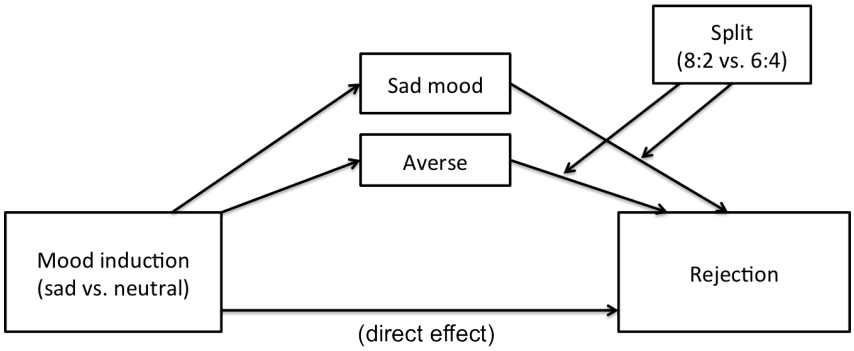

Figure 3.7: Illustration of the moderated mediation model tested here.

Table 3.4 shows results from the multiple mediation analysis. In the upper panel, each row corresponds to the effect at a specific path in the model. As shown by the t/Z [14] column, the paths from mood induction to a sad mood and an aversion emotion were significant, so was the effect of split version on the decision of rejection. No other paths were significant. This is broadly consistent with the results from the hierarchical regression reported earlier.

The lower panel shows specific indirect effects of mood induction through sad mood or averse, for either 8:2 or 6:4 games. The rightmost columns show corresponding bootstrap 95% CIs. All these CIs contain zero, suggesting the none of these specific indirect effects was significant. Thus, although we suspected that the null effect of the mood induction was caused by counteractive operations of sadness and anger/disgust, the results from the mediation analysis suggest that incidental affect induced in the current study did not influence responders' decisions.

3.6 Discussion

Study 1 aimed at investigating the effect of a sad mood on socio-economic decision making using the mini-UG setting. We reasoned that the mini-UG incorporates an emotion/deliberation dilemma, such that rejecting a stingy offer is emotion-laden, whereas accepting it, considering the situational constraints, results from more cognitively controlled processing. Building on

[14] Z for the logistic regression model with the responder's rejection as the dependent variable.

Table 3.4: Output of the mediation analysis.

	B	SE	*t/Z*
mood induction → sad mood	3.38	0.27	12.67***
mood induction → averse	3.44	0.33	10.51***
split → rejection	1.67	0.58	2.89**
sad mood → rejection	0.17	0.14	1.25
(sad mood × split) → rejection	-0.22	0.17	-1.27
averse → rejection	-0.08	0.12	-0.70
(averse × split) → rejection	0.13	0.16	0.81
mood induction → rejection (*direct effect*)	0.36	0.49	0.73

Specific indirect effects, conditional on split version

	B	CI low bound	CI high bound
sad mood, 8:2 games	-0.16	-0.97	0.61
sad mood, 6:4 games	0.59	-0.42	1.53
averse, 8:2 games	0.15	-0.46	0.89
averse, 6:4 games	-0.29	-1.14	0.65

Note: *** $p < .001$; ** $p < .01$

the theoretical position and empirical evidence suggesting that a sad mood would promote a more comprehensive evaluation of the situation, we hypothesised that the sad mood induction would be associated with a lower rejection rate for an 8:2 offer in non-Fair games of the 8:2 mini-UG. Inconsistent with this prediction, there was no systematic difference in the likelihood of rejecting an 8:2 offer between mood induction conditions in non-Fair games. In contrast, our data presented an overall stronger tendency for sad-mood-conditioned participants to reject 8:2 offers. This descriptively noticeable pattern was then considered with the deficiency of the mood manipulation: the "sad" movie clip also resulted a strong induction of anger and disgust. Based on neuroeconomic evidence and the appraisal-tendency framework for emotional effect on decision making, we suspected that anger and disgust could have counteracted sadness in terms of their effects on responders' decisions. However, the following mediation analysis suggests that neither sadness nor anger/disgust influenced responders' decisions in the mini-UG. These results are considered below in relation to outcome salience in the mini-UG.

3.6.1 Re-examination of the mini-UG paradigm

More important for our purpose, the null effect of a sad mood relative to a neutral mood runs counter to the claim that a sad mood would promote responders' consideration of the varying intentions in the mini-UG. We think the indistinguishable decisions between neutral and sad

mood inductions need to be considered with the lack of game type effect in the 8:2 mini-UG.

A particularly noteworthy result was that, whereas neutral-mood participants rejected an 8:2 offer with indistinguishable likelihood across different types of game in the 8:2 mini-UG, their rejection of a 6:4 offer was significantly less likely in 6:4 non-Fair games than in the 6:4-Fair game. Admittedly, the null effect of game type in the 8:2 mini-UG might be due to the small sample size and certain aspects of the experimental procedure. A possible problem was that participants had learnt the game at the beginning of the experiment. Although at that point games were presented using letters instead of exact numbers, so as to avoid participants' encounters with the tested games, participants might still have made punitive decisions ahead of time for unequal offers. However, this intervention should be consistent for both the 8:2 and 6:4 mini-UGs and thus cannot be a plausible explanation for the discrepancy between them in terms of the effect of game type or intention. Rather, as noted earlier, this disparity suggests an impressively dominant role of outcome relative to intention in directing decisions within socio-economic interactions. Whereas an 8:2 offer was uniformly rejected regardless of positive intention, a 6:4 offer was accepted in comparable situations but rejected only when the fairest choice was accessible. Crucially, this calls into question whether the mini-UG paradigm effectively embraces an emotion/deliberation dilemma allowing for examining mood effect on the trade-off between emotional and cognitively controlled processing in making socio-economic decisions.

Our initial construal of the mini-UG was that responders were faced with a dilemma in that they perceived no bad intentions whilst receiving disadvantageous inequality. Implicit in this construal are assumptions (1) that both payoff distribution and intention matter for reciprocity decisions, and (2) that both factors, when working divergently, influence the decisions competitively. The first assumption, as noted earlier, is supported by substantial evidence (e.g., Blount, 1995; Falk, Fehr, & Fischbacher, 2008; Falk et al., 2003; Ohmura & Yamagishi, 2005; Sutter, 2007). However, upon inspection, the second assumption is challenged by research demonstrating a dominant role of payoff distribution in reciprocity behaviour (Bolton, Brandts, & Ockenfels, 1998; Cushman, Dreber, Wang, & Costa, 2009; Stanca, 2010; Xiao & Bicchieri, 2010), which suggests an issue regarding the appropriateness of the experimental paradigm.

There is evidence that intention and intentionality, compared to payoff distribution, barely account for reciprocity behaviour. Bolton et al. (1998), for example, implemented a two-party game similar to the mini-UG, where Player 1's (in a similar role to the proposer) intention could be inferred by comparing chosen options with alternative ones. The authors found that Player 2's (in a similar role to the responder) preference for payoff distribution could explain

the size of their reciprocity nearly perfectly, whereas Player 1's intention had almost no effect.

Stanca (2010) showed a dominant influence of outcome over intentionality on positive reciprocity using a "gift-exchange game". The gift-exchange game involved two players, each of whom was endowed with 20 tokens. Player 1 (the first mover) chose $A \in 0, 1, \ldots, 20$ to send to Player 2 (the second mover), who then received triple the amount of A $(3A)$ and chose $B \in 0, 1, ..., 20$ as a return; Player 1 was then reimbursed with $3B$. Stanca's design implemented the gift-exchange game in four conditions that were differentiated in term of the presence or absence of Player 1's cost (his gifting amount could be reimbursed or not) and Player 1's intentionality (gifting amount was issued by himself or randomly). For example, in the condition where Player 1's gifting amount was chosen randomly and this amount was reimbursed to Player 1 after Player 2 received the gift, there was neither cost nor intentionality. By examining the correlation between Player 1's gifting and Player 2's reciprocity amounts, Stanca (2010) found that the extent to which Player 2 reciprocated Player 1's gift was significantly higher in the condition involving only Player 1's cost than in the condition involving neither cost nor intentionality ("NO-CI" condition). In contrast, the correlations did not differ between the condition involving only Player 1's intentionality and the NO-CI condition, thus highlighting a primary role of outcome over intentionality in positive reciprocity.

Xiao and Bicchieri (2010) extended this line of research and examined relative effects of outcome and intentionality under circumstances where positive reciprocity runs counter to equal allocation, which was also the case in the mini-UG. The authors employed two versions of the "trust game". In the baseline version, a truster and a trustee were both endowed with 40 tokens. The truster decided to send 0 or 10 tokens to the trustee, who then received triple the sent amount. The trustee could in turn reimburse the truster $B \in 0, 5, 10, \ldots, 30$. The "asymmetry" version of the trust game was the same as the baseline game except that the truster was endowed with 80 tokens, and the trustee with 40. Thus, in the asymmetry trust game, if the truster sent 10 tokens to the trustee, any return would result in fewer earnings for the trustee compared to the truster. In short, any degree of positive reciprocity would cause disadvantageous inequality to the trustee (Xiao & Bicchieri, 2010). Data from both trustees and trusters were illustrative of a central position of payoff distribution in guiding reciprocity behaviour. Whereas 55% of trustees in the baseline trust game returned no less than 10 tokens, only 26% did so in the asymmetry condition. Meanwhile, whereas 77% of trusters in the baseline condition expected that the trustee would return no less than 10 tokens, only 22% in the asymmetry-endowment condition reported the same expectation. In line with Xiao and Bicchieri's (2010) findings, Cushman et al. (2009) showed that generosity does not matter in the presence of disadvantageous outcome.

Taken together, the research discussed above suggests that responders in the mini-UG might not, or might to a very low extent, take proposers' intention into consideration at the time of decision making. It is thus plausible that the presumed conflict between emotion-compelling and more reasoning-based decisions in the mini-UG, even while indeed existing, is not so intensive as to posit a dilemma at the moment. Rather, responders could have made decisions largely based on the payoff distribution. Therefore, it is very likely that we encountered a floor effect with respect to the extent to which a responder's decision concerns intention.

Taking into consideration the non-salient effect of intention on positive reciprocity may assist in reconciling the inconsistency of our results with those of Forgas (1998b), Sinclair and Mark (1991) and Inness et al. (2005). In Forgas' (1998b) study, participants received information that an essay-writer argued for an unpopular position as an assignment (thus doing so under situational force). Forgas (1998b) found that participants induced in a sad mood, relative to those in a neutral or happy mood, were less likely to attribute the unpopular position to the writer's dispositional attitude, suggesting a diminishing effect of sad mood on dispositional versus situational attributions. Unlike responders in the mini-UG, who needed to infer a situational force, participants in Forgas' (1998b) study were explicitly informed of the external constraint. In addition, as argued by Avramova et al. (2010), Forgas' impression-making task itself might have facilitated the assessment of all given information. Thus, Forgas' (1998b) paradigm could have more easily activated the consideration of situational constraints than the mini-UG, leaving a space for mood to exert processing effects on attribution. Likewise, participants in Sinclair and Mark (1991) were presented with both equality- and equity-based claims, and those in Inness et al. (2005) were informed of the exact difference in performance between themselves and working partners. Both procedures could have facilitated participants' consideration of external factors. Thus, these studies might better reflect the effect of mood on the weight of situational information.

When considering the inconsistency between the current study and that by Harlé and Sanfey (2007), we should take into account the inter-study difference in light of the presence and quality of intentionality. Harlé and Sanfey (2007) measured the effect of sadness on responders' decisions in the UG where the proposer's offer clearly revealed his intentionality. As shown by Cushman et al. (2009), when payoff distribution and intentionality converge, intentionality matters only when both factors are of negative quality (though it has a smaller effect than payoff distribution). Thus, whereas a responder's rejection of an 8:2 offers in the mini-UG (non-Fair games) is in response to the disadvantageous inequality, the same move in the UG is in response to a negative intentionality in addition to the inequality. This

additional dimension in the UG may explain the increased rejection rate for unfair offers in the sadness condition reported by Harlé and Sanfey (2007). As also argued by the authors, selfish intentionality conveyed by unfair offers in the UG might be exacerbated for sad participants who had a more "pessimistic" perception of the scenario (Harlé & Sanfey, 2007). Indeed, research has suggested that people in a negative mood are more sensitive to offensiveness (Forgas, 1998a).

An additional question casting doubt on the validity of the mini-UG in presenting an emotion/deliberation dilemma is the extent to which the first mover's intention is perceived as kind when his action is expected to be positively reciprocated. Stanca et al. (2009), in addressing this question, showed a negative effect of strategic motivation on positive reciprocity. The authors manipulated the involvement of strategic space in the gift-exchange game as described above, where Player 1 can gift Player 2 tokens at Stage 1, and Player 2 can reciprocate the gift by sending back tokens at Stage 2. The study included two conditions. In the standard condition, both players were fully informed of the exchange-procedure before Stage 1. In the "no-information" condition, both players were informed of Stage 2 only after Stage 1 was over. Thus, in the no-information condition, Player 1's offer revealed exclusively his kind intentionality (Stanca et al., 2009). In contrast, in the standard condition, one cannot rule out that, e.g., Player 1 purposely made a particular offer in the hope of a higher return. Stanca et al. (2009) showed that people are indeed sensitive to such a perception of strategic motivation. In particular, when receiving the same amount of tokens, Player 2 gifted back Player 1 more in the no-information condition than in the standard condition, suggesting a negative effect of strategic motivation on positive reciprocity.

Likewise, the responder in the mini-UG might also have perceived a strategic motivation of the proposer, possibly in a worse way. The responder might construct the belief that the proposer chose an 8:2 offer with a positive anticipation. Further, given the advantageous inequality for the proposer, the responder might even think that their opponent was more empowered to achieve a self-desired outcome. As argued by Alicke (2000), when final outcome can be perceived as being consistent with the actor's desire, concerns for his lack of control over the situation are discounted. In line with this argument, Leslie, Knobe, and Cohen (2006) also showed that "foreseeable" bad side effects could even be attributed to intentionality. These possible complications concerning intention inference mean that the mini-UG might be unreliable to represent the emotion/deliberation dilemma in the way we proposed.

In sum, closer inspection of the mini-UG suggests that this experimental paradigm, although it conceptually incorporates an emotion/deliberation dilemma, may be unable to effectively do so when it involves real decision making. In the following studies in this thesis, we

switched to the trolley-problem-like moral dilemma paradigm. The moral dilemma paradigm, as seen in Chapter 2, posits a dilemma where the emotional cost of a situation-responsive choice indeed has as material payoff (i.e., the welfare of the majority); it is thus assumed to more effectively incorporate an emotional/deliberation dilemma.

Chapter 4

Exploring the Influence of Mood on Moral Judgement (Study 2)

4.1 Introduction

4.1.1 The dual-process model for moral judgement

As reviewed in Chapter 2, Greene et al. (2001, 2004, 2008), building on their studies on moral dilemmas exemplified by the trolley problem (Thompson, 1985), have developed a dual-process model for moral judgement. This dual- process model posits two dissociative, conflicting types of processing: the emotional processing that drives deontological/non-utilitarian judgements (non-UJs) and the cognitively controlled processing that gives rise to utilitarian judgements (UJs). Support for the model comes from, on the one hand, association between emotion and non-UJs and, on the other hand, association between cognitive effort and UJs. The former is evidenced in such findings as that non-UJs show a greater activity in emotion-associative brain regions than UJs (Greene et al., 2004), and that deficit in emotional processing results in a higher likelihood of UJs (Koenigs et al., 2007; Mendez et al., 2005). The latter is revealed in studies showing that brain areas implemented in cognitive control are more activated for UJs than non-UJs (Greene et al., 2004), that cognitive load selectively interrupts UJs (Greene et al., 2008), that working memory ability is positively predictive of UJs (Moore et al., 2008), and that experimentally induced or dispositional tendency of reflective processing increases UJs (Paxton et al., 2012)

4.1.2 Influence of incidental affect on moral judgement

The involvement of emotion in forming moral judgements inspires research that looks at and also shows effects of incidental affect on moral judgement. Schnall et al. (2008), for example,

found that extraneous disgust increased the likelihood of non-UJs in the footbridge dilemma. In a similar vein, Wheatley and Haidt (2005) showed that "hypnotic" disgust (i.e., participants were asked to generate a feeling of disgust when reading certain words embedded into moral-related vignettes) made moral judgement more severe, although their stimuli were different from moral dilemmas exemplified by the trolley problem. More relevant to the current study is that by Valdesolo and DeSteno (2006), who showed that a happy mood increased the rate of UJs in the footbridge dilemma; however, no mood effect was observed for the switch dilemma (called the "trolley dilemma" in their study).

4.1.3 Mood and moral judgement — the present study

To explain this selective effect of positive mood on UJs in the moral personal (MP) dilemma, Valdesolo and DeSteno (2006) provided the explanation that the temporary positive feeling eliminated the otherwise strong aversion caused by the MP dilemma; on the other hand, the moral impersonal (MI) dilemma, i.e., the switch dilemma, did not elicit a comparative emotional negativity and thus was not influenced by the extraneous affect. Implicit in this interpretation is the assumption that mood affects moral judgement by combining the feeling of mood with the feeling of the integral emotion. The tested happy mood, specifically, acts as an affective "buffer" making people more tolerant of the negative emotion elicited by the MP dilemma. We call this the *affective buffer* hypothesis. The affective buffer hypothesis seems to be consistent with the direct mood effect within the AAI theory; that is, a positive mood affects moral judgement by directly conveying a positive (or, less negative) view of the object (dilemma) in question. In this view, negative mood would be expected to decrease UJs in MP dilemmas.

The AAI theory also suggests a processing effect of mood, which would predict the opposite of the affective buffer hypothesis. Positive mood would be expected to increase reliance on the prepotent emotional response and thus decrease the likelihood of UJs, whereas negative mood would be expected to make people think more carefully about the problem and thus give rise to utilitarian judgements. Because such a processing effect is based on how moods "tune" processing style, we call it the *affective tuning* hypothesis. Somewhat in line with this view, Schnall et al. (2008) showed that inducing sadness resulted in less severe moral judgements (though the dependent variable combined the judgement on the footbridge dilemma with that on other types of moral problems).

Study 2, as a preliminary study, examined mood's influence on moral judgement by testing both positive and negative moods. This study included the affective buffer hypothesis and

the affective tuning hypothesis as two alternative hypotheses.

4.2 Study overview

Study 2 examined effects of both positive and negative moods on moral judgements in the moral dilemma paradigm. The experiment used a 3 x 3 factorial design: three mood conditions (*baseline*, *positive mood* and *negative mood*) were tested for all dilemma types (*MP*, *MI* and *non-moral* (*NonM*)). Both factors were varied within subjects across all three levels. The baseline condition referred to the phase prior to mood induction. Mood and moral judgement data collected at this point provided a baseline against which results from the same tasks after mood induction were compared. We induced positive and negative moods using movie clips, with the induction order counterbalanced (i.e., positive or negative mood was induced first). We measured mood using a 0-5 scaled mood questionnaire. For dilemma type, we included NonM as a control for moral relevance, and MI as a control for the intensive involvement of (negative) emotion and thus an emotion/deliberation conflict in moral dilemmas.

We also measured the arousal of emotion in response to dilemmas, using galvanic skin response (GSR; called skin conductance earlier in the review), as a potential useful variable to test for the affective buffer hypothesis. Emotions are typically thought to be composed of at least three components: valenced feeling, physiological arousal and cognitive appraisal (Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005). There has been empirical evidence suggesting a potential link between physiological arousal of emotion and behavioural response triggered by emotion (e.g., Blanchette & Leese, 2011). Another example was van't Wout et al.'s (2006) study, which is important for our purpose. As reviewed earlier, van't Wout et al. (2006) showed a positive correlation between the rate of rejection of unfair offers in the UG and skin conductance. As discussed in Chapter 2, the rejection of unfair offers, which is thought to be consequent to "unpleasant" emotion in response to the offer, conceptually matches non-UJs in MP dilemmas. In addition, skin conductance is thought to be a direct measure of arousal (Greenwald, Cook, & Lang, 1989; van't Wout et al., 2006). I will explain in the following section how the physiological measure might inform the affective buffer hypothesis.

4.3 Experimental hypotheses

Both the affective buffer and affective tuning hypotheses would predict an interaction between mood valence and moral dilemma type (personal versus impersonal), but in different patterns. According to the affective buffer hypothesis, negative mood, contrary to positive mood, would

lead to fewer utilitarian responses for MP dilemmas because it would be assumed to intensify the negative feeling. In addition, it should not affect moral judgements in MI dilemmas because the judgements are not as driven by emotional impulse as in MP dilemmas. Just like manipulation of cognitive load has no effect on the latency for non-UJs in MP dilemmas that are not governed by cognitively controlled processing (Greene et al., 2008), manipulation of emotion would not affect the likelihood of UJs in MI dilemmas that do not rely on emotional processing.

On the other hand, the affective tuning hypothesis would pose an opposite prediction regarding moral judgements in MP dilemmas. Specifically, positive mood would increase the reliance on emotional reaction to MP dilemmas and thus would raise the likelihood of non-UJs in them; negative mood would show the opposite effect. However, the affective tuning hypothesis would also predict no mood effect on moral judgements in MI dilemmas, but based on a different rationale. MI dilemmas, relative to corresponding MP ones, evoke less intensive emotion and thus less intense conflict between emotional and cognitively controlled processing. Presumably, the feature that MI dilemmas are not very tensive makes UJs come very straightforwardly. Support for this notion comes from the finding that the rate of UJs in MI dilemmas is unaffected by such factors as self-involvement in danger and inevitability of death, which would presumably boost UJs (Moore et al., 2008). Thus, the MI type itself appears to generate a ceiling effect. Accordingly, we expected that processing strategy altered by positive or negative mood would not affect moral judgements in MI dilemmas and thus there would be no mood effect.

Hypotheses regarding the measure of physiological arousal of emotion, i.e., GSR, are as follows. As mentioned above, non-UJs in MP dilemmas and rejection of unfair offers in the UG are conceptually matched in terms of the involvement of emotion. Based on this comparison and van't Wout's (2006) result that rejection of unfair offers in the UG was positively correlated with the measure of GSR, we expected non-UJs in MP dilemmas to be linked with increased GSR. Assuming that this hypothesised relationship is confirmed, we made a further experimental hypothesis regarding the affective buffer hypothesis. Because the affective buffer hypothesis suggests that positive mood attenuates the dilemma-triggered negative emotion whereas negative mood enhances it, it would predict that GSR corresponding to MP dilemmas would be highest in the negative mood condition, lowest in the positive mood condition and in-between in the baseline condition.

Finally, with respect to dilemma type, we expected the likelihood of UJs to be highest in NonM dilemmas, given the absence of moral issue in them (the concept "utilitarian" was not applicable for NonM dilemmas; we used this descriptive term only for simplicity). The

proportion of UJs was expected to be lowest in MP dilemmas and in-between in MI dilemmas.

4.4 Method

4.4.1 Participants

Forty people (15 male and 25 female), the majority of whom were students at the University of Glasgow, were recruited for the experiment for course credits or monetary reward.

4.4.2 Materials

4.4.2.1 Mood manipulation (mood induction and check of manipulation)

The movie clips used for mood induction were edited from the "Jurassic Bark" episode of Futurama, an American science-fiction cartoon. The first half of the episode was purely comedic and the second half led to a sad ending. We split the full-length cartoon into two halves and used the first half to elevate mood and the second to depress mood. The length of the first segment was 11 minutes, 21 seconds, and that of the second segment was 9 minutes, 9 seconds.

Mood was assessed using a 10-item questionnaire with a 0-5 scale for each item. The 10 emotional items were selected from the PANAS-X manual by Watson and Clark (1994). Four items measured positive mood (*happy*, *excited*, *delighted*, *cheerful*) and four measured negative mood (*sad*, *blue*, *lonely*, *downhearted*). We also included *anger* and *disgust* because they are known to influence moral judgement (e.g., Russell & Giner-Sorolla, 2011; Schnall et al., 2008; Wheatley & Haidt, 2005); also, some parts of the Futurama episode might have induced them. The six-point scale was based on the measure scale by Watson and Clark (1994), ranging from 0 (emphnot at all) to 5 (*extremely*), and the intermediate steps were labelled as "very slightly", "a little", "moderately" and "quite a bit".[15]

4.4.2.2 Dilemmas

Moral dilemmas (MP and MI dilemmas) were selected from the 24 moral- related scenarios used in Moore et al.'s (2008) work (see Appendix A). For each participant, nine moral-related scenarios were randomly drawn from the entire 24. This design allowed for a variation in

[15]The initial scale by Watson and Clark (1994) ranges from one to five, with the minimum point labelled as "not at all or very slight". We included a zero point to appeal to the more intuitive association between a rating of zero and the phrasing "not at all".

scenarios to control for specific content effect. Both MP and MI dilemmas of each selected scenario were presented to the participant. For example, if the trolley problem was chosen, both the footbridge and switch dilemmas were presented. For NonM dilemmas, we took the nine NonM dilemmas used by Greene et al. (2001), with the only modification in cases involving money, where we switched US to UK currency (see Appendix B). All the dilemmas (moral and non-moral) ended with the question "is it appropriate to x?", where x represented a utilitarian action in moral dilemmas and a moral-irrelevant choice in NonM dilemmas. Three of each type of dilemma (MP, MI and NonM) were pseudo-randomly assigned to each mood condition. The allocation was subject to the constraint that paired dilemmas (i.e., both MP and MI dilemmas of the same scenario) were not presented within the same mood condition. This was done to minimise the likelihood that participants would remember scenarios and simply replicate responses.

4.4.2.3 Galvanic skin response (GSR)

The equipment used for GSR recording was a Biopac MP 150 system coupled with UIM100c, STP100c and GSR100c. Electrodes attached to participants' fingers were Ag-AgCl electrodes (internal diameter = 6 mm). The conductive medium was isotonic gel (0.5% saline in a neutral base). Sampling frequency was set to 200 Hz and recording was low-pass filtered at 1 Hz at the equipment.

4.4.3 Procedure

Participants were individually tested. In the experiment, participants were seated at a table in front of an iMac computer terminal. The experimental room was divided by an office room divider (1.57 meters high and 1.60 meters wide). Participants and the experimenter sat on different sides of the divider so that they could not have visual access to each other. After signing a consent form, participants read an instruction form that explained the experiment as a study of the influence of story presentation order on memory. Participants were instructed that they would be watching two clips from a Futurama episode, either in the proper sequence or not, and that each clip would be followed by some questions. They were also told that their GSR would be recorded throughout the experiment. Electrodes were then attached to participants' distal phalanges of the index and middle fingers of their non-dominant hand. They were asked to keep this hand stable throughout the experiment. The experimenter checked the fidelity of the GSR signal before telling participants that they could initiate the experiment following instructions shown on the computer screen. The experimenter then went

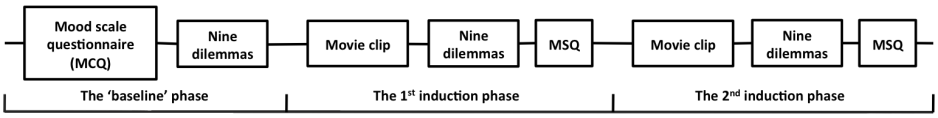

Figure 4.1: Illustration of the sequence of stimuli presentation.

back to sit on the opposite side of the divider. Participants were told that they could call the experimenter if any problems arose and were otherwise left alone.

Figure 4.1 shows the full sequence of stimuli presentations faced by each participant. The three phases correspond to the three mood conditions; the one before the first mood induction is the baseline condition. Participants' GSR was recorded throughout the experiment.

In each mood condition, each participant responded to nine dilemmas — three of each dilemma type — that were shown in a random order. One dilemma at a time was presented on the computer screen in the following way. The full text of each dilemma, including the final question, and instructions for response submission (in red type and shown below the question) were presented simultaneously on one page. Participants responded to each dilemma by pressing the "Y" (representing "Yes") or "N" (representing "No") key on the keyboard.

In the baseline condition, participants responded to dilemmas after completing the mood questionnaire by which they indicated to what extent they "presently" felt each emotion. They then watched one of the two video clips and answered another nine dilemmas presented in the fashion described above. Participants then answered the mood questionnaire asking how they felt when watching the video clip. The same sequence was presented for the second induction phase. We chose this dilemma-then-questionnaire order due to the concern that responding to the mood questionnaire could affect participants' awareness of the mood induction and alter the effect of mood. To ensure a clear measure of GSR to participants' response to each moral dilemma, there was a five-second interval between each dilemma. For the same reason, there was also a five-second delay between experimental tasks (i.e., mood questionnaire, video clip, dilemmas).

After the third mood questionnaire, the end of the experiment was indicated to the participant and the GSR recording stopped. The experimenter then verbally asked participants what they thought the experimental purpose was and their answers were documented. Finally, participants were carefully debriefed about the experimental purpose.

4.5 Results

Because we are primarily interested in the effects of induced moods on moral judgements, it is critical that our induction procedure had a measurable effect on mood. We thus present results from the mood rating measurements before presenting the moral judgement data. We then present the GSR data analysis. For statistical analyses, unless mentioned, statistical significance was tested at the .05 level.

4.5.1 Results for mood manipulation

Self-reported ratings on the items measuring the positive mood (*happy*, *delighted*, *cheerful*, *excited*) and on the items measuring the negative mood (*sad*, *blue*, *lonely*, *downhearted*) were both reliable ($\alpha = 0.81$). Thus for both moods, a single score was created by averaging ratings on corresponding items. We refer to the score for positive mood as *positive mood rating* and that for negative mood as *negative mood rating*.

Half participants were induced with positive mood first and negative mood second and the other half experienced the opposite order. We refer to them as the "positive-first" (PF) and "negative-first" (NF) group, respectively. Considering the possibility that the order of mood induction could have had an effect, we visualised mood rating data from these two groups separately. The left and right panels of Figure 4.2 show the results of positive mood rating and negative mood rating, as a function of mood induction order. The baseline, positive and negative mood conditions are shown by black asterisks, green squares and blue triangles, respectively.

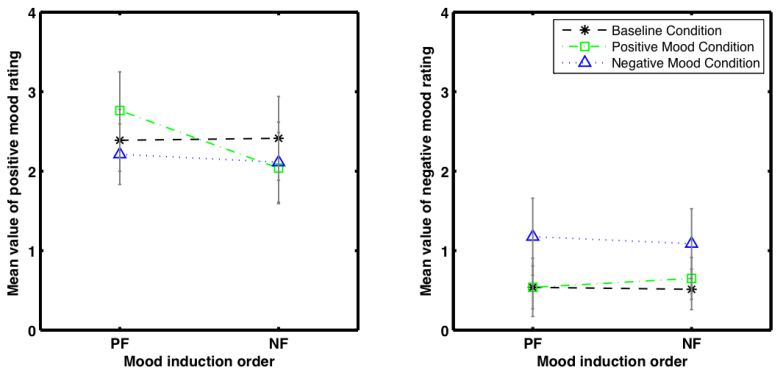

Figure 4.2: Mean value of mood rating as a function of mood induction order and mood condition. Left and right panels correspond to results of the positive and negative mood ratings. Hash-marked bars represent 95% CIs.

Ratings were, on average higher for the positive mood scale (the left panel compared to the right one), suggesting either a bias in response or that most participants were in a positive mood. Importantly, there is an apparent interaction between mood induction order and mood condition for positive mood ratings. Specifically, in the PF order, positive mood ratings were higher in the positive mood condition than in the other two conditions (see the left group of plots in the left panel). The fact that positive mood ratings did not change after the positive mood induction in the NF group suggests that the negative mood induction had a lasting effect that was immune to the positive mood induction. Contrary to this, the positive mood induction seemed to have the desired effect in the PF group. Negative mood ratings (right panel) on the other hand showed no such interaction with mood condition. It is clear however that the negative mood induction had the desired effect of increasing ratings on the negative mood scale. The lack of interaction on the negative mood scale may be due to a floor effect: ratings on this scale were so low to begin with that there was not much room for them to decrease with the positive mood induction. Overall, the pattern of mood rating data suggests that the negative mood induction had more lasting effects than the positive mood induction. It seems that a depressed state induced by watching a sad segment endured through the positive mood induction for the NF group, whereas in the PF order, the positive mood did not endure through the negative mood induction. Because of this asymmetry, mood induction order was included as a potentially important factor in analyses of moral judgement data.

To test for the effects of induced moods on mood ratings, we ran a two-way mixed ANOVA. Mood condition was treated as a within-subject factor and mood induction order as a between-subject factor. Analyses were performed separately for the positive and negative mood ratings. With respect to the positive mood rating, there was a marginal effect of mood condition ($F(2, 76) = 2.84$, $p = .065$, $\eta^2 = .069$), and, consistent with the pattern observed in the left panel of Figure 4.2, a significant interaction between mood condition and induction order ($F(2, 76) = 6.09$, $p = .004$, $\eta^2 = .138$). The main effect of induction order was not statistically significant ($F(1, 38) = .81$, $p = .373$, $\eta^2 = .021$). Planned comparison indicated that in the PF group, positive mood ratings after the positive mood induction was reliably higher than the baseline measure ($F(1, 38) = 3.76$, $p = .060$) and ratings after the negative mood induction ($F(1, 38) = 8.09$, $p = .007$). Contrary to this, in the NF group, positive mood ratings were lower than the baseline measure after both the positive and negative mood inductions ($F(1, 38) = 9.02$, $p = .005$; $F(1, 38) = 5.77$, $p = .021$), and did not differ between the two induction phases ($F(1, 38) = .36$, $p = .552$).

With respect to the negative mood rating, the main effect of mood induction was significant ($F(1.43, 54.20) = 9.93$, $p = .001$, $\eta^2 = .207$). Neither induction order effect nor the two-way

interaction were significant ($F(1, 38) = 0$, $p = 1$, $\eta^2 = 0$; $F(1.43, 54.20) = .24$, $p = .714$, $\eta^2 = .006$, respectively). It appeared that the negative mood induction increased negative mood ratings regardless of induction order. Further comparison revealed that negative mood ratings for the negative induction were reliably higher than baseline and post-positive induction measures ($F(1, 78) = 16.89$, $p < .001$; $F(1, 78) = 13.28$, $p < .001$). Taken together, the results of mood rating suggest a valid induction of negative mood regardless of the order of mood induction. They also indicated an effective positive mood induction when positive mood was induced first. In addition, they revealed an asymmetric effect of mood induction order. For this reason, mood induction order was included as a factor in the following analyses.

4.5.2 Results for moral judgement

4.5.2.1 Primary analyses

Figure 4.3 shows the proportion of UJs as a function of dilemma type. The three colours correspond to the mood conditions. The left panel corresponds to results from data pooled across both of the two mood induction orders (all data). The middle and right panels correspond to results from the PF and NF groups. When the induction order was disregarded, as shown in the "All Data" (AD) panel, the proportion of UJs was lowest for MP dilemmas (56%), second lowest for MI dilemmas (77%) and highest for NonM dilemmas (97%). This pattern is consistent with most previous studies and met the prediction that likelihood of UJs would be higher for MI dilemmas than for MP dilemmas. Contrary to this, there was no clear effect of induced mood on the likelihood of UJs.

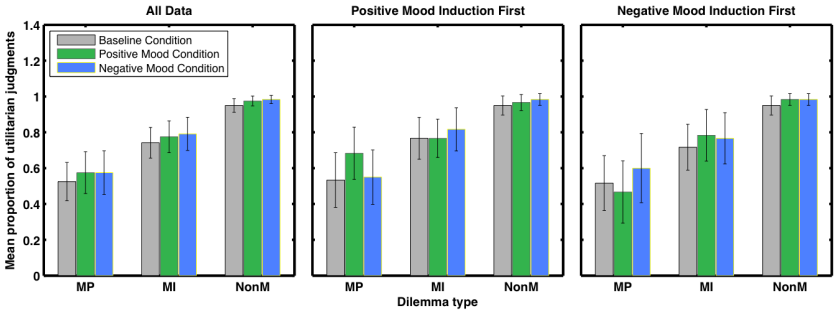

Figure 4.3: Mean proportion of UJs as a function of dilemma type and mood condition. Hash-marked bars represent 95% CIs. The left, middle and right panels correspond to results from aggregated data, the PF and NF groups.

For the statistical analysis, we used a three-way mixed ANOVA and a full factorial model was tested. The model treated mood condition and dilemma type as within-subject variables

and treated mood induction order as a between-subject variable. It tested for main effects of dilemma type, mood induction and mood induction order, two-way interactions between factors and a three-way interaction. The results revealed a significant effect of dilemma type ($F(1.58, 59.91) = 51.10$[16], $p < .001$, $\eta^2 = .574$). Neither mood induction nor mood induction order were found to have statistically significant effects ($F(2, 76) = 2.45$, $p = .093$, $\eta^2 = .06$; $F(1, 38) = .23$, $p = .634$, $\eta^2 = .006$, respectively). The only statistically reliable interaction among these variables was the three-way interaction between mood condition, induction order and dilemma type ($F(4, 152) = 2.55$, $p = .042$, $\eta^2 = .063$).

To explore this three-way interaction, we tested for the interaction between mood condition and dilemma type by running a two-way repeated measure ANOVA at each level of mood induction order. The results showed that, although the F statistic corresponding to the two-way interaction was higher in the PF relative to the NF order, neither of them yielded a significant interaction ($F(4, 76) = 1.71$, $p = .155$, $\eta^2 = .083$; $F(2.41, 45.72) = .96$, $p = .405$, $\eta^2 = .048$, respectively).

Given the order effect of mood induction, we also analysed moral judgement by block, i.e., the *baseline* block and the 1^{st} and 2^{nd} *mood* blocks that were classified by time sequence. Figure 4.4 shows proportions of UJs for the three type of dilemmas in the baseline and the two mood blocks. On average, the three blocks look similar in the proportion of UJs. But for MP dilemmas (red bars), there seems to be a small increase in UJ from the baseline block to the first mood block, following which was a small decrease in UJ in the second mood block.

For statistical analysis, we used a generalised mixed-effect model for logistic regression. The model included participant as a random factor, and dilemma type and block as two fixed factors. The model examined the effects of dilemma type, block and their interaction. For the two fixed factors, non-moral (NonM) type and the baseline block were treated as the reference levels. The model was fitted by maximising the restricted log-likelihood. Wald Chi-square was used as the statistic for overall effects of the two fixed factors and and their interaction. The results showed that significant effects of dilemma type ($\chi^2(2) = 50.20$, $p < .001$) and the interaction between dilemma type and block ($\chi^2(4) = 15.5$, $p = .004$). The effect of block was not significant ($\chi^2(2) = 4.00$, $p = .14$). To examine the interaction, we used a mixed-effect

[16]Mauchly's test indicated that the sphericity assumption was violated when testing for the dilemma type effect. The degrees of freedom were corrected using Greenhouse-Geisser estimate. In cases hereafter where the sphericity assumption was violated, we also used the Greenhouse-Geisser correction and reported adjusted degrees of freedom.

model for logistic regression at each type of dilemma. The model included block as a fixed factor and participant as a random factor, and assigned the baseline block as the reference level. The model thus tests for the effects of the first and second mood blocks relative to the baseline block. Results revealed two significant differences: (1) an increase in UJ for MP dilemmas from the baseline block to the first mood block (β = 1.03, z = 2.49, p = .012); and 2) a higher proportion of UJs for MI dilemmas in the second mood block compared to the baseline block (β = 1.01, z = 2.39, p = .017).

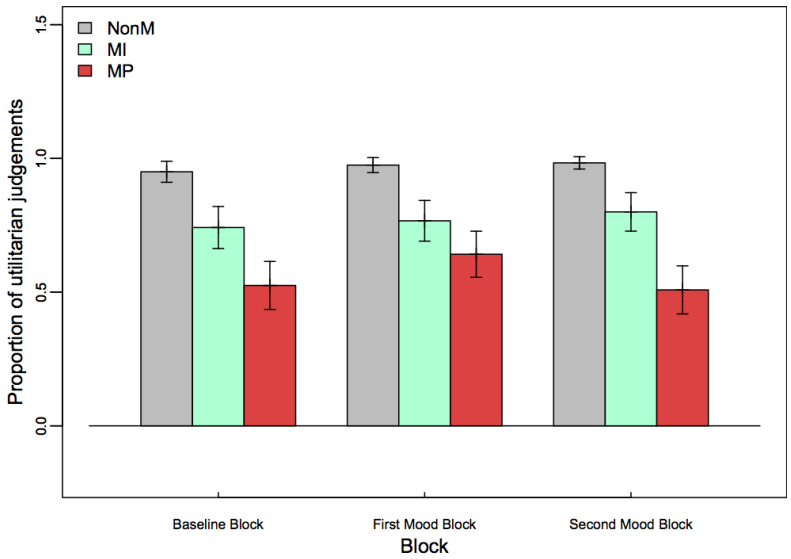

Figure 4.4: Proportion of utilitarian judgements as a function of dilemma type and block. Hash-marked bars represent 95% CIs.

To create a more complete picture of the effect of mood induction on likelihood of UJs for the three dilemma types, we considered shifts in the proportion of UJs. This analysis gave us a greater insight into individual differences of the effect of mood induction than the aggregate data presented above. Recall that each participant responded to three of each type of dilemma in each mood condition. Thus each participant could have provided 0, 1, 2 or 3 out of three possible UJs for each type of dilemma in each mood condition. Specifically, we calculated changes in the proportion of participants making each possible number of utilitarian judgements from the baseline condition to the positive mood condition ($p_{positive-mood} - p_{baseline}$) or to the negative mood condition ($p_{negative-mood} - p_{baseline}$). For example, if 10 of 20 (50%) participants gave 2/3 MP utilitarian judgements in the baseline condition and 12 of 20 (60%) gave 2/3 MP utilitarian judgements in the negative mood condition, the change would be

2/20 (10%). So, in this case, positive numbers represent an increase in the proportion of participants providing 0, 1, 2 or 3 utilitarian judgements and negative numbers represent a decrease. We will refer to the four points in the distributions as $p(n/3)$ where n is 0, 1, 2, or 3.

Figure 4.5 shows this change in the proportion of participants who provided 0, 1, 2 or 3 out of three UJs for the two mood conditions. The end points on the vertical bars are 95% CIs and the hash marks on these bars are 68% CIs. CIs were determined using a bootstrapping procedure. Red or yellow bars show proportion changes from the baseline condition to the positive or negative mood condition.

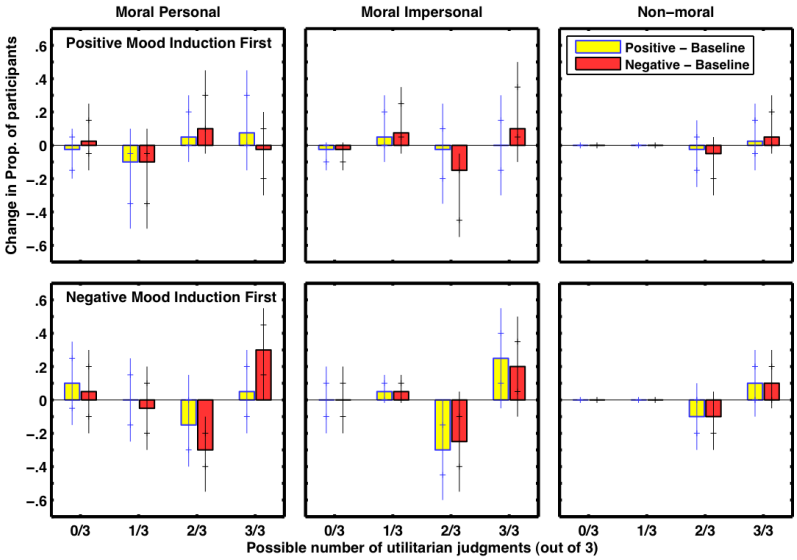

Figure 4.5: Change in proportion of participants as a function of the number of UJ (out of three) and mood condition contrast. The end points and hash marks on the vertical bars are 95% CIs and 68% CIs. The top and bottoms panels correspond to the PF and NF mood induction orders. Columns from left to right correspond to MP, MI and NonM dilemmas.

First we focus on the MP dilemma results for the PF and NF groups (two left most panels). The changes in the distribution of participants were apparently more dramatic in the NF group (bottom) than the PF group (top). The shifts were quite small in the PF group and were similar in both mood condition (small decreases in the $p(1/3)$ were complemented by small increases in $p(2/3)$). Contrary to these small and similar shifts, there were larger shifts in the NF group and they were more dramatic for the negative mood induction condition. In this condition we see a clear increase in the proportion of participants providing utilitarian responses to all three MP dilemmas. This was complemented by a decrease in $p(2/3)$. Changes

in the distribution was much more modest in the positive mood condition. The shift from $p(2/3)$ to $p(3/3)$ after negative mood induction is the only case where the 95% CIs do not overlap with the zero point. This suggests that there might be a subpopulation of participants, who were already biased towards UJs, becoming more so when in a depressed state. Next we consider results for the MI dilemmas (middle panels). Again, we see only a very small shift in the distribution that was similar for both mood conditions in the PF group but a more dramatic shift in the NF group. Finally, for the NonM dilemmas (the two right most panels), there was little effect of mood condition or induction order on the distribution of responses.

Overall, for the MP and MI dilemma, the negative mood induction, relative to the positive mood one, seemed to create more variance in the response distributions and this was primarily observed in those participants with a bias towards UJs to begin with (moving from 2/3 to 3/3). Also, where this shift was similar for the two mood inductions for the MI dilemmas, there was a larger trend in this direction for the negative mood induction for the MP dilemmas. These results suggest that there might be a subset of participants who responded in the negative mood condition with an increase in proportion of UJs in the MP dilemmas. This runs counter to the affective buffer hypothesis.

4.5.2.2 Examining the effect of time

The experimental procedure made each participant responded to multiple dilemmas in one mood condition. Generally, engaging in any repeated behaviour is likely to change the behaviour with time. Thus, time can be a confounding variable. Figure 4.6 shows the proportion of participants making UJs for the three dilemmas of each type presented after the mood-induction video. The three time points on the x-axis correspond to the first, second and third dilemma of a particular type presented after the video. The three bar colours correspond to mood conditions. The top and bottom panels correspond to the PF and NF orders, and the three columns of panels to the MP, MI and NonM dilemmas. While there is no obvious difference in the proportion of UJs at the three time points, there does seem to be fewer utilitarian responses in the MP cases at the third time point; and this seems particularly so in the PF order: the proportion of UJs at the first, second and third points were 60%, 73%, and 43% (see the top left panel).

We used a generalised estimating equation (GEE) approach to binomial regression to test for effects of time on proportion of utilitarian judgements in the MP and MI dilemmas. Our model tested for main effects of MP and MI dilemma types (MP type was treated as the reference category), trial order and an interaction term. Only the coefficient of dilemma

type was reliably different from zero (β = 0.58, z_{Robust} = 2.31, p = .011). There was no main effect of trial order (β = −0.01, z_{Robust} = −0.91, p = .182) and while the interaction term was marginally significant the effect size was very small (β = 0.03; z_{Robust} = 1.62, p = .052). This marginal statistical significance of the interaction term is apparent given the reduction in the proportion of UJs for MP cases in the third post-induction trial. The absence or at least relatively minor effect that trial order seems to have is shown more clearly in Figure 4.7. The figure shows the proportion of UJs, for the three dilemma types, for each of the nine trials throughout the experiment. Different coloured symbols correspond to the three mood conditions and the coloured lines indicate whether participants received positive or negative mood induction first. In all cases, the proportion of UJs was relatively stable across trials.

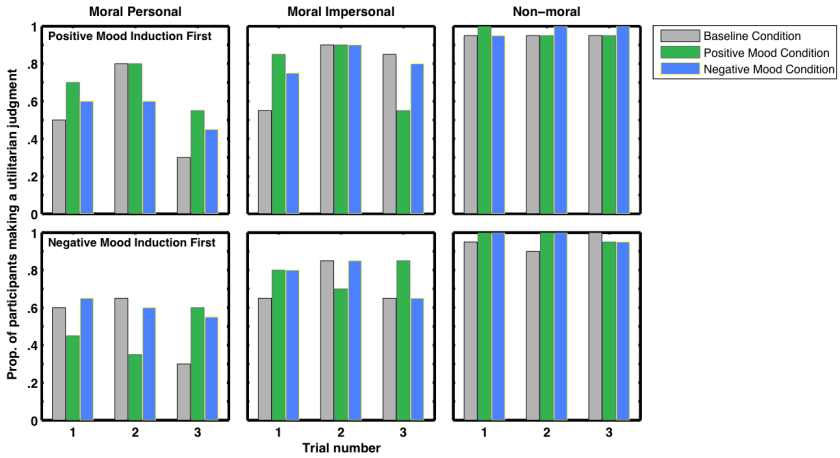

Figure 4.6: Proportion of participants making a UJ to the 1^{st} , 2^{nd} and 3^{rd} presented dilemma (of a type) in each mood condition. The top and bottom panels correspond to the PF and NF groups. The columns from left to right correspond to the MP, MI and NonM dilemmas. Different colours of bars correspond to the mood conditions.

4.5.2.3 Testing for an immediate effect of mood

The primary aim of our study was to measure effects of induced moods on moral judgement. The mood scale measurements indicate that the video-based mood induction had the desired effect in some cases. Also, the above analysis shows that time did not systematically affect moral judgements in the experiment. However, the process of responding to multiple dilemmas was also likely to alter mood. Any change in affective state due to responding to a moral dilemma would best be described as an effect of integral affect. On the other hand, the emotional response to one moral dilemma is "incidental" with respect to a subse-

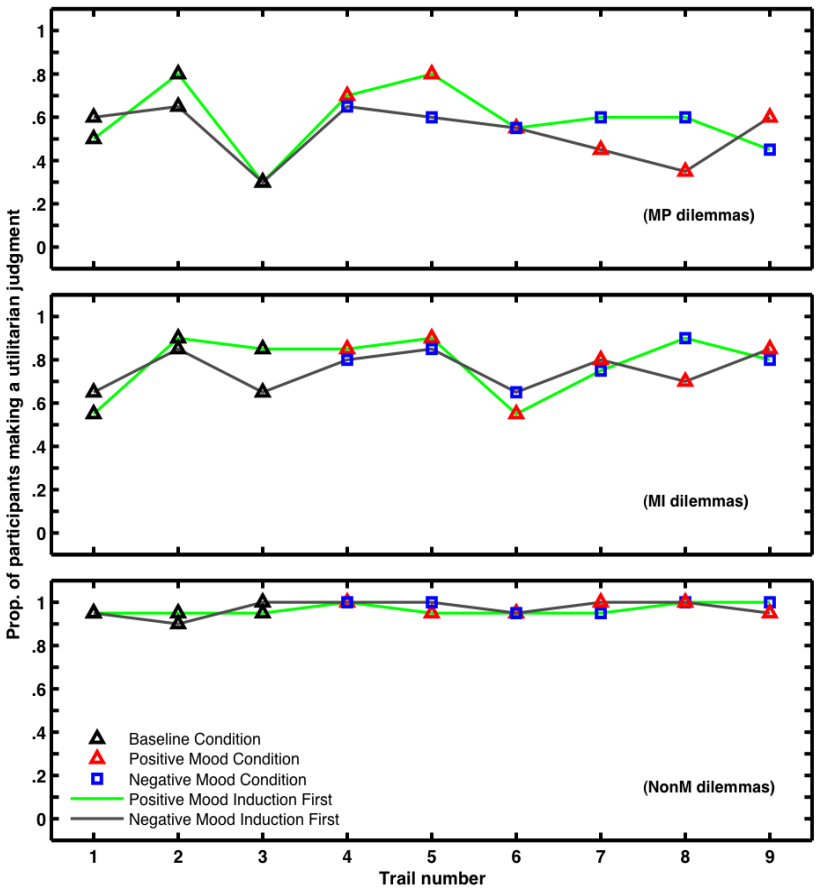

Figure 4.7: Proportion of participants making a UJ plotted against trial numbers. The top, middle and bottom panels correspond to the MP, MI and NonM dilemmas.

quent dilemma. This unknown effect made it particularly important to examine the dilemma responses occurring immediately after the mood induction procedure.

Because dilemmas were randomly ordered in each mood condition, there was no guarantee of getting an MP dilemma immediately after the mood-induction phase. That is, the first post-induction MP dilemma might be presented at, e.g. the 7^{th} trial (of the total nine in one mood condition). Thus, the first post-induction MP response shown in Figure 4.6 might not be informative of an immediate mood effect. Accordingly, we ran an analysis in which we focused on responses to MP dilemmas that were presented at the *early stage* in each mood condition. We defined the early stage to be within the first three dilemmas shown after the mood induction. By this definition, we tentatively assumed that this time window would allow for the immediate mood effect if there was any. Thirty-one of the 40 participants were exposed to at least one MP dilemma within the early stage of each mood condition; their data

were used for this analysis. Also, for each of the 31 participants, in each mood condition, only the MP dilemma presented at the earliest time was used. Thus, if a participant responded to two MP dilemmas at the early stage in a mood condition, only the first shown one was taken. This was done to maximise the likelihood of observing the immediate mood effect, if any, on moral judgement in MP dilemmas. For simplicity, we called this MP dilemma the *first presented MP dilemma*.

Figure 4.8 shows the proportion of participants making a UJ in the first presented MP dilemma. The three bar colours correspond to mood condition. The three groups of bars, from left to right, correspond to the PF group, the NF group and data pooled across both groups (labelled AD for aggregated data). For all the groups, the proportion of those approving of an MP killing appears to be highest after the negative mood induction, lowest in the baseline phase and second highest after the positive mood induction (except the NF group, where the positive mood condition shows the same value as the baseline measure). This shows a pattern that both positive and negative mood inductions increased the likelihood of utilitarian judgements for the first presented MP dilemma. For the statistic analysis, we ran Cochran's Q Test to test for the mood effect for each of the three groups. The results revealed that the mood effect reached statistical significance only for the AD group and between the baseline and negative mood conditions ($Q(1) = 4.50$, $p = .034$). This suggests that the negative mood induction increased the rate of utilitarian judgements at least for the first presented MP dilemma. The result thus goes counter to the buffer hypothesis but may provide some support for the affective tuning hypothesis.

4.5.2.4 Relationship between moral judgement and mood rating

For additional insight into a potential relationship between induced affect and moral judgement, we examined the relationship between mood ratings and proportion of UJs more directly.

Figure 4.9 shows the proportion of UJs as a function of mood rating for the 10 individual emotional items. The red and black points correspond to MP and MI dilemmas, respectively. The scatter points at the top and bottom give an idea of how many trials there were in each instance. The main effect of dilemma type is evident in the upward shift of black points relative to the red points. To analyse the relationship between mood ratings and UJs for MP and MI dilemmas, we used a GEE approach to binomial regression. The model included coefficients for MP and MI types, mood ratings and an interaction term. Fits of these regression lines are shown in the figure (black and red solid lines).

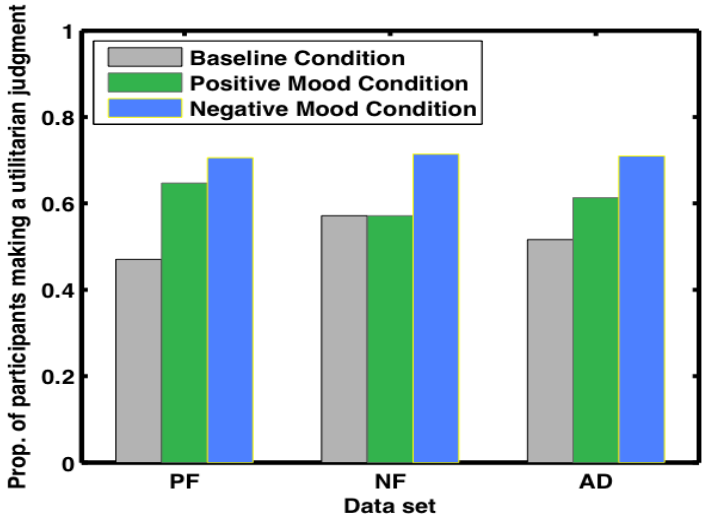

Figure 4.8: Proportion of UJs in the first presented MP dilemma, as a function of mood condition and data set.

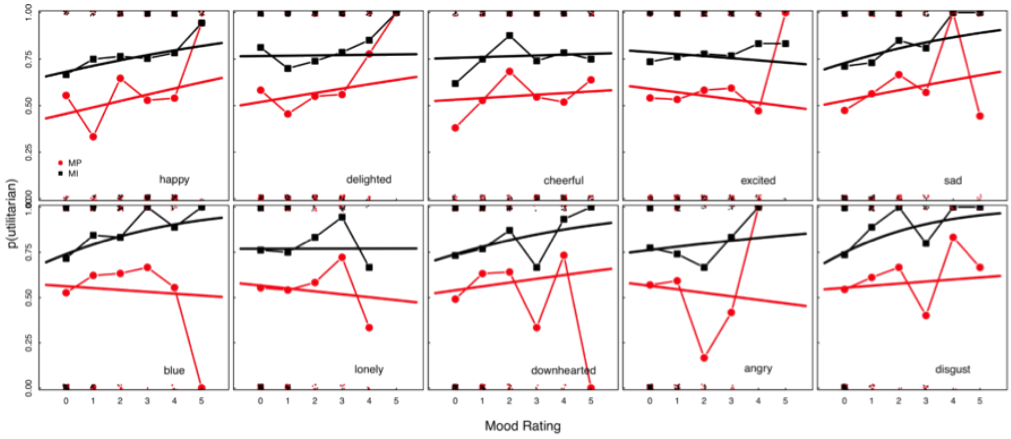

Figure 4.9: Proportion of UJs plotted against mood rating. Each panel corresponds to an individual emotional item. Red and black points correspond to MP and MI dilemmas, respectively. The scatter points at the top and bottom correspond to actual responses to moral dilemmas (binary data) along with each value of mood rating. The solid lines were fitted by the model tested above. Panels, from top left to bottom right, correspond to the emotion items *happy*, *delighted*, *cheerful*, *excited*, *sad*, *blue*, *lonely*, *downhearted*, *angry* and *disgust*.

To focus on mood effects that might be noteworthy, we consider only items where the regression coefficients indicated either a change in proportion of UJs for both dilemma types that was larger than 10%, or a difference in the change of utilitarian proportion between

dilemma types that was greater than 10%. These cases are identified in Figure 4.10, where the change in the proportion of UJs with maximum mood rating (six: from zero to five) is shown for the two dilemma types and each emotional item. The red and black points correspond to the MP and MI types, respectively. Each emotion item is represented by the first two letters of it adjective (shown on the x-axis). The changes in the proportion of UJs were predicted by the models tested above. Large effects were observed for happy, delighted, sad, blue, downhearted, angry and disgusted. While the increase in UJs with happiness ratings is consistent with Valdesolo and DeSteno's (2006) result and the affective buffer hypothesis, the similar trend observed for sad is not.

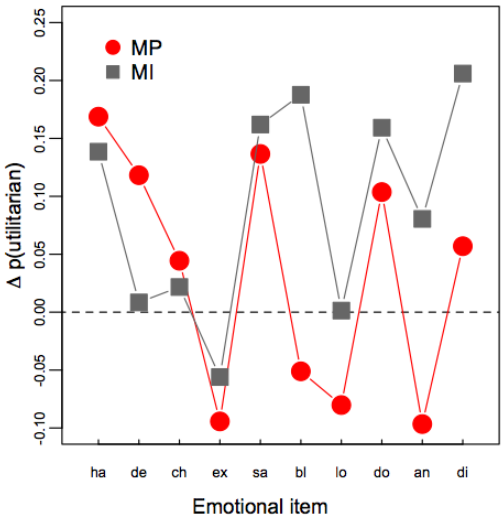

Figure 4.10: Proportional change in UJs determined by regression fits for each of the 10 emotions.

Results of statistical analyses of the regression on mood scales are shown in Figure 4.11. Panels, from top left to bottom left, show coefficient estimates for the main effects of mood, dilemma type and their interaction. The grey points correspond to a fit that assumes independence between observations and the black points are estimates using generalised estimating equations. Hash-marked bars are 95% CIs. In the case of GEE parameters, these are constructed using methods that are robust against inaccurate assumptions of the covariance matrix. Thus, we can only be confident in effects for cases where error bars do not overlap with zero (indicated by the dashed line). Figure 4.11 indicates that while dilemma type had a large and statistically significant effect on the proportion of utilitarian judgements, the effect of mood ratings and its interactions with dilemma type were relatively small and not statistically reliable. The interaction trends noted in figure 4.10 are however potentially interesting and suggest that there may be some validity to the affective buffer hypothesis. Also, for both MP and MI dilemmas, UJs tended to increase with disgust; this is in line with Schnall et

al.'s (2008) finding that induction of disgust leads to more severe moral judgement. It also seems interesting that MP utilitarian judgements tended to decrease with anger; I will return to these observations in the discussion section of this chapter.

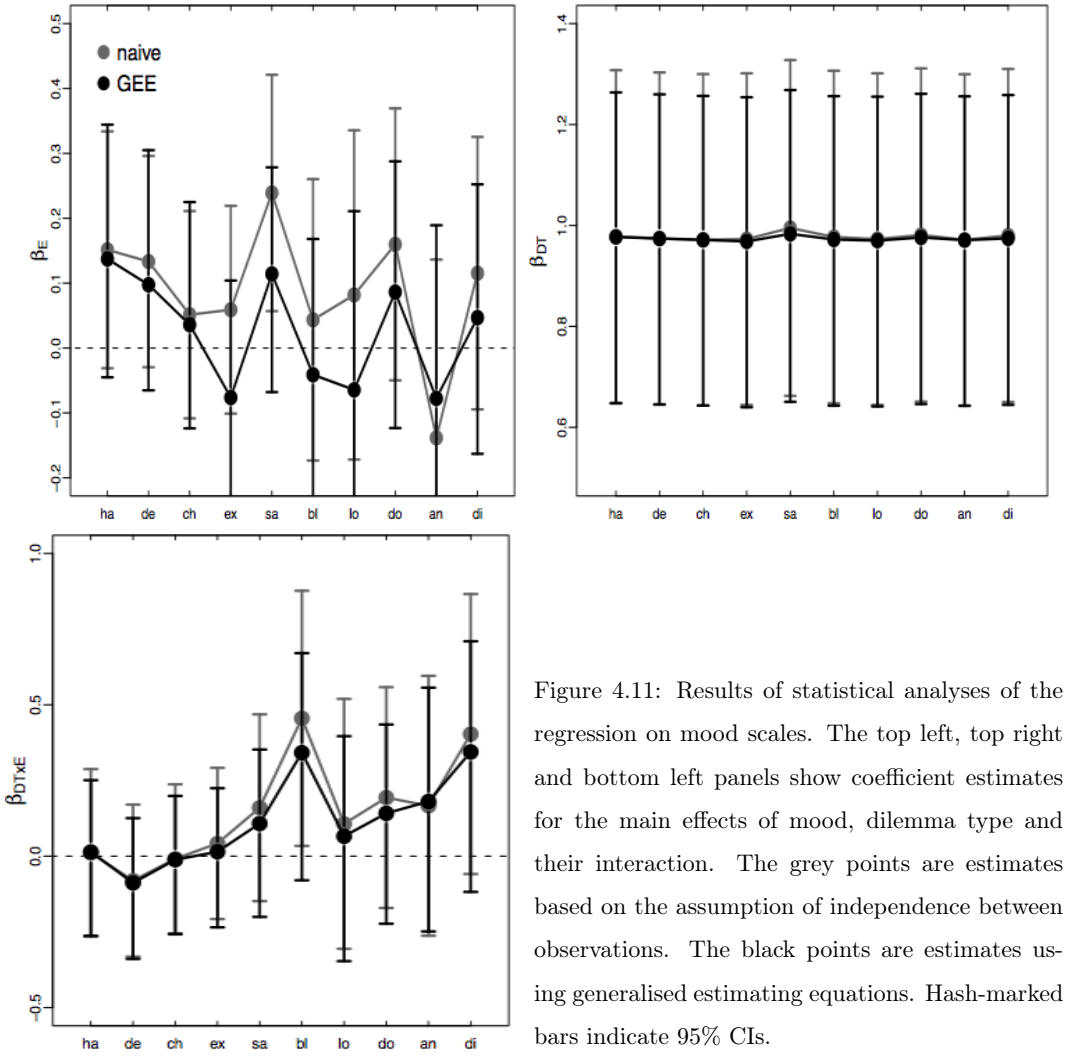

Figure 4.11: Results of statistical analyses of the regression on mood scales. The top left, top right and bottom left panels show coefficient estimates for the main effects of mood, dilemma type and their interaction. The grey points are estimates based on the assumption of independence between observations. The black points are estimates using generalised estimating equations. Hash-marked bars indicate 95% CIs.

4.5.2.5 Examining the effect of dilemma presentation order

Because dilemmas were presented in a random order, each moral-issue scenario had two possible orders of presenting its MP and MI dilemmas: the MP dilemma was shown earlier than the MI (MP-first) or the opposite (MI-first). Participants' responses might be sensitive to this contingent variation. That is, they made the same judgement on paired MP and MI dilemmas, depending on which type was shown first (Lanteri, Chelini, & Rizzello, 2008). As shown in Figure 4.3, MI dilemmas were more likely to receive UJs. Thus, if there was an effect of

dilemma presentation order, we should expect a higher likelihood of UJs for an MP dilemma when it followed the MI-first order than when it followed the MP-first order. Similarly, an MI dilemma would be expected to receive fewer utilitarian judgements when it was presented later than its paired MP version. The following analysis aimed to test if there was an order effect working in this way. This analysis is important because, if there was such an effect, we should then focus on MP dilemmas that were shown prior to their paired MI types.

In our experiment, 22 of the 24 moral-related scenarios from Moore et al. (2008) were tested as a result of the random selection. Eight of these 22 scenarios received only one dilemma presentation order and were thus excluded from the analysis. Another five of the 22 scenarios were also excluded because their sample size was too small (no more than five participants). Thus, the analysis used data from the remained nine scenarios. Figure 4.12 shows the proportion of UJs for the nine individual scenarios. The light grey and dark grey bars correspond to the MP-first and MI-first orders, respectively. In each panel, the left and right groups of bars show the likelihood of UJs in the MP and MI dilemmas of a scenario, respectively. The title of each scenario (named by Moore et al. (2008)) is shown on the top of each panel.

As seen in Figure 4.12, most scenarios show similar rates of UJs in the two presentation orders, for both the MP and MI dilemmas. Two scenarios give a relatively obvious indication of the order effect described above. The "Preventing Ebola" scenario (middle left panel) presents a clearly higher utilitarian proportion for its MP dilemmas in the MI-first order (82%) than the MP-first one (33%), suggesting that encountering its MI dilemma earlier increased the likelihood of UJs for the paired MP dilemma. Likewise, for the "Shark Attack" scenario (top right panel), the utilitarian rate for the MI dilemma was lower in the MP-first order than in the MI-first one.

We ran Fisher Exact Test to test for the null hypothesis that moral judgement for a moral dilemma was independent of dilemma presentation order. Analyses were performed for each individual scenario, on its MP and MI dilemmas. The results revealed that only for the MP dilemma of the "Preventing Ebola" scenario was the null hypothesis rejected (p = .011, one-sided). Therefore, results from 8/9, and thus a majority of, themes suggest that the effect of dilemma presentation order was not evident.

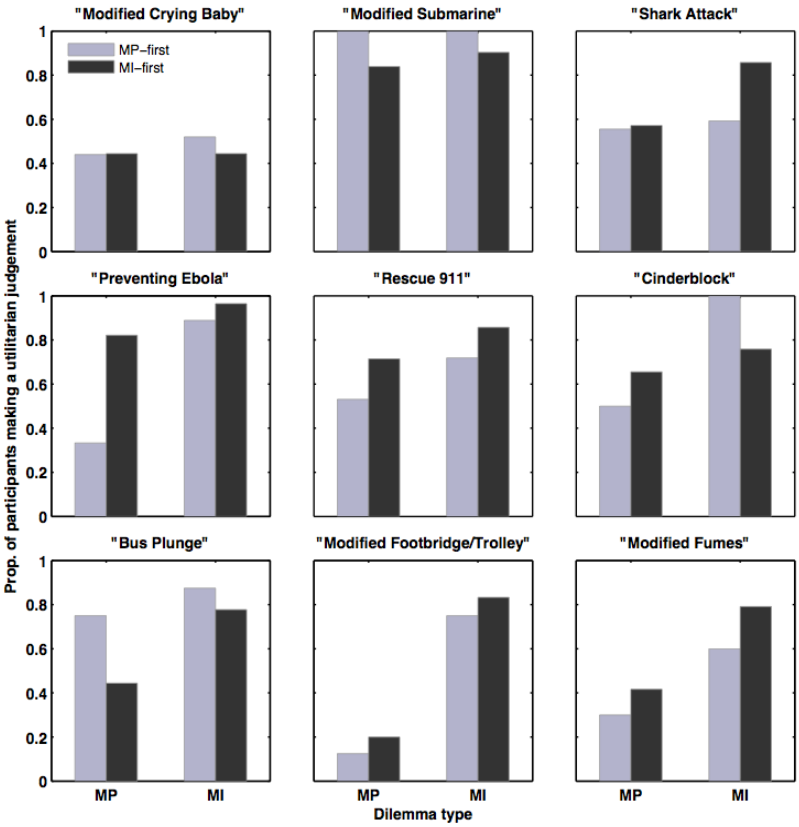

Figure 4.12: Proportion of participants making a UJ, as a function of dilemma type and dilemma presentation order. Each panel corresponds to a scenario and the title of the scenario is shown on the top of the panel.

4.5.3 Results for GSR

4.5.3.1 GSR data reading

GSR data were first filtered as follows: GSR recordings from eight participants were excluded due to technical problems during the experiment. For the remaining 32 participants, three participants' recordings were high-pass filtered at .05 Hz with the equipment. These three participants' data were included in further analysis although it was impossible to recover the data before the high-pass filter. To avoid losing power in low frequency, data from the other 29 participants were not high-pass filtered. To reduce the possible impact of this inconsistency in frequency, a linear trend was removed from data that were not high-pass filtered by taking residuals of the best fit-line. Because high frequency was widely observed, GSR recordings were further filtered through 50^{th} order zero-phase forward and backward digital filtering.

The filtering equation is:

$$GSR_{filted}(t) = \frac{\sum_{i=0}^{49}(GSR(t-i))}{50}$$

where t represents a sampling point. After filtering in the forward direction, the filtered sequence was reversed and run back through the filter. The 50^{th} order was chosen to make 200 Hz data similar to 4 Hz data, among which the Nyquist Frequency was 2 Hz — twice the highest GSR frequency (no higher than 1 Hz).

GSR amplitude[17] (united in *micromho*) was used as the skin conductance measure for each dilemma. For each dilemma, the time window for computing the GSR amplitude was between one second after the dilemma was released and five seconds after a response key was pressed. When GSR recording showed a downward slope between 100 milliseconds and 1100 milliseconds after the dilemma was presented, the moment of measuring GSR amplitude was delayed until GSR recording reached the valley point.

4.5.3.2 Effects of dilemma type and mood induction on GSR

Figure 4.13 shows mean values of GSR amplitude at each type of dilemma in the three mood conditions. On average, GSR seemed similar across the three mood condition. In the baseline and positive mood conditions, MP and MI dilemmas show higher values of GSR than NonM dilemmas, but the two types of moral dilemma do not seem different. In the negative mood condition, MI dilemmas show a higher GSR value than both MP and NonM dilemmas. Given that both dilemma type and mood condition were within-subject factors and that each participant responded to three dilemmas of each type, we used a mixed-effect model to analyse effects of the two experimental factors. The model included participant as a random factor, and dilemma type and mood condition as two fixed factors. The model examined the effects of dilemma type, mood condition and their interaction on GSR. The model was fitted by maximising the restricted log-likelihood. There was a significant effect of dilemma type ($F(2, 824) = 7.80$, $p < .001$) Neither the effect of mood condition nor that of the two-way interaction was significant ($F(2, 824) = .94$, $p = .392$; $F(4, 824) = 1.19$, $p = .312$). Planned pairwise comparison between dilemma types revealed that both MP ($M = .91$) and MI ($M = .95$) dilemmas corresponded to a higher level of GSR than NonM dilemmas ($p = .003$ and $p = .005$, respectively), whereas GSR values at MP and MI dilemmas were not significantly

[17]GSR amplitude refers to the mean of only the non-zero values within the duration for computation (Dawson, Schell, & Filion, 2000).

different (p = .974). These results indicate that the inclusion of moral tension, as a way of distinguishing between moral and non-moral dilemmas, increased GSR. This in turn suggests that moral and non-moral dilemmas differed in terms of the degree of affective processing, and specifically, emotional arousal. The comparable levels of GSR between MP and MI dilemmas, however, suggest that the "emotional-processing difference" between the two types of moral dilemmas, proposed by Greene et al. (2001, 2004, 2008) as a view to understand the MP–MI distinction, might not be on the arousal dimension.

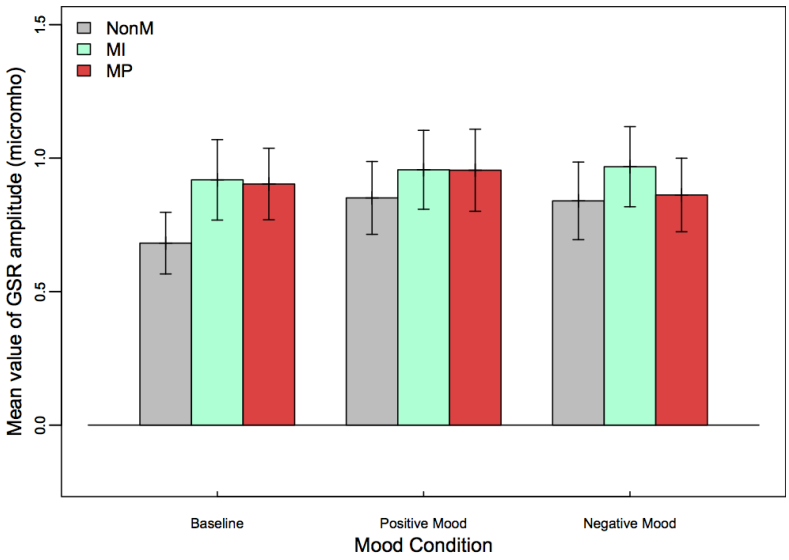

Figure 4.13: GSR as a function of dilemma type and mood condition. Hash-marked bars represent 95% CIs.

4.5.3.3 Relationship between GSR and moral judgement

Figure 4.14 shows proportions of UJs in MP and MI dilemmas (presented by the red and black points) as a function of GSR. The effect of dilemma type is shown by the averagely higher proportion for MI dilemmas than MP ones. Contrary to this apparent effect of dilemma type, the change in utilitarian proportion with GSR amplitude was vanishingly small.

For statistical analysis, we used a GEE approach to binary logistic regression. The model included coefficients for GSR amplitude, dilemma type (dummy variable: 0 for MP, 1 for MI, and MP was treated as the reference category), and their interaction. The fitted regression lines are shown in Figure 4.12. The results proved our observation. There was a significant effect of dilemma type (β = .87; z_{Robust} = 3.86, p < .001). Neither the coefficient of GSR amplitude nor that of the two-term interaction was significantly different from zero (β = 0.04;

z_{Robust} = .21, p = .834; β = .27; z_{Robust} = .98, p = .327, respectively). Thus, GSR was not reliably predictive of moral judgement in MP dilemmas. This, combined with the above result that MP and MI did not differ in GSR amplitude, suggests that GSR was not evidently an index of differential emotional response between MP and MI dilemmas.

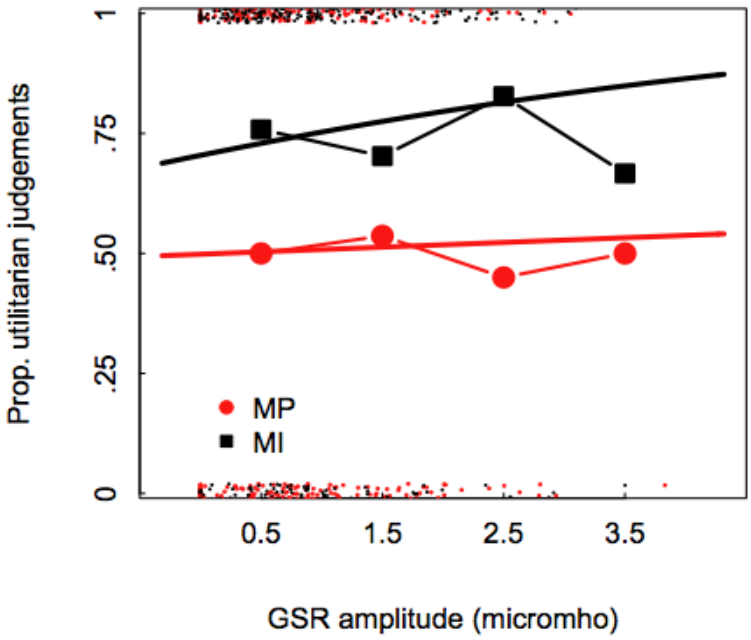

Figure 4.14: Proportion of UJs in the MP and MI dilemmas as a function of GSR amplitude.

4.6 Discussion

Study 2 aimed to test for two different hypotheses with respect to mood's influence on moral judgement in a moral dilemma paradigm. The affective buffer hypothesis, derived from Valdesolo and DeSteno's (2006) finding, posits that positive or negative mood increases or decreases the likelihood of UJs in MP dilemmas by enhancing or eliminating the intensity of the dilemma-eliciting emotion. On the other hand, the affective tuning hypothesis, based on the influence of mood on cognitive processing, posits that negative mood increases the likelihood of UJs in MP dilemmas by eliciting careful, controlled processing, whereas positive mood decreases the likelihood of UJs by increasing reliance on emotional responses to MP dilemmas. Results from the primary analysis examining the effect of mood induction on moral judgement did not provide statistically reliable evidence for either hypothesis. However, further analyses give an indication of both ideas.

Some results lend support to the affective tuning hypothesis. When focusing on the MP dilemma presented shortly after the mood induction phase, we indeed found that a utilitarian response was significantly more likely in the negative mood condition than in the baseline condition. This result is potentially important for informing of an immediate effect of mood. Similarly, when looking at the variation in response distribution between mood conditions, we found a significant shift in the percentage of UJs, from 2/3 in the baseline condition to 3/3 after being induced into a down state. Thus, as noted earlier, it seemed that there might be a subpopulation of participants who were inclined to UJs in the baseline phase, and tended to become more so with the negative mood induction. This implies that, for people who are already relatively immune to adverse reactions to MP dilemmas, feeling moderately down could maintain or enhance an analytic, controlled processing strategy and thus make them behave in a more utilitarian fashion. Also, in line with the affective tuning hypothesis, analysis concerning the relationship between mood and moral judgement showed that the proportion of UJs tended to increase with sadness rating. This result is also consistent with Schnall et al.'s (2010) result that an induction of sadness made moral judgements less severe.

On the other hand, consistent with the affective buffer hypothesis, our results also show that the proportion of UJs tended to increase with ratings of feeling happy and delighted, but to decrease with ratings of feeling blue. However, because these, as well as the above, relational patterns were correlational in nature, they could only be suggestive of the effect of mood on moral judgement. Nevertheless, the complex pattern of mood effects observed here suggests that there is more to the effect of mood than that of serving as an affective buffer. However, the design of Study 2 had a limited ability to tease apart the complex effects, as it collected only moral judgements following mood inductions. This was resolved in Study 3, which also measured mood mood-as-buffer and cognitive processing (reported in Chapter 5).

Our results also show that skin conductance was not related to moral judgement, which is inconsistent with van't Wout et al.'s (2006) finding showing a close link between arousal of emotion and decisions in the UG. This suggests that the impact of emotion on moral judgement, unlike that on socio-economic decisions, might not be largely attributed to the physiological arousal of emotion. It is possible that the integral emotions in the strategic interaction and moral dilemma settings were distinct. Research shows that whereas anger is a common response to offense to individual right and intentionality of harm, disgust is a more unique response to "bodily norm violation" (Gutierrez & Giner-Sorolla, 2007; Rozin, Lowery, Imada, & Haidt, 1999; Russell & Giner-Sorolla, 2011). This differentiation between contextual cues eliciting anger and disgust seems applicable for comparison between the ultimatum game and moral dilemma paradigms. Whereas unfair offers in the UG evoke anger (Pillutla &

Murnighan, 1996; Sanfey, 2003), prompting responders to punish their opponents, harmful actions passively involved in moral dilemmas perhaps stimulate emotions closer to disgust, making people avoid the actions. This may also explain the results here that UJs for MP dilemmas tended to increase with disgust but to decrease with anger.

Next, I turn to methodological concerns with Study 2. One methodological concern is with the within-subject mood manipulation. As revealed by data analyses, there was an asymmetric effect of mood induction order. For participants who were induced into a positive mood first (i.e., the PF group), both mood inductions were effective. However, for those who experienced the opposite induction order (i.e., the NF group), a positive mood was not effectively induced. It turned out that the first-induced negative mood endured through the positive mood induction phase. This is possibly because the NF participants watched the second half (i.e., the "sad" half) of the whole episode and thus knew what happened at the end of the story. As a result, when watching the "funny" half of the episode in the positive mood induction phase, they might not be as engaged as when they watched the "sad" half. Nevertheless, due to this observed effect of mood induction order, in Study 3, we included mood as a between-subject variable.

Another methodological concern is with the procedure that participants responded to multiple moral dilemmas in each mood condition. Although our results have ruled out the effects of time and dilemma presentation order as confounding variables due to this feature of design, the multiple-dilemma procedure still had potential confounding effects. For example, as mentioned earlier, an unknown effect was on participants' affective states during the experiment. It is possible that responding to multiple moral dilemmas could make participants feel increasingly negative toward the end of each mood condition; and as a result, this dilemma-elicited emotion might have had a more profound effect than induced moods. As a tentative solution, we selected a single MP dilemma presented shortly after a mood induction and examined the mood effect on moral judgement for this dilemma. Although this solution was reasonable, there was possibly uncontrolled influence due to the selection. Therefore, we also made a modification in Study 3 that participants responded to one MP and one MI dilemma. Details in this regard are available in Chapter 5.

Chapter 5

Positive Mood Increases Reliance on Predisposition to Utilitarian Judgement (Study 3)

5.1 Study overview

The aim of Study 3 was to examine the trade-off between mood-as-buffer and mood's influence on processing style. To do so, we examined the influence of mood on moral judgement, performance in problem-solving tasks with high cognitive demand, and self-control related decisions that could be influenced by an "emotional buffer". This design allowed for us to test for the affective buffer and tuning hypotheses by examining the relationship between moral judgement and responses to the two types of non-moral tasks, respectively.

The experiment used a 3 × 2 mixed factorial design: mood (*neutral*, *positive* and *negative*) was a between-subject variable, and dilemma type (*MP* and *MI*) a within-subject variable. Moods were induced by asking participants to write about events in their life ("self-reflective writing"; SRW; Small & Lerner, 2006) and were measured using Visual Analogue Scales (McCormack, Horne, & Sheather, 1998). Unlike in Study 2, participants responded to one MP dilemma and one MI dilemma.

To test for the affective buffer hypothesis, we used a self-control relevant decision task in which participants indicated whether they were willing to receive negative feedback. Presumably, accepting negative feedback comes at an emotional cost, in that people are confronted with information focusing their weak aspects (Higgins, 1987). This feature nicely mirrors a personal killing in the moral dilemma paradigm. Further, it is evident that positive mood promotes one's willingness to consider negative feedback and that positive mood reduces the

perceived negativity of negative feedback (Trope & Neter, 1994; Trope & Pomerantz, 1998). These empirical results provide justification for our use of the negative feedback task to measure mood-as-buffer.

To test for the affective tuning hypothesis, we used the Wason Selection Task (WST; Wason, 1966) and the Cognitive Reflection Test (CRT; Frederick, 2005). Importantly, as we will see in the Method section, both cognitive tasks easily generate incorrect answers that can be viewed as intuitive fallacies, and deliberative processing is required to reach correct solutions (Alter, Oppenheimer, Epley, & Eyre, 2007; Oechssler, Roider, & Schmitz, 2009). Also, neither cognitive task involved obvious emotional content. Thus, performance in the tasks would unambiguously index processing style.

5.2 Experimental hypotheses

Experimental hypothesis according to the affective buffer notion:

HA1: The likelihood of UJs in the MP dilemma would be higher in the positive mood condition, and lower in the negative mood condition, than in the neutral mood condition.

HA2: Favourable attitude to negative feedback (i.e., willingness to accept the the feedback) would be positively related to a utilitarian response in the MP dilemma.

HA3: The likelihood of being willing to receive negative feedback would be higher in the positive mood condition, and lower in the negative mood condition, than in the neutral mood condition.

Experimental hypotheses according to the affective tuning notion:

HB1: The likelihood of UJs in the MP dilemma would be higher in the negative mood condition, and lower in the positive mood condition, than in the neutral mood condition.

HB2: Performance in the cognitive tasks would be positively related to a utilitarian response in the MP dilemma.

HB3: Performance in the cognitive tasks would be better in the negative mood condition, and worse in the positive mood condition, than in the neutral mood condition.

Finally, with respect to the MI dilemma, following the same rational as presented for Study 2, we expected that mood would not affect moral judgement in the MI dilemma, and moral judgement in the MI dilemma would not be related to the index of mood-as-buffer or that of processing strategy.

5.3 Method

5.3.1 Participants

One hundred and nine English native speakers (43 males and 66 female; aged 18 to 62) participated in the experiment for course credits or monetary reward at a rate of £6 per hour. Nighty-four of the participants were students at the University of Glasgow. Participants were recruited through posters in the departmental waiting room, mass email or word of mouth.

5.3.2 Materials

5.3.2.1 Mood manipulation (mood induction and check of manipulation

Participants assigned to the positive or negative mood condition were asked to write about events in their lives that made them feel happy or sad; those in the neutral mood condition were asked to describe typical ways they spent evenings. The written work was completed in English, either on the computer or on paper, depending on the participant's preference. Materials for writing on paper included a stack of departmental headed paper, a pen, a pencil, a corrected pen and eraser.

Mood was checked using a four-item questionnaire. Two items (*happy*, *excited*) measured positive mood and two (*sad*, *blue*) measured negative mood. Each item was rated on a computerised version of a visual analogous scale (VAS). Each scale was 100 units long (1 unit = 4 pixels), anchored at the left-hand end with the minimum extreme "*Not at all*" (scored zero) and at the right-hand end with the maximum extreme "*Extremely*" (scored 100; Slyker & McNally, 1991). A vertical slash marker was initially located in the middle of each scale, representing the medium score of 50. Participants were asked to indicate how strong they felt an emotion by placing the slash at some point on the line. The final score was the unit number rounded to the nearest integer (Slyker & McNally, 1991). The four scales were shown at the same time on a single page, and above each line was a different item.

5.3.2.2 Moral dilemmas

The one MP and one MI dilemmas used in Study 3 were selected from the test pool in Study 2. The selection was subject to the criterion that the likelihood of UJs was approximately 50% (see Appendix C). This was to ensure that we did not encounter ceiling or floor effects and to maximise the likelihood of finding mood effects, if any. The MP dilemma was the "Rescue 911" dilemma and the MI dilemma was the "Shark Attack" dilemma (Moore et al., 2008; see Appendix A for wordings)

5.3.2.3 Cognitive Reflection Test (CRT)

The CRT (Frederick, 2005) is ia simple test to measure the cognitive tendency of ability to override false intuitive response. The test contains three mathematical questions:

1. A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost? _____ cents
2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? _____ minutes
3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? _____ days

The tricky number and framing used in the questions make it easy for people to respond with "intuitive" answers that are nevertheless incorrect (Frederick, 2005; correct and so-defined intuitive answers are shown in Table 5.1). Research suggests that such intuitive fallacy can be overcome by cognitive effort (e.g., Alert et al., 2007) and that a better performance in the CRT is associated with controlled versus emotion-loaded decision making (Frederick, 2005; Oechssler et al., 2009). Most importantly, Paxton et al. (2012) found that CRT performance was positively linked to UJs in MP dilemmas. Thus, the role of intuition versus reflection in the CRT is structurally similar to the emotion-cognition mechanisms that supposedly underlie moral judgement in MP dilemmas. The present study used a computerised version of the CRT. The only change we made was to replace US dollar currency with British Pounds in the bat-ball question.

Table 5.1: Correct and intuitively incorrect answers to each CRT question.

	Correct answer	Intuitively incorrect answer
Bat-ball	5	10
Widgets	5	100
Lily pads	47	24

5.3.2.4 Wason Selection Task (WST)

The WST (Wason, 1966) is a cognitive reasoning task in which people are presented with a conditional hypothesis in the form "if P then Q" and are asked to find a logically valid method to test the hypothesis. Specifically, people are provided with four cards, each supposedly displaying the P instance (P or Not-P) on one side and the Q instance (Q or Not-Q) on the other. Each card only shows one side, presenting the four instances: P, Not-P, Q and Not-Q.

The task is to decide which card or cards must be turned over to test the hypothesis. The "if P then Q" hypothesis would be false only when the case "P but not Q" was found. Thus, the correct solution is to turn over the P card to find if the other side shows Not-Q, and to turn over the Not-Q card to find if P is on the other side. Much research shows that people's ability to correctly solve the WST is rather poor, and most tend to select only the P card or mistakenly pair it with the Q card (see, e.g., Cosmides & Tooby, 1992 for a review).

In Study 3, we used a social version of the WST: the "social competition task" examined by Badcock and Allen (2003). The exact wording of this WST is as follows:

> "You work in a large, corporate firm, and you're very excited because recently, you found out that you are being considered for a promotion. It will improve your quality of living considerably, and will guarantee your financial security for the rest of your life. It is, without a doubt, your dream job.
>
> But much to your dismay, you learn that three of your rivals — John, Matt and Angela, are also being considered for the same position. Your employers tell you that while they will appoint the best person for the job, anyone who is especially interested in the job should probably submit an application.
>
> Unfortunately, John, Matt and Angela are all extremely well qualified. They are aggressive and competitive workers, and you're extremely worried that one of them will get the job instead of you. Also, anyone who is going to submit an application has to write their name on the company notice-board — so if you apply and donâĂŹt get it, the whole firm will know that you have failed.
>
> You discuss this concern with one of your co-workers, who has been working in the firm for some time. He thinks that you'll get the promotion, but only if you take the risk and submit an application. In other words:
>
> 'IF YOU APPLY FOR THE JOB, THEN YOU WILL GET IT.'
>
> However, the last thing you want is to apply and fail. It's the job you've been waiting for all your adult life, and if you don't get it, you don't think you'll ever enjoy such a great opportunity again.
>
> The cards below have information about the possible outcomes of this scenario. Each card represents a single outcome. One side of a card shows whether or not you apply for the job, and the other side of that card shows whether or not you get it.
>
> If you apply for the job, will you get it? Or will you fail? Only CLICK the card(s) you definitely need to turn over to see whether or not your application would be successful." (Badcock & Allen, 2003, p. 653)

In the social-competition WST, the P, Not-P, Q and Not-Q cards showed "you apply for the job", "you don't apply for the job", "you get it" and "you don't get it", respectively.

We selected the "social competition task" for two reasons. First, whereas very few people correctly solve the normal version of the WST where the to-be- examined statement is about, e.g., a conditional relationship between number and letter (e.g., Wason, 1966; with only ~4% solving the task), more were found to solve this social version (29% on average; Badcock & Allen, 2003). Thus, it seemed less likely that we would encounter floor effects with this WST. Second, Badcock and Allen also showed that participants in an experiment-induced depressed state were more likely to correctly solve the "social competition task" than control participants. This supports the idea that negative mood could improve performance in the WST by facilitating cognitively effortful processing.

5.3.3 Procedure

Participants were tested individually. After arriving at the experiment room, participants were seated at a table in front of an iMac computer terminal. The experiment room was divided by an office room divider (1.57 meters high and 1.60 meters wide). After participants signed the consent form, the experimenter went to sit on the opposite side of the divider and left the participant alone unless questions or problems arose during the experiment. All instructions were presented in a step-by-step fashion on the computer screen. There were two steps before the main part of the experiment: (1) two practice dilemmas (non-moral) to familiarise participants with the procedure of reading and submitting responses to moral dilemmas (described below); (2) demographic data (i.e., name, age, gender and nationality) collection along with a baseline measure of mood using the four-item VAS questionnaire; at this point, participants were asked to what degree they were feeling each measured emotion "at the moment". Participants were then instructed that a "writing task" would occur three times on an assigned topic (depending on the mood condition) and that they would be asked to answer some "unrelated" questions between writing exercises. They then moved on to the main part of the experiment (Step 3) by clicking an option button to write on the computer or on paper.

Figure 5.1 shows the full sequence of stimuli at Step 3. There were three task sessions and each session started with a SRW mood induction and ended with the check of mood manipulation. In each mood check phase, participants responded to the mood questionnaire by indicating how strongly they were feeling each emotion during the writing exercise in the same session. In each task session, the in-between task (the MP dilemma, the MI dilemma or the two cognitive tasks) was presented immediately after the mood induction procedure. Accordingly, we called the task sessions the MP session, MI session and the cognitive task

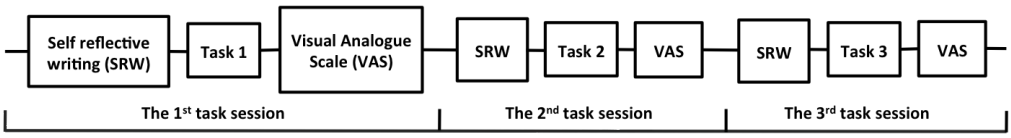

Figure 5.1: Illustration of the sequence of stimuli presentation in the main part of the experiment.

session. The order of task sessions was counterbalanced across participants within each mood condition. So was the order of the two cognitive tasks within the cognitive task session. So, for example, in a sequence of task sessions, Task 1 could be the MP dilemma, Task 2 the MI dilemma and Task 3 the WST and CRT.

For each writing exercise, participants were asked to complete the work within 10 minutes whilst providing "enough details" so that "other people who read the description would feel the same" (the positive and negative mood conditions) or "would be able to reconstruct the way they spent their evenings" (the neutral mood condition). And right before each writing exercise, participants were instructed to write about a different event or a different way they spent their evenings.

Participants read and responded to the MP and MI dilemmas in the following way. The first line of the dilemma was presented at the top of the screen. Participants needed to press a key on the keyboard to reveal an additional line of the text of the dilemma. The final key-press revealed the question asking for judgement on the utilitarian action in the dilemma. Participants responded to the question by clicking the "Yes" or "No" button on the screen. They could change their response before submitting it by clicking the "submit" button. All three buttons were presented below the dilemma text.

Procedures with respect to the two cognitive tasks were as follows. When the WST was initiated, the text of the "job application" event, the four cards, instructions for answer submission and the "submit" button were presented simultaneously on one page. Each card could be selected or de-selected by clicking or re-clicking on it. For the CRT, the three questions were shown at the same time on one page. We presented a verbatim version of Frederick's (2005) instructions above the CRT questions: "below are several problems that vary in difficulty, try to answer as many as you can." Participants could switch between questions by pressing an assigned key and submit their answers by pressing another. Participants were free to use handwriting materials for computation.

Following the third (final) task session at Step 3, participants were exposed to the "attitude to negative feedback" question. To fit preceding parts of the procedure, the negative feedback was related to participants' written work. Specifically, participants were told through text on

the screen that they could have their written work assessed by a "literacy critic", who would point out the parts where they "could have done a better job". They were asked whether they would be willing to receive this feedback. Participants gave their answers by clicking a "Yes" or "No" button. The end of the experiment was then indicated. The experimenter then verbally asked participants for their thoughts about the experiment, and their answers were documented. Finally, participants were carefully debriefed about the experimental purpose.

5.4 Results

Data from 108 of the 109 participants were used in the analysis. One participant had to be excluded because he was found to have participated in Study 2; he also indicated awareness of the experimental purpose during the post-experiment oral survey. Other data exclusions specific to different measures were due to problems in certain parts of the procedure. These are noted in corresponding subsections.

5.4.1 Results for mood manipulation

As mentioned in the Procedure section, mood ratings were taken at four time points: pre-induction and after each of the three tasks. At the first point, participants indicated their mood at the moment. At the latter three, participants indicated their mood during the mood induction writings. Mood rating data from one participant were excluded from analyses involving the ratings because she was confused in regard to the relevant time point of reporting her mood.

The two items measuring negative mood (*sad*, *blue*) were reliably scaled (Pearson Product-moment correlation coefficient, r = .92); so were the two measuring positive mood (happy, excited) (r = .74). Thus, a single index was computed by averaging ratings on items for positive and negative moods, respectively; they were referred to as *positive mood rating* and *negative mood rating*. The left and right panels of Figure 5.2 shows mean values of positive and negative mood ratings. In each panel, the left, middle and right groups of bars present results for the neutral, positive and negative mood conditions, respectively. Measures at pre-induction, MP, MI and cognitive task (labelled as "Cog" in the figure) sessions are shown by grey, green, blue and yellow bars.

For both positive and negative moods, pre-induction ratings did not differ across the mood conditions (see grey bars in each panel). This reveals that: (1) initial affective states of participants in one mood condition were not biased relative to those in another; and (2) participants in different mood conditions used the mood scales in the same way. Also, the

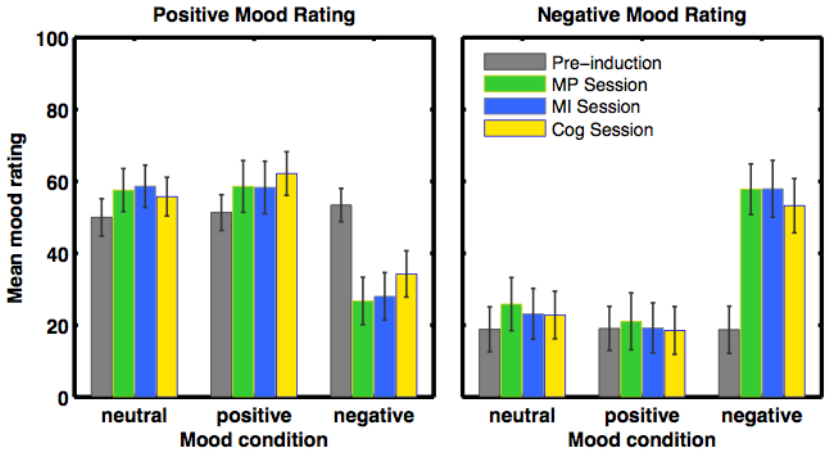

Figure 5.2: Mean mood ratings for the three mood conditions at the four points. Left and right panels correspond to results for the positive and negative mood ratings. Hash-marked bars represent 95% CIs

ratings at the three post-induction points look similar (green, blue and yellow bars in each bar group), suggesting that the mood induction procedure at the three points altered participants' moods to a similar extent.

Positive mood rating was on average higher in the neutral and positive mood conditions than in the negative one (M = 55.46, 57.59 vs. 35.58), and the opposite (M = 46.91 vs. 22.65, 19.46) was observed for the negative mood rating. This suggests that, relative to the neutral and positive mood conditions, the negative mood condition induced an overall more negative affective state. Comparison between pre- and post-induction sessions indicated that while the negative mood induction had a clear effect by decreasing positive mood ratings and increasing negative mood ratings, corresponding changes introduced by the positive mood induction were relatively small. This asymmetry might be caused by the fact that participants arrived came with a relatively positive mood ($M_{positive-mood-rating}$ = 51.56), so there would be a ceiling effect on mood ratings.

We ran a mixed two-way ANOVA, with mood condition as a between-subject variable and time point as a within-subject variable. The model tested for main effects of mood condition and time point, and their interaction. Analyses were performed for positive and negative mood ratings, respectively.

Analyses for positive mood rating revealed significant effects of mood condition and the two-way interaction ($F(2, 104)$ = 26.95, p < .001, η^2 = .341; $F(6, 312)$ = 16.21, p < .001, η^2 = .238). The main effect of time point was not statistically reliable ($F(3, 312)$ = 1.95,

p = .121, η^2 = .018). Post hoc tests indicated that ratings were lower in the negative mood condition than in the neutral and positive ones ($p < .001$), whereas the latter two did not differ (p = .799). Further planned comparison indicated that the pre-induction ratings were the same in all the mood conditions ($F(2, 416) = .55$, p = .577). Post-induction ratings were lower than the pre-induction measure in the negative mood condition ($Fs(1, 105) > 31.52$, $ps < .001$). The opposite pattern was true in the neutral and positive conditions ($Fs(1, 105) > 4.01$, $ps < .048$; except that in the neutral mood condition, comparison between the pre-induction and Cog session yield a marginal effect of mood induction: $F(1, 105) = 3.65$, p = .059). Thus, both the negative and positive mood inductions had the desired effects. The slightly light-hearted state resulting from the neutral mood induction was not entirely unexpected. When writing about how they spent their evenings, many participants described leisure events such as watching a movie and dining out with family and friends. Such activities presumably elicit pleasant feelings.

For negative mood ratings, main effects of mood induction and time point were both significant ($F(2, 104) = 30.84$, $p < .001$, $\eta^2 = .372$; $F(3, 312) = 21.94$, $p < .001$, $\eta^2 = .174$); so was the two-way interaction ($F(6, 312) = 14.06$, $p < .001$, $\eta^2 = .213$). Post hoc tests illustrated a higher rating in the negative mood condition than in neutral and positive ones ($p < .001$), whereas the latter two did not differ (p = .684). Pre-induction ratings were same across the mood conditions ($F(2, 416) = .005$, $p = .995$). Furthermore, while ratings increased after each negative mood induction ($Fs(1, 105) > 64.12$, $ps < .001$), they remained the same as pre-induction ratings after the neutral and positive mood inductions ($Fs(1, 105) < 1.74$, $ps > .190$; though an exception was in the neutral mood condition, where ratings increased at the MP Session: $F(1, 105) = 4.59$, p = .034). This suggests that the main effect of mood induction was due to the effect of the negative mood induction, which is also validated by the two-way interaction.

Overall, Participants in different mood conditions were in a similar affective state at the beginning of the experiment. The negative mood induction had the desired effect on both mood scales, and the positive mood induction did so on the positive mood scale. The neutral mood induction had a similar effect to the positive mood induction. Nevertheless, both the negative and positive mood manipulations were successful.

5.4.2 Examining mood effects on moral judgement

Figure 5.3 shows the proportion of participants making a UJ for the MP or MI dilemma (left or right groups of bars) in the three mood conditions (shown by the three colours of the bars).

The average proportions of UJs across all the mood conditions were 51% and 48% for MP and MI dilemmas, respectively. This is fairly consistent with results from Study 2 (56% and 65%, respectively) and meets our goal of having two dilemmas with a likelihood of UJs being approximately 50%.

The grey, green and blue bars correspond to the neutral, positive and negative mood induction conditions. According to the affective buffer hypothesis, we expected a greater proportion of UJs in the MP dilemma with positive mood, compared with negative and neutral. However, MP data showed that the difference in UJ likelihood between mood conditions was vanishingly small (the proportions of UJs were 47%, 56% and 50% for the neutral, positive and negative mood conditions, respectively). For the MI dilemma, both positive and negative mood conditions show a higher UJ proportion than the neutral mood condition (50% and 56%, vs. 39%)

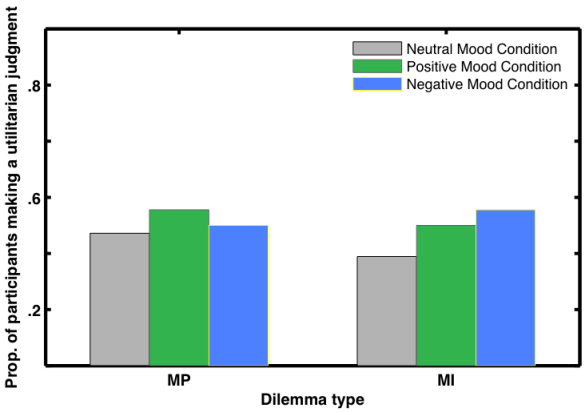

Figure 5.3: Proportion of participants making a UJ for the MP and MI dilemmas, in the three mood conditions.

To test for effects of mood condition, dilemma type and their interaction, we performed a logistic regression using a GEE approach. Mood condition and dilemma type were defined as a between-subject and a within-subject factor, respectively. MI type and non-UJ were defined as the reference categories of response and dilemma type. Maximum-likelihood model parameters were estimated using a logit link function with the binomial regression, and the correlation matrix was assumed to have independent entries. Statistical tests were performed using Type III variance with Wald Chi-Square statistic. Neither the main effect of mood manipulation nor that of dilemma type was statistically significant at the .05 level ($\chi^2(2) = 1.34$, $p = .510$; $\chi^2(1) = .25$, $p = .616$, respectively). There was also no reliable interaction ($\chi^2(2) = 1.20$, $p = .549$).

The above analysis relied on the assumption that the mood manipulation had the desired effect. While this had been revealed to be true for the negative mood induction, the effect of the positive mood induction seemed indistinguishable from that of the neutral mood induction. Considering this imprecision, we again explored the relationship between mood rating and moral judgement, as in Study 2; we did this analysis with the caveat that it was correlational and we could not disambiguate real mood difference between subjects from difference in the use of the mood scales.

The left and right panels of Figure 5.4 show the proportion of UJs for the two moral dilemmas as a function positive and negative mood ratings, respectively. Mood ratings here were measures in corresponding dilemma sessions. The red and black points show results for the MP and MI dilemmas (mood ratings were grouped into five equal non-overlapping bins for presentation, as marked on the x- axis). The scatter points at the top and bottom represent the actual location of ratings on the mood scale (a small amount of random jitter was added for presentation). To analyse the relationship between mood rating (positive or negative) and moral judgement, we performed a binary regression using a GEE approach. The model included coefficients for mood rating, dilemma type (dummy variable: 0 for MP and 1 for MI; thus MP was treated as the reference category) and their interaction. The regression fit lines are shown in Figure 5.4.

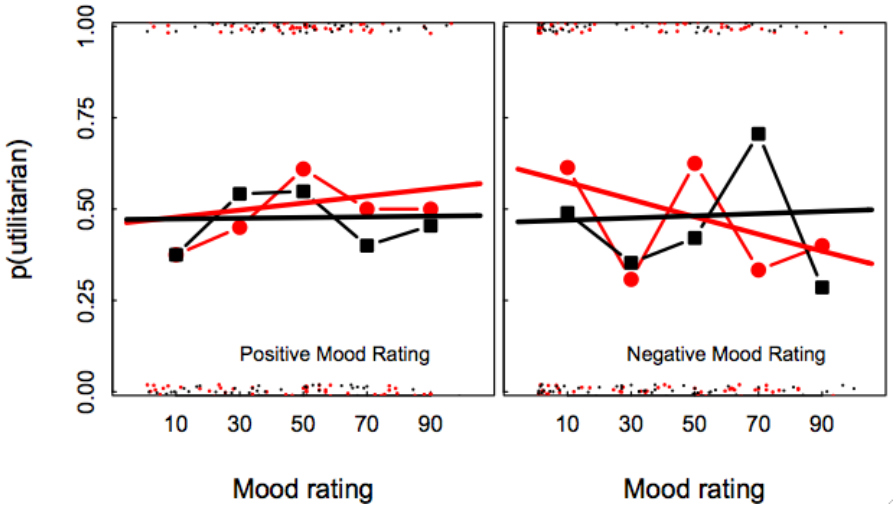

Figure 5.4: Proportion of UJs as a function of mood rating. Red and black points correspond to the MP and MI dilemma. The solid lines were fitted by the model tested above.

The fitted lines depict an interaction for the effect of negative mood rating and dilemma type on the proportion of UJs (see the right panel). The proportion of UJs in the Mp dilemma

tended to decrease with negative mood rating. This is similar to what we found in Study 2 and consistent with the affective buffer hypothesis. Also, as expected, the proportion of UJs in the MI dilemma seems unchanged along the mood scale. There was also a relatively smaller increase in the proportion of UJs with positive mood rating. These trends are shown more clearly in Figure 5.5, which shows the proportional changes in UJs for the two dilemmas with the maximum increase in positive or negative mood rating (101: from zero to 100); the proportional changes were predicted by the model tested above. Notably, for the MP dilemma, the likelihood of UJs was expected to increase by 10%, with the maximum rise in the positive mood rating, and to decrease by 23%, with the maximum rise in the negative mood rating. There was a very small change in the likelihood of UJs with either mood rating for the MI dilemma.

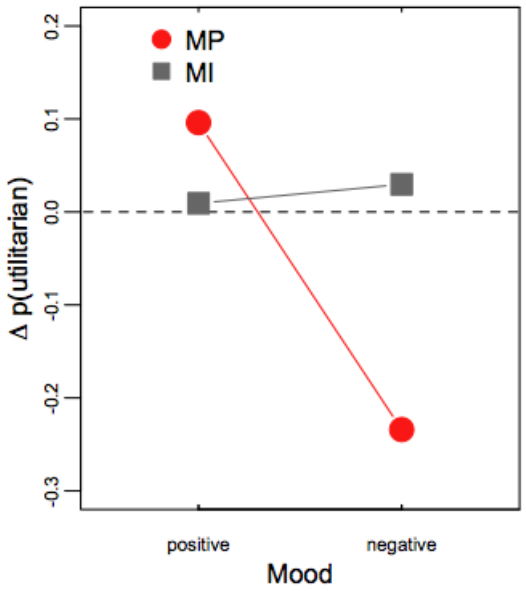

Figure 5.5: Proportional change in UJs determined by regression fit on positive and negative mood ratings.

However, Binomial regressions revealed that none of the three coefficients, i.e., coefficients for mood rating, dilemma type and the two-way interaction, was reliably different from zero. The statistical results are shown in Figure 5.6, in which the three panels show coefficients for mood rating, dilemma type and their interaction. Coefficients were estimated using generalised estimating equations. In each panel, the right and left points show results computed by the models regressing on positive and negative mood ratings, respectively. Hash-marked bars are 95% CIs computed using methods that are robust against inaccurate assumptions of the covariance matrix. Thus, an effect was considered reliable only when corresponding CIs do not overlap with zero. This was not the case for any of the tested coefficients.

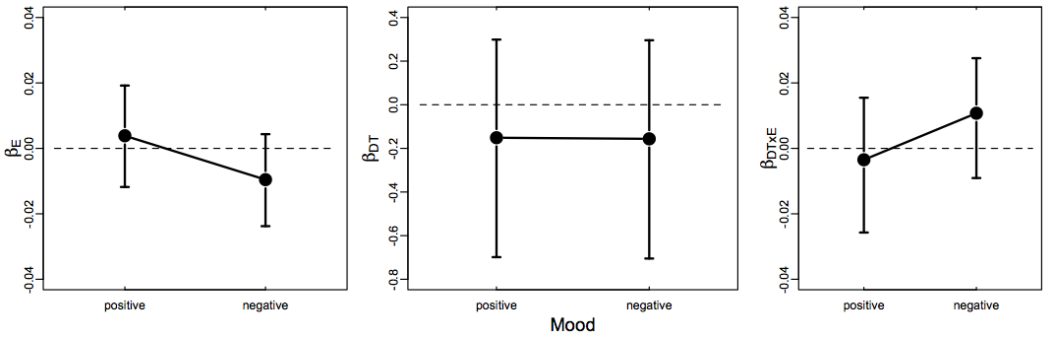

Figure 5.6: Statistical results of the regressions on mood scales. Panels, from left to right, show coefficients for mood rating, dilemma type and the two-way interaction. In each panel, the left and right points are coefficients computed from the models regressing on positive and negative mood ratings, respectively. Hash-marked bars indicate 95% CIs.

5.4.3 Results regarding attitude to negative feedback

Figure 5.7 shows the proportion of UJs as a function of dilemma type and attitude to negative feedback. The green and grey bars correspond to cases where participants were willing and unwilling to receive critical feedback on their written work. For the MP dilemma, it seems that more UJs came from those who were not willing to consider the negative feedback (54% vs. 48%). This is in contrast to what would be expected according to the affective buffer hypothesis. The opposite pattern is shown for the MI dilemma, where more UJs came from those who indicated willingness to consider the negative feedback (50% vs. 46%). However, both effects were vanishingly small.

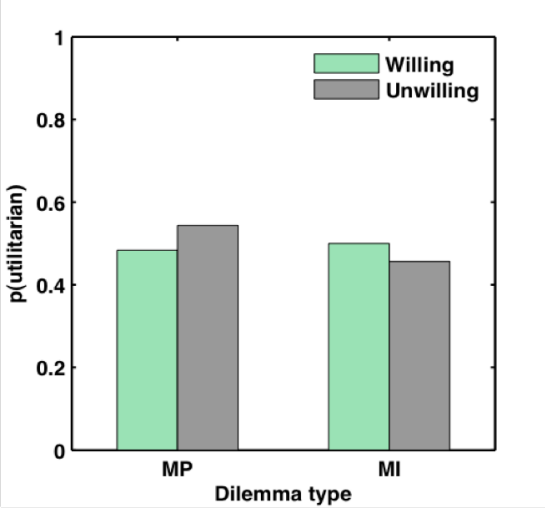

Figure 5.7: Proportion of UJs as a function of dilemma type and attitude to negative feedback.

We conducted a binary regression using a GEE approach, including coefficients of attitude to negative feedback, dilemma type and a two-way interaction. Unwillingness and MP were treated as the reference categories of attitude and dilemma type. Neither the effect of attitude nor that of dilemma type was significant (β = −.24, z_{Robust} = −.61, p = .542; β = −.35, z_{Robust} = −.95, p = .342, respectively). Nor was the interaction (β = −.41, z_{Robust} = −.89, p = .373). Both the lack of statistical significance and the small effect size illustrate a lack of relationship between attitude to negative feedback and moral judgement for both MP and MI dilemmas. The result regarding the MI dilemma was within expectations, and that regarding the MP dilemma was not supportive of the affective buffer hypothesis.

The use of attitude to critical feedback to measure an emotional buffer was built on the empirical evidence that positive mood promotes and negative mood inhibits acceptance of negative feedback (Trope & Neter, 1994; Trope & Pomerantz, 1998). Thus, it was important that we obtained the same mood effects to ensure that attitude to negative feedback measured in our experiment was a valid index of mood-as-buffer. Figure 5.8 shows the proportion of participants willing to receive negative feedback in the three mood conditions ($p_{positive}$ = 56%, $p_{negative}$ = 47%, $p_{neutral}$ = 69%) We ran Likelihood-ratio Chi-square Test to test for the association between mood condition and attitude to negative feedback. The result, however, revealed that attitude was independent of mood condition ($\chi^2(2)$ = 3.71, p = .156, ϕ = .18), suggesting that attitude to negative feedback measured in our experiment might not be a valid index of an emotional buffer.

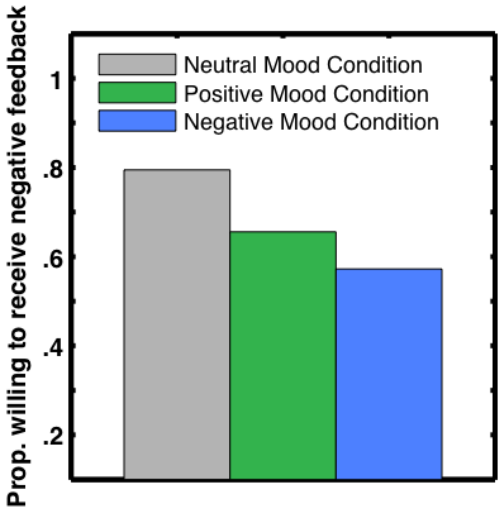

Figure 5.8: Proportion of UJs as a function of dilemma type and attitude to negative feedback.

Nevertheless, given the imprecision of the mood manipulation discussed earlier, we also explored the relationship between attitude to negative feedback and mood rating. We per-

formed a binary regression, and the model tested for the coefficient of mood rating. Analyses were carried out for positive and negative mood ratings,[18] respectively. Regression fitted lines are shown in Figure 5.9, where the solid and dotted lines correspond to regressions on positive and negative mood ratings.

The likelihood of being willing to receive negative feedback increased with positive mood rating, and this effect was significant (β = .02, z = 1.96, p = .050). In contrast, it tended to decrease with negative mood rating (β = −.01, z = −1.61, p = .11). This pattern provides rough evidence that attitude to negative feedback as measured in our experiment could have indexed an emotional buffer. However, this interpretation comes with the caveat that the mood ratings used here did not precisely measure participants' affective states right before they chose whether to receive critical feedback.

In sum, a favourable attitude to negative feedback was associated with positive mood. On the other hand, there was no measurable relationship between the attitude and choices in the MP dilemma. These suggest a lack of a mediating role of mood-as-buffer in moral judgements. An alternative interpretation should be noted however: the seemingly comparable "buffer" function of positive mood might have different underlying mechanism in the negative feedback and moral dilemma paradigms. We will return to this point in the Discussion section.

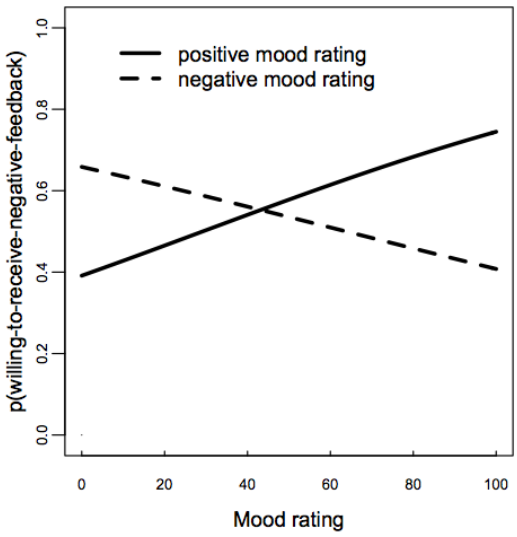

Figure 5.9: Proportion of UJs as a function of dilemma type and attitude to negative feedback.

[18]Because participants responded to this "feedback" question immediately after the last task session, we did not have a direct measure of participants' affective state right before then. As a tentative solution, we used mood ratings reported in the last task session for this analysis, given its temporal closeness. As a result, possible affective change due to activities in the last task session was arbitrarily ignored.

5.4.4 Results regarding the CRT

CRT data from one participant in the negative mood condition were not collected due to a computer malfunction and thus could not be included in following analyses.

5.4.4.1 Relationship between moral judgement and CRT performance

Figure 5.10 presents the proportions of UJs in the MP and MI dilemmas in cases where a CRT question was correctly or incorrectly answered. Panels, from left to right, correspond to the bat-ball, widgets and lily pads questions (called q(bat-ball), q(widget) and q(lily pads) hereafter). In each panel, the dark and grey bars correspond to incorrect and correct answers, and the left and right groups of bars to the MP and MI dilemmas. As shown in the bat-ball panel, the likelihood of MP-UJs was clearly higher when the question was solved correctly (68%) than when it was not (43%). While the opposite pattern appeared for the MI dilemma, the effect was very small (correct versus incorrect: 47% vs. 52%). With respect to q(widgets) and q(lily pads), it seems that for both dilemmas, the likelihood of UJs was lower in the correct than the incorrect cases (47% vs. 52%; 47% vs. 55%; respectively). But again, the effects were fairly small.

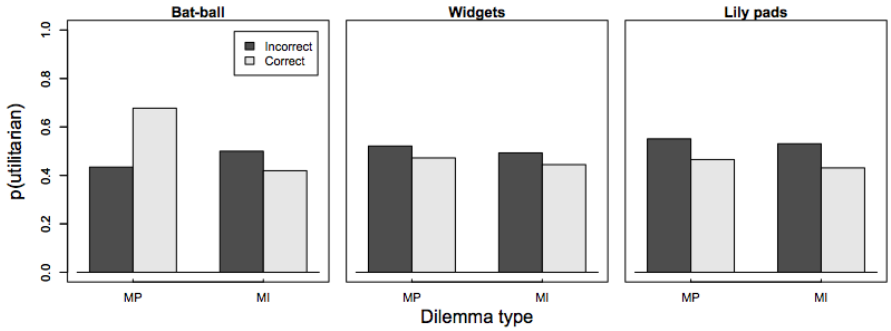

Figure 5.10: Proportion of UJs in the two types of dilemmas when a CRT question was answered correctly or not. Panels, from left to right, correspond to q(bat-ball), q(widgets) and q(lily pads).

For each question, a participant was scored one if he correctly answered the question and zero otherwise. This scoring method was the same as that used by Frederick (2005), Paxton et al. (2012) and other researchers (e.g., Alter et al., 2007) who employed CRT performance as an index of depth or style of processing. To test for the relationship between moral judgement and CRT performance, we ran binomial regression using a GEE approach. The model included coefficients of answer score, dilemma type and their interaction. Analyses were conducted for each of the three CRT questions. Correctly solving q(bat-ball), compared to failing it,

significantly increased the log-odds of UJs in the MP dilemma (β = 1.01, z_{Robust} = 2.24, p = .025). There was no reliable effect of dilemma type (β = .26, z_{Robust} = 1.05, p = .294) when the model was tested for q(bat-ball). But the two-way interaction was significant (β = −1.33, z_{Robust} = −2.44, p = .015), suggesting that good performance in q(bat-ball) was associated with a lower proportion of UJs in the MI dilemma. For the other two CRT questions, neither the coefficient of answer score nor that of dilemma type was different from zero; nor was that of the interaction term ($|z_{Robust}|s < .88$). Thus, performance in q(widgets) or q(lily pads) was not predictive of moral judgements.

This discrepancy in predicting moral judgement between CRT items might be due to the correctness standard. That is, this criterion might have been most appropriate for q(bat-ball). Thus, the correct/incorrect distinction in q(bat-ball), relative to that in the other two questions, was more informative of processing style. Response distribution of the CRT questions provided support for this notion. Figure 5.11 shows the response distribution of each CRT question. The grey, blue and pink bars correspond to q(bat-ball), q(widgets) and q(lily pads). The four groups of bars, from left to right, show proportions of participants providing the correct, the intuitive, a non-intuitive incorrect and no answer. As shown by the leftmost bar group, relative to q(widgets) and q(lily pads), q(bat-ball) was much less likely to receive its correct answer (29%; 34% and 54% for the widgets and lily pads questions, respectively). However, as shown by the "intuitive" bar group, q(bat-ball) was the item most likely to receive its intuitive answer, suggesting that q(bat-ball) was the trickiest among the three. This implies that when responding to the CRT, it could be most difficult to overcome the intuitive solution to q(bat- ball). Thus, correctly solving this question could demonstrate a reflective processing style more validly. This idea was somewhat supported by the observation that whereas more than 60% of those correctly answering q(bat-ball) also successfully solved q(widgets) (64%) or q(lily pads) (77%) questions, it was less likely for those solving q(widgets) (56%) or q(lily pads) (41%) to correctly answer q(bat-ball).

In addition, as shown in Figure 5.11, whereas q(bat-ball) generated mostly its correct and intuitive answers, responses to the other two questions were more distributed. Specifically, only 7% of the participants responded to q(bat-ball) with a non-intuitive incorrect answer or did not provide an answer. By comparison, a much higher percentage did so for the widgets (21%) and lily pads (19%) questions. This is noteworthy because although non-intuitive incorrect answers did not qualify as good performances in terms of correctness, the fact that they were different from the intuitive answers suggests that they might also have resulted from relatively careful processing but failed due to computation mistakes. Thus, the difference in response distribution between q(bat-ball) and the other two questions suggests that evaluating

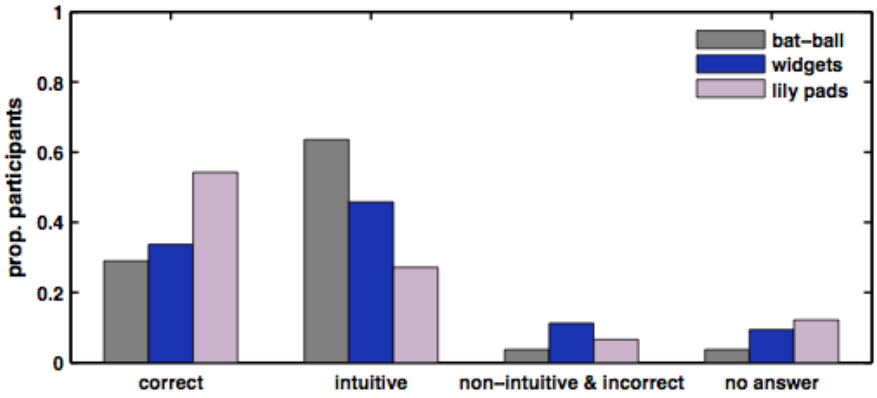

Figure 5.11: Response distributions for the three CRT questions.

performance based on correctness was most appropriate for q(bat-ball). Taken together, the results of the CRT response distribution suggest that the correct/incorrect distinction in q(bat-ball) was most reliable as a measure of reflective versus intuitive processing. Thus, for the following analyses involving CRT performance, we used score for q(bat-ball) (called bat-ball score for simplicity).

5.4.4.2 Relationship between mood and bat-ball score

The following analysis examined whether mood affected answer to the bat-ball question. Only if so could the above correlation between bat-ball score and UJ in the MP dilemma be attributed to mood's influence on processing strategy. The left and right panels of Figure 5.12 show the proportion of participants correctly solving q(bat-ball) as a function of positive and negative mood ratings. Mood ratings were those measured in the cognitive task sessions. For presentation, mood ratings were binned into five equal non-overlapping intervals. The scatter points (slightly jittered to make presentation clearer) at the top and bottom represent the actual location of ratings on the mood scale.

We ran a binary regression including coefficients for mood rating. Analyses were run for positive and negative mood ratings. Lines fitted by the regression are shown in Figure 5.12. As shown by these relatively flat fitted lines, both coefficients yielded a very small effect size and were not statistically reliable (positive mood: $\beta = -.007$, $z = -.70$, $p = .481$; negative mood: $\beta = -.001$, $z = -.11$, $p = .912$), suggesting a lack of relationship between mood rating and bat-ball score. These results suggest that mood did not affect answer to q(bat-ball).

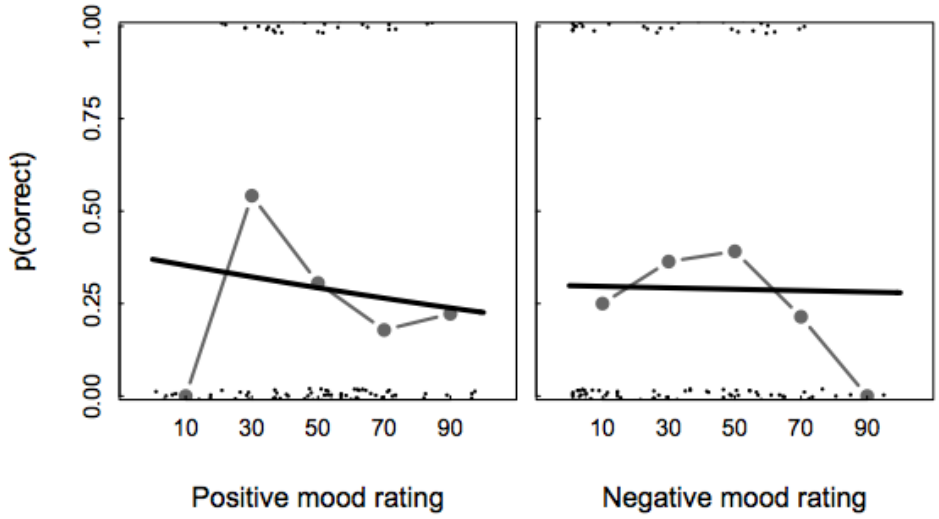

Figure 5.12: Proportion of participants correctly answering q(bat-ball) as a function of positive or negative mood rating. The solid lines are regression fitted lines.

5.4.4.3 Predictiveness of the bat-ball score depends on mood

The result that reflective processing measured by bat-ball score was predictive of a UJ in the MP dilemma was consistent with Paxton et al.'s (2012) finding that a greater acceptance of MP-UJs was associated with a better CRT performance (though in their study the performance was indexed by the summed score across questions). However, bat-ball score was independent of mood. This, taken at face value, suggests that the processing effect was not attributed to mood and thus disproves the idea that mood influences moral judgement by alerting a certain processing style via tuning about the current situation.

On the other hand, this independence between mood and CRT performance reveals that CRT might measure characteristic reflectiveness that is unaffected by momentary factors such as mood. Accordingly, the link between bat-ball score and MP moral judgement demonstrates an effect of "trait reflectiveness" on moral judgement, an idea also abstracted by Paxton et al. (2012). Indeed, recent research suggests that the CRT in large part measures a disposition to solving problems in an elaborative way (Campitelli & Labollita, 2010; Oechsslera, et al., 2009), and that performance in the test is not even necessarily related to built-in capacity such as numeric skill (Campitelli & Labollita, 2010).

Frederick (2005) and Oechsslera et al. (2009) showed that those who performed better in the CRT also behaved more patiently in an intertemporal choice task and tended to make the long-term choice (i.e., choosing a larger, delayed reward over a smaller, immediate one).

Thus, it seems CRT could measure dispositional reflectiveness in regard to the extent to which one's decision is not immediately driven by emotional impulse. Related to the moral dilemma paradigm, this implies that participants who correctly answered the bat-ball question might have a disposition to think about the moral problem in a thorough pattern; by contrast, those who failed the question might be more likely to respond impulsively. Taking this notion a little further, CRT performance might to some extent indicate tell moral inclination, such that those who performed better in the test are more likely to be utilitarian in general. Indeed, in an analysis where response time (RT) for moral judgement was included as a predictor reflecting depth or effort of processing, we found that the association between bat-ball score and utilitarian judgement was not moderated by the RT.[19] However, due to the low reliability of this result, for the following analysis we entertained the idea that bat-ball score measured one's dispositional tendency to make a moral judgement upon reflection or impulse (but we will return to the proposal of moral inclination in the Discussion section).

Taking account of this individual difference in dispositional processing style would lead to an alternative hypothesis for how mood might influence moral judgement. As reviewed in Chapter 2, recently revised AAI theorising suggests that mood's influence on JDM depends on "what comes to mind" at the moment (Clore & Huntsinger, 2007). That is, mood affects one's final response by "conferring" value on the most accessible cognition content at the response moment, including thoughts, inclination, processing tendency and so forth (Clore & Huntsinger, 2007, 2009). Accordingly, positive mood should be expected to prove the perceived appropriateness or necessity of one's dispositional approach to a moral dilemma (i.e., to think about it elaborately or just go with the feeling that killing is bad), whereas negative mood would confer a negative value to it and in turn invalidate one's initial processing tendency. Following this rationale, the effect of trait reflectiveness, as measured by the bat-ball score, should be profound when participants' mood was positive but diminished when participants' mood was negative.

Figure 5.13 shows proportions of UJs in the MP dilemma when q(bat-ball) was correctly or incorrectly answered. The three groups of bars correspond to the three mood conditions. As expected, in the positive mood condition, the likelihood of UJs was much higher among

[19]The analysis uses a binomial regression with bat-ball score and RT as predictors and MP moral judgement as a dependent variable. The model included coefficients for bat-ball score, RT and their interaction. Correctly answering the bat-ball question increased the odds of UJ by 1.30 ($p = .054$). In contrast, neither the coefficient of RT nor that of the two-way interaction was different from zero ($ps > .315$). This result, however, is of low reliability given that the data could not allow for distinction between real difference in RT and individual difference in response latency.

participants who answered the question correctly than those who answered it incorrectly (91% vs. 40%). Effects in the same direction were observed in the neutral (54% vs. 44%) and negative (57% vs. 46%) mood conditions, but were much less pronounced.

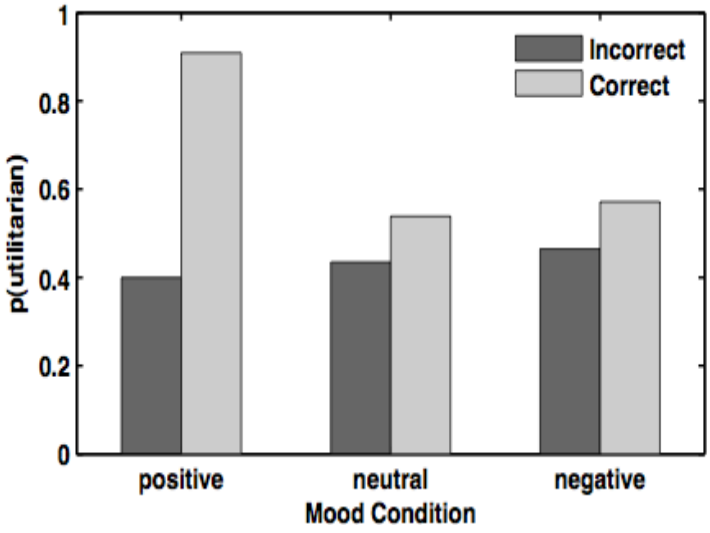

Figure 5.13: Proportions of UJs in the three mood conditions when q(bat-ball) was correctly answered or not.

Statistical analysis used a binomial regression with moral judgement in the MP dilemma as the dependent variable. The model included coefficients for mood (with positive mood condition as the reference level), the bat-ball score (set as a categorical variable with the score of zero as reference level), and a two-way interaction. As expected, in the positive mood condition, correctly answering the bat-ball question, relative to failing it, substantially increased the log-odds of UJs ($\beta = 2.71$, $z = 2.41$, $p = .016$). The effect of correctness was largely eliminated in both the neutral and negative mood conditions (effects relative to the positive mood condition: $\beta = -2.91$, $z = -1.73$, $p = .083$; $\beta = -2.28$, $z = -1.61$, $p = .107$). Binomial regression including the coefficient of the bat-ball score run for the neutral or negative mood condition showed that in neither condition was the coefficient different from zero ($ps > .532$) Thus, whereas dispositional reflectiveness increased the likelihood of UJs in the positive mood, dispositional processing style had no effect on moral judgement in the neutral or negative mood conditions. Whereas the result for the negative mood condition was expected, that for the neutral mood condition was not, given that participants who experienced the neutral mood induction reported positive feelings at a similar level to those who experienced the positive mood induction. This suggests that the combined effect of positive mood induction and processing disposition might be also due to some feature of the mood-induction procedure.

5.4.5 Results for the WST

WST data from one participant in the negative mood condition were not collected due to a computer malfunction and thus could not be included in the following analyses.

Table 5.2 shows counts and frequencies (in parentheses) of different responses to the WST. The top three rows correspond to the three mood conditions and the bottom row shows the overall results regardless of mood condition. The four columns, from left to right, correspond to the logically correct response (selecting P card and $Not\text{-}Q$ card), the two most common logical fallacies (selecting P card or selecting P and Q cards) and other errors in selection. As shown in the "overall" row, a rather small proportion of participants (6%) correctly solved the WST, whereas most participants made the two common errors (79%). The pattern was shown across mood conditions, though it is more obvious in the neutral mood condition than the other two. Likelihood ration Chi-square test revealed that it was not evident to reject the null hypothesis that the WST response distribution was the same across mood conditions ($\chi^2(6) = 9.82$, $p = .132$, $\phi = .29$). These results are dramatically contrary to those of Badcock and Allen's (2003), who showed that a fairly high percentage of participants (29%) correctly solved the social-competition WST, and that non-clinically depressed participants outperformed neutral-affect ones in the task. Rather, our results suggest that this social-contextualised WST, like the normal version of the WST (e.g., Wason, 1966), was also rather difficult to answer correctly. Thus, it seems likely that we encountered a floor effect with respect to performance in the WST.

Table 5.2: Responses to the WST.

	Correct	P error	P&Q error	Other error
Neutral Mood	3 (8%)	20 (56%)	11 (30%)	2 (6%)
Positive Mood	2 (6%)	18 (50%)	9 (25%)	7 (19%)
Negative Mood	2 (6%)	10 (28%)	16 (46%)	7 (20%)
Overall	7 (6%)	48 (45%)	36 (34%)	16 (15%)

This contradiction between our and Badcock and Allen's (2003) results might be attributable to procedural differences. In the current study, participants dealt with only one WST. In contrast, those in Badcock and Allen's study responded to four WSTs in total and, more importantly, the social-competition WST followed a "truth-detection" WST, which was the most difficult among the four. The repeated presentation and the difficulty of the previous test were likely to improve performance in the social-competition WST. Participants might have suspected that the task was more difficult than they thought and thus try harder to solve it. Thus the overall likelihood of accuracy was higher than that observed among

participants in the current study. Nevertheless, due to the rather low accuracy rate across mood conditions, we did not use WST performance as a measure to examine the hypothesised processing effect of mood.

5.5 Discussion

The aim of Study 3 was to investigate the trade-off between a buffer effect and a processing effect of mood on moral judgement. Below, I consider possible interpretations and implications of our results while discussing methodological concerns and suggesting directions for further research.

5.5.1 Mood as an affective buffer

The primary result, that UJ likelihood for the MP dilemma tended to increase with positive mood but to decrease with negative mood, seems in accordance with the buffer hypothesis. However, further analyses revealed that moral judgement was not associated with attitude to negative feedback and that the acceptance of negative feedback increased with positive mood but decreased with negative mood. These results, in combination, contradict the idea that mood affects moral judgement by modifying the emotional negativity integrated in a moral dilemma. However, this interpretation is inconclusive in (at least) two respects.

First, the dissociation of moral judgement from attitude to negative feedback could alternatively suggest that underlying the seemingly comparable buffer function of positive mood might be different mechanisms in the two paradigms. Although early research suggests that positive mood increases willingness to consider negative feedback by diminishing the perceived negativity of the feedback (Trope & Neter, 1994), extended research along the same line demonstrates that the enhancing effect of positive mood is perhaps through facilitating an elaborative assessment of negative feedback instead of, or in addition to, downgrading its negativity (Gervey, Igou, & Trope, 2005; Raghunathan & Trope, 2002; Trope & Pomerantz, 1998). This is indicated by such findings that people in a positive mood think about and recall more negative than positive suggestive information, and that the more a positive-mood person is biased to processing negative feedback, the worse he feels afterwards (Raghunathan & Trope, 2002). This mediating effect of negative feedback processing in mood change suggests that negative feedback is indeed distressful for people in a positive mood. Further studies also showed that positive mood facilitates processing of negative feedback by adopting a self-improvement versus ego-defence goal (e.g., Gervey et al., 2005; Trope & Pomerantz, 1998). This motivational effect on processing of emotion-laden stimuli is not comparable with the

hypothesised buffer effect that positive mood encourages a utilitarian choice by undermining its emotional cost. Perhaps due to such a difference was moral judgement not found to be linked with attitude to negative feedback.

Second, it is questionable whether attitude to negative feedback measured in the current experiment validly indexed a buffer effect of mood, regardless of whether the effect was due to motivational processing of negative feedback or due to attenuating emotional negativity of the feedback. Specifically, while we found that willingness to accept negative feedback increased with positive mood rating and decreased with negative mood rating, this relational result was obtained with the caveat that mood rating data entered in the analysis could not capture participants' mood when responding to the attitude-revealing question. Strictly, as indicated by the independence between attitude and mood induction, mood did not affect the likelihood that one was willing to accept the critical feedback on his previous written work. This absence of a mood effect, however, could be argued to be caused by a lack of diagnostic importance of the feedback, which casts doubt on the effectiveness of attitude to negative feedback being an indicator of mood as buffer.

Research investigating the role of mood in coping with feedback shows that positive mood overcomes the emotional deterrent of negative feedback only when the feedback addresses a domain of personal importance and when the feedback is reliable (Gervey et al., 2005; Raghunathan & Trope, 2002; Reed & Aspinwall, 1998; Trope & Neter, 1994; Trope & Pomerantz, 1998). Although participants in the current study were explicitly asked to write in an affecting way, and thus the quality of their work could be evaluated, the random format of the writing entailed that participants might not be concerned with this assessment. As a result, feedback on the written work was perceived as unimportant. This issue was conveyed by participants' post-experiment comments. Many participants indicated that since they did not attempt the written task, the feedback could hardly be important or informative. In addition, there seemed to be an unexpected effect of the written content due to its self-conveying character. Specifically, some of the participants who wrote about negative experiences expressed their unwillingness to disclose their private vulnerability to criticism.

Taken together, our results are unable to conclusively reject the affective buffer hypothesis. Nevertheless, inspection of the results and possible methodological shortcomings suggest directions for future research by addressing the above questions. Future research can employ an emotion-neutral task on which negative feedback is perceived as both self-relevant and important. Attitude to negative feedback (e.g., willingness to accept it, interest in considering it) should also be measured immediately following a mood induction task. Furthermore, results obtained from the revised design may in turn suggest a re-examination of the buffer

hypothesis for mood's influence on moral judgement. Specifically, if, with the revised design, results reveal a reliable association between UJ and favourable attitude to negative feedback, and replicate the buffer effect of positive mood on attitude to negative feedback, it could be argued that positive mood's buffer effect on moral judgement is due to facilitating an elaborate processing of a moral problem instead of simply undermining negative emotion elicited by the problem.

5.5.2 Mood and processing strategy

By addressing the relationship between cognitive task performance and moral judgement, and the relationship between cognitive task performance and mood, we examined the affective tuning hypothesis, according to which mood influences moral judgement by alerting a certain processing style via its informational function. We found that successfully solving the most revealing CRT question, i.e., the bat-ball question, was associated with a higher UJ likelihood in the MP dilemma. This result, reconciled with the dual-process model for moral judgement (Greene et al., 2001, 2004, 2008), suggests that moral judgement can be guided by processing style such that engaging in reflective processing gives rise to UJs, which was similarly revealed by previous research (e.g., Moore et al., 2008; Paxton et al., 2012). However, the result that bat-ball score, as an index of processing style, was independent of mood suggests that the processing effect on moral judgement could not be attributed to difference in mood, thus disproving the affective tuning hypothesis. However, further analyses suggest that mood might have affected moral judgement through informational value, but the affective tuning hypothesis was invalid due to neglecting individual difference in trait reflectiveness during analysis.

The independence between bat-ball score and mood gives rise to the idea that bat-ball score measured one's dispositional reflectiveness versus impulsiveness, based on research showing CRT performance as an indicator of characteristic tendency to make a decision upon reflection instead of emotional impulse (Oechssler et al., 2009). A follow-up analysis considering this individual difference showed that the predictive link from dispositional reflective processing to UJ was a function of mood. Whereas dispositional reflectiveness was related with a higher likelihood of UJs in the positive mood condition, no such a processing effect was found in either the neutral or negative mood condition.

This interaction between processing disposition and mood can be argued to fit into Clore and Huntsinger's (2007, 2009) mood-and-accessible-cognition framework, which suggests that positive or negative mood affects JDM by conveying positive or negative value on the most

accessible cognition content (e.g., thought, inclination, processing tendency) in the first instance. Accordingly, we argued that positive or negative mood provides positive or negative value to one's initially activated approach to a moral dilemma. That is, if a person is generally disposed to cope with problems in a reflective pattern and tends to do the same when faced with a moral dilemma, he would see this processing tendency as appropriate when being in a good rather than a bad mood, and would in turn be more likely to make a UJ. Similarly, if a person in general tends to respond spontaneously based on emotion, this inclination would be particularly likely to operate and in turn promote non-UJs when in a good mood. Consistent with this idea, whereas there was a disparity of UJ probability between reflective and impulsive tendency in the positive mood condition, moral judgement was not differentiated by dispositional processing tendency in the negative mood condition. This meta-cognition pattern is in line with the idea that mood influences moral judgement by conveying information about the value of one's initially activated processing tendency. From this perspective, our results are in accordance with other research demonstrating a meta-cognition mannered mood effect on cognitive processing. For example, Ruder and Bless (2003) showed that positive mood promotes reliance on the "ease-of-retrieval" heuristic; that is, people in a positive mood, compared to those in a negative mood, are more likely to judge a position as credible when they find it easy to come up with arguments for the position. Similarly, Koch and Forgas (2012) found that when judging whether a claim was true, participants in positive but not negative mood relied on "processing fluency" as a clue that the claim was true. Just as mood confers value on the ease-of-retrieval feeling or the congruence-truth link, mood confers value on reflective or impulsive processing in response to a moral dilemma.

The current study uses bat-ball score, a dependent variable, as a criterion to assign participants into dispositional reflectiveness or impulsiveness groups. This means the sample size of each level was not balanced. Thus, we expected a modest reliability of the interaction between mood and dispositional processing. Future research can address this problem by setting processing tendency as an independent variable, priming participants with reflective or impulsive processing tendency.

5.5.3 Mood and goal adoption

The interaction between processing disposition and mood also gives rise to a thought with respect to mood's influence on goal adoption: positive mood encourages and negative mood inhibits the adoption of a utilitarian goal. This thought is first based on the proposal that CRT performance might have measured the degree to which one is utilitarian in general. This

proposal is drawn in part from the predictive role of CRT score for utilitarian judgement, as found in both Paxton et al.'s and the current study. It also builds on research that consistently shows the predictive power of CRT performance on responses in a variety of heuristic-and-bias tasks (i.e., tasks in which certain illogical or short-term responses are prepotent; Campitelli & Labollita, 2010; Toplak, West, & Stanovich, 2011). More importantly, score on the CRT is found to account for a considerable amount of variance in heuristic-and-bias task performance that is unexplainable by cognitive ability or dispositional processing style (see Toplak et al., 2011).

Accurate responses in most heuristic-and-bias tasks require both deliberative processing and capacity of computing or inferring accurate answers (Stanovich, 2009). Thinking disposition can be argued to be responsible for the activation of deliberative processing, and cognitive capacity for accurate computation or logical reasoning. Thus, the CRT seems to uniquely measure some other construct than cognitive capacity and dispositional processing. Two specific economic tasks — in both of which responses are found to be predicted by CRT performance — provide a hint in this regard. One is the intertemporal choice task, in which one is faced with a choice between a smaller, immediate and a larger, delayed reward. Another is a gambling task in which the risk-taking choice corresponds to a high expected value. CRT performance has been found to be positively predictive of long-term decisions in both tasks (i.e., the larger but delayed reward and risk-taking choice; Campitelli & Labollita, 2010; Frederick, 2005). Note that whereas an inaccurate response is immediately available in most heuristic-and-bias tasks (e.g., the Linda problem; Tversky & Kahneman, 1983) this is not the case for the intertemporal choice and high-expected-value gambling tasks. These two tasks, like a moral dilemma, create a dilemma where one is faced with an immediate reward, safety and a future larger gain. Thus, inhibiting the pursuance of a short-term benefit calls for the consideration of future payment. Simply put, one needs to be farsighted. This gives rise to the idea that the CRT might uniquely measure a broader processing scale, which enables one to assess given information as a whole rather than focusing mainly on salient pieces.

Thus, those who performed better in the CRT, when faced with a moral dilemma, might be more likely to consider saving the majority versus minority while being less bounded by the affective pain. Interpreted in this way, CRT performance might, to some extent, indicate whether one can be seen as utilitarian in general. This is not to say that a utilitarian choice in a moral dilemma is necessarily the rational decision. Rather, we contend a notion that those who are utilitarian keep in mind a goal being deciding for the greater good. Indeed, as mentioned earlier, we found that the predictive power of dispositional reflectiveness, as indexed by bat-ball score, was not moderated by the response time in the moral dilemma.

Admittedly, this result is of low reliability because the current data do not allow for the partition of variance of individual difference in response latency. Nevertheless, it still gives rise to the idea that for those performing better in the CRT, reaching a utilitarian judgement does not necessarily rely on more effortful processing. Thus, those performing better in the CRT may have been habituated to be inclined to a utilitarian goal (this routine may be shaped by e.g., individual learning, circulation by culture).

Relating CRT performance to utilitarianism, the combined effect of mood and bat-ball correctness can be argued in terms of mood's influence on goal adoption. Research in neurophysiology distinguishes an approach system generally related to positive affect and an avoidance system generally related to negative affect (cf. Carver & White, 1994; Depue & Collins, 1999).[20] Congruent with this implicit association between positive or negative affect and approach or avoidance tendency, research on mood and motivation shows that positive mood encourages the adoption of the most accessible goal whereas negative mood promotes avoidance of the goal (Fishbach & Labroo, 2007). Our results can be argued to be compatible with this pattern and thus add to the argument that positive mood promotes goal adoption whereas negative mood dissuades it. For those whose most accessible goal is utilitarian, being in a positive mood facilitates the adoption of the goal whereas being in a negative mood inhibits it. As a result, the utilitarian inclination gives rise to a UJ in the positive but not negative mood condition. This interpretation is also compatible with the mood-and-accessible-cognition framework, if the most accessible cognition content refers to one's accessible goal at the moment. This idea, that mood can affect moral judgement by encouraging the adoption or rejection of a utilitarian goal, can be further examined by priming participants with different moral-related goals.

Finally, note the above explanations in terms of mood's influence on the adoption of dispositional processing or a utilitarian goal cannot account for the result in the neutral mood condition. Whereas participants receiving the neutral-mood manipulation were induced with a positive mood at a similar level to those receiving the positive-mood manipulation, moral judgements were not differentiated by CRT performance in the neutral mood condition. This difference suggests that the facilitating effect of positive mood induction on the predictive power of CRT performance might be not only an effect of a positive mood. For example, writing about happy life experience, compared to casual evening activities, might enhance one's self-esteem and thus cause one to value the most accessible processing tendency or goal.

[20]Though it should be noted that some specific negative emotion, e.g., anger, is associated with approach tendency (Carver, 2004).

Indeed, congruent with this view, research on self-esteem shows that people with high self-esteem tend to focus on positive aspects of accessible information (Dodgson & Wood, 1998). Given this imprecision in mood effect in the current study, future research should employ various mood induction methods to confirm the observed mood effect.

Nevertheless, our results highlight the need to consider individual difference in cognitive aspects related to JDM, such as thinking disposition and implicit motivation, as reflected in the current study. Meanwhile, the importance of considering such dispositional factors also gives rise to thoughts on the comparison between the current dilemma paradigm and the paradigms used by de Vries et al. (2008b, 2012), who showed that positive mood facilitates reliance on intuitive processing whereas negative mood promotes reliance on deliberate processing. It might be due to certain essential differences between the paradigms that our results contradict the initial thesis hypothesis that positive mood gives rise to emotion-based judgements or decisions whereas negative mood increases more cognitively controlled outcomes. This perspective will be discussed in detail in the following (General Discussion) chapter.

Chapter 6

General Discussion

6.1 Review of empirical chapters

The current thesis aims to explore the influence of mood on JDM in scenarios positing an emotion/deliberation dilemma such that spontaneous, emotional judgements and decisions are in conflict with more controlled, objective, utilitarian judgements and decisions. The initial thesis hypothesis was that positive mood should give rise to judgements or decisions reflective of an emotional impulse, whereas negative mood should give rise to judgements or decisions characterised by cognitive control. This hypothesis was built on the AAI theoretical framework (Clore & Huntsinger, 2007, 2009; Schwarz & Clore, 2007) and related empirical evidence suggesting that moods present valence-congruent information about the current situation and in turn influence processing style. To examine the hypothesis, we used two specific paradigms that are analogously assumed to incorporate the emotion/deliberation dilemma: One is the mini-UG setting, in which intention- and outcome-based decisions should be diverged (Study 1); the other is a moral dilemma paradigm in which a utilitarian judgement favouring the welfare of the majority is at the cost of an emotion-laden act sacrificing the minority (Studies 2 & 3).

Study 1 examined the effect of a sad mood, relative to a neutral mood, on responders' decisions in the mini-UG. Drawing on research on emotion and fairness perception (Hegtvedt & Killian, 1999; Sanfey et al., 2003), on negotiations (Babcock et al., 1997; Leung et al., 2004) and on attribution (Gilbert & Malone, 1995), we reasoned that the mini-UG engendered an emotion/deliberation dilemma in cases where a highly disadvantageous offer (e.g., 2 out of 10 tokens) is backed with a sensible justification (e.g., the alternative option is even worse, as was the case in the Hyper-unfair game). We proposed that in such cases, an aversive emotional response to the disadvantageous inequality would opt for rejection of the offer, whereas more

cognitively controlled processing would promote the objective assessment of the situation, hence acceptance of the offer.

For the core idea of the thesis, we hypothesised that a sad mood would promote acceptance of seemingly unfair offers when they are justifiable given certain situational constraints. This experimental hypothesis was based on the AAI framework and empirical evidence that a sad mood imposes reliance on deliberative processing versus intuitive feeling (de Vries et al., 2008b, 2012), promotes situational attribution in the presence of environmental force (Forgas, 1998b), and increases equity-based fairness judgements and decisions (Inness et al., 2005; Sinclair & Mark, 1991). These, in combination, arguably suggest that a sad mood should give rise to decisions reflective of a more comprehensive assessment of the situation.

Our results, however, did not meet the initial prediction; rather, they showed comparable likelihoods of rejecting 8:2 offers between participants receiving a neutral mood induction and those receiving a sad mood induction. This null effect of a sad mood was further discussed in view of a rather minor impact of intention on responders' decisions in the mini-UG, which was suggested by both our results for game type and the literature of reciprocity behaviour. Specifically, we found that whereas an 8:2 offer was highly rejected disregarding the variation in intention, a 6:4 offer was fairly easily accepted when it came with a reasonable intention. A relatively definite reading of the contrast could be that the consideration of intention depends on the quality of outcome. Nevertheless, a more fundamental point is that payoff distribution plays a highly dominant role over intention in determining socio-economic decisions. A closer analysis of relevant literature showed that this claim was in accordance with the empirical evidence that payoff distribution, but not intention or intentionality, determines final decisions in the context of positive reciprocity (Stanca, 2010; Xiao & Bicchieri, 2010).

In Studies 2 and 3, we used a moral dilemma paradigm to examine the idea that moods can influence moral judgements by affecting individuals' processing style. In a moral dilemma, participants were confronted with a choice between a utilitarian action (e.g., saving five people at the cost of killing an innocent person) and a deontological/non-utilitarian action (e.g., not killing the person). We adopted a dual-process approach according to which a person's negative emotional response provokes a non-utilitarian judgement, whereas a cognitively controlled process gives rise to a utilitarian judgement (Greene et al., 2001, 2004, 2008; Koenigs et al., 2007; Mendez et al., 2005; Moore et al., 2008; Paxton et al., 2012). Unlike the mini-UG, the moral dilemma paradigm posits a dilemma where the emotional cost of a utilitarian, situation-responsive choice does have a material payoff (i.e., achieving the welfare of the majority); thus, the moral dilemma paradigm is believed to more effectively embody an emotion/deliberation dilemma.

In Study 2 we examined two different hypotheses with respect to the influence of moods on moral judgements. The affective tuning hypothesis was based on the AAI approach for the process tuning effects of moods. It argued that because negative mood gives rise to systematic, deliberative processing, it should increase the likelihood of utilitarian judgements in moral personal dilemmas; in contrast, because positive mood tends to increase reliance on emotional responses, it should reduce the likelihood of utilitarian judgements in moral personal dilemmas. The affective buffer hypothesis, implied by Valdesolo and DeSteno's (2006) study, predicted the opposite. It assumed that positive mood would attenuate the emotional negativity integrated in moral personal dilemmas, whereas negative mood would strengthen it.

Using a within-subject design in Study 2, we did not find an aggregated-level difference between the negative mood and baseline conditions in terms of the likelihood of utilitarian judgements for moral personal dilemmas. However, further inspection of the data presented mixed, intriguing results. On the one hand, in line with the affective tuning hypothesis, the negative mood induction led to a higher proportion of utilitarian judgements for the moral personal dilemma presented shortly after the mood induction. On the other hand, in accordance with the buffer hypothesis, the likelihood of utilitarian judgements tended to increase with positive mood.

Accordingly, Study 3 further examined the above two hypotheses with respect to mood effects on moral judgement. We measured, in addition to moral judgements, processing style and mood-as-buffer in non-moral tasks, and looked at whether and how the indicator variables were related to moral judgement. With respect to the affective buffer hypothesis, we found that the more positive a participant felt, the more likely he was to make a utilitarian judgement on a moral personal dilemma, and the more willing he was to accept negative feedback. However, the result that moral judgement and feedback-acceptance were unrelated did not support the buffer hypothesis. This absence of support, as noted in Chapter 5, was subject to the caveat that acceptance-of-negative-feedback might not validly measure the function of mood suggested by the affective buffer hypothesis: The buffer hypothesis for moral judgement suggests that positive mood gives rise to utilitarian response by downgrading the degree of emotional negativity, hence pointing out a deactivation of the emotional path; in contrast, research on affect and self-control suggests that positive mood promotes the motivation to process negative feedback without fading its emotional cost, hence illustrating an enhancement of the cognitively controlled path (Gervey et al., 2005). Meanwhile, given the conceptual parallel between the moral dilemma and self-control (i.e., feedback-acceptance) paradigms, the possibility that mood may influence moral judgements through affecting self-control emerged,

a point I will return to later.

With respect to the affective tuning hypothesis, we found that reflective processing (indexed by the bat-ball score in the CRT) was predictive of a utilitarian judgement in a moral personal dilemma. This was in general in line with the dual-process model for moral judgement (Greene et al., 2001, 2004, 2008; Paxton et al., 2012). Meanwhile, processing style (impulsive or reflective) as measured in Study 3 was independent of mood, suggesting that the association between reflectiveness and utilitarian judgements was not related to changes in mood. Thus, these results were not illustrative of the affective buffer hypothesis.

Given the dissociation between CRT performance and mood, we further took the bat-ball score as an indicator of dispositional reflectiveness. We showed that the association between reflectiveness and moral judgements was dependent on mood induction. Whereas in the positive mood condition, dispositional reflective processing was related with a higher likelihood of utilitarian judgements, in neither the neutral nor the negative mood condition was there a statistically reliable relationship between dispositional processing tendency and moral judgement. This result is in accordance with the "affective processing principle", which posits that mood conveys a valence-congruent value of the most accessible thought or behaviour tendency (Clore & Huntsinger, 2007, 2009). Accordingly, positive or negative mood affects moral judgement by transmitting a positive or negative value of one's initial processing approach to a moral dilemma (i.e., whether to respond to the dilemma based on emotional impulse or further reflection). Similarly, assuming that CRT performance may inform a person's moral orientation (utilitarian or deontological), the above interaction suggests that mood may influence moral judgement by conveying a positive or negative value of an individual's moral orientation. In this respect, generally, our finding of the mood effect on moral judgement is illustrative of an informational role and tuning function of mood.

6.2 Homogeneity of the most accessible thought

Taking into account the individual difference in moral orientation may help reconcile the inconsistency between the current and de Vries et al.'s (2008b) results. As reviewed in Chapter 2, de Vries et al. showed that, whereas positive mood was associated with a greater reliance on emotional reaction (e.g., a gut feeling a deck was advantageous in the IGT; de Vries et al., 2008b), negative mood was associated with a greater reliance on deliberative decisions (e.g., a computation of the expected value of a gamble; de Vries et al., 2012). As a result, happy-mood participants outperformed sad-mood ones in, e.g., the early stage of the IGT, when individuals' "wise" decisions are largely guided by their gut feelings that distinguish

advantageous from disadvantageous decks (de Vries et al., 2008b).

Unlike response to moral dilemmas that could be largely related to implicit moral orientation, response to the above risky decision making task seem to be relatively uniform among individuals. This is not to say that risk-related decision making is independent of dispositional factors. Indeed, Peters and Slovic (2000), for example, demonstrated that people with greater emotional reactivity were more likely to sample from the advantageous decks in the IGT. Weller, Levin, and Bechara (2010) also showed that performance in the IGT was related to risk-taking tendency and sensitivity to expected loss. Yet, the point is that people's decisions in the gambling game are still based on their ascertainment about the gain/loss contingencies through sampling (Weller et al., 2010), which is more of a gut feeling at the early stage. Thus, for probably the majority of the participants in de Vries et al.'s (2008b) IGT study, the most accessible information in the early trials wer their gut feeling about which decks were advantageous and which were not. Given that positive mood promotes the reliance on this kind of intuition, while negative mood decreases it, participants in a positive mood outperformed those in a negative mood in the early stage of the IGT. However, compared with the emotional signal evoked in the IGT, individuals' moral orientations in the face of a moral dilemma could be less homogeneous, thus so could be their inclined moral judgements. This is also illustrated by the fact that the moral personal dilemma we used in Study 3 was approximately 50% likely to receive a utilitarian judgement. Thus, while there was no mood effect in terms of a between-group difference, an interactive effect between mood condition and moral orientation was detected.

6.3 Alternative explanations for mood effect on moral judgement

An interesting pattern observed in the current studies was that the likelihood of utilitarian judgements for moral personal dilemmas tended to increase with positive mood (Studies 2 & 3) but decrease with negative mood (Study 3). Although this might be seen as consistent with the affective buffer hypothesis, below I consider two alternative accounts that deserve attention: One is with respect to mood's influence on the implementation of willpower; the other is with respect to mood's processing effect in terms of thinking level and scope.

6.3.1 Mood, willpower and ego depletion

The observation that utilitarian judgements tended to be reduced with negative mood is arguably in with research showing a link between negative mood and ego depletion (e.g., Jones, Graupmann, & Frey, 2006; Knapp & Clark, 1991; Leith & Baumeister, 1996; Schwarz & Pollack, 1977; Seeman & Schwarz, 1974). Before turning to this point, let us first consider the dual-proces model for moral judgement and an inherently related concept, *willpower*.

Greene et al.'s (2001) initial claim was that both an emotion-driven process and a more cognitively controlled process are involved in forming moral judgements. In later articles (Greene et al., 2004, 2008), they made the structure more specific, such that the emotionally impulsive processing drives non-utilitarian judgements and the cognitively controlled processing can overcome the impulse and encourage utilitarian judgements. Although inconclusive, this position does suggest that the dual-process model is more of a "intervention", or sequential, than a "parallel-competitive" structure (Evans, 2008, p. 266). This is plausible given that one's emotional responses to a moral dilemma represent a focus on spontaneous and hedonic versus future and material values (Pham, 2007).[21]

Willpower and ego-depletion An inherently related concept to the sequential structure is willpower. Taken analogous to energy, willpower is thought and found to be an *limited* inner resource that is demanded in a variety of "acts of self-control and executive functioning" (Schmeichel, Vohs, & Baumeister, 2003, p. 33; for overviews of the "limited-resource" model, see Baumeiter & Heatherton, 1996; Muraven & Baumeister, 2000; for empirical evidence, see, e.g., Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven, Tice, & Baumeister, 1998; Vohs & Heatherton, 2000; for reviews, see, e.g., Baumeister, Muraven, & Tice, 2000; Vohs, 2006). From a dual-process perspective, willpower exerts its influence when the cold, reflective, cognitively controlled processing overcomes the hotter, impulsive, emotion-driven processing (Mischel, DeSmet, & Kross, 2006, p. 300). This implies that depletion of willpower, referred to as "ego depletion" (Baumeister et al., 1998), would promote the tendency to act upon emotional rather than cognitively controlled processing (Loewenstein & O'Donoghue, 2007; Vohs, 2006). In support of this view, ego depletion has been found to lead to, e.g., reduced patience (Baumeister et al., 1998; Experiment 2), greater impulsive consumption (Vohs &

[21]The sequential structure is not essentially incompatible with the above notion of individual moral orientation, bearing in mind that individual moral orientation could have been shaped through personal learning and/or cultural transmission. People with a utilitarian orientation may not experience an aversive emotion at all, or, more probably, they have learnt to regulate emotion rapidly and efficiently to match a utilitarian goal. For the latter case at least, the sequential-structure dual-process model is still applicable.

Faber, 2007), increased procrastination (Tice, Bratslavsky, & Baumeister, 2001; Experiment 3) and a greater preference for immediate gratification (Tice et al., 2001; Experiment 2) — all can be seen as allowing an immediate, emotional act the cost of a long-term, greater reward. Analogously, ego depletion may reduce utilitarian judgement in the moral dilemma context.

Negative mood and ego depletion Negative mood is found to contribute to ego depletion and in turn makes people more prone to act or decide upon emotional impulse than cognitive control. For example, early research showed that children (aged 9 to 11) induced in a negative mood, compared to those induced in a positive and/or neutral mood, were less resistant to immediate gratification (Schwarz & Pollack, 1977; Seeman & Schwarz, 1974). Likewise, among adults, negative mood is associated with a greater preference for immediate gratification in an investment setting (Knapp & Clark, 1991; Wertheim & Schwarz, 1983). Leith and Baumeister (1996) also showed that negative mood led to more irrational risk-taking decisions (i.e., pursuing a gambling act with a very "slim" likelihood of resulting in a huge win). More recently, Jonas et al. (2006) found that negative mood reduced the selection of dissonant information, which is shown to be willpower-expended (Fischer, Greitemeyer, & Frey, 2008). In a similar vein, for activities requiring self-regulation to overcome visceral drive, such as dieting (Baucom & Aiken, 1981; Ruderman, 1985) and smoking cessation (Shiffman & Waters, 2004), precedent negative mood has been shown to be associated with quicker lapse. Together, the evidence above suggests that for moral judgement, negative mood may decrease utilitarian judgements through ego depletion, which reduces cognitive control.

6.3.2 Mood and processing scope

On the other hand, the observation that utilitarian judgements tended to increase with positive mood can be seen to be in accordance with the upgrading effect of positive mood on construal level and processing scope (Fredrickson, 2001; Fredrickson & Joiner, 2002; Isen, 2007, 2008; Isen & Reeve, 2005; Pyone & Isen, 2011). This is based on two theoretical considerations. First, according to the "construal-level" theory (Trope & Liberman, 2003), construal level is influential for JDM where final choices give priority to either present, salient gain or future reward that has a larger implication. Specifically, low-level construals are associated with a more concrete perception of the situation and give rise to present-focused choices; in contrats, high-level construes are associated with a more abstractive perception of the situation and give rise to long-run beneficial decisions (Trope & Liberman, 2003). In accordance with this position, research shows that high-level construals promote, e.g., preference for delayed gratification and attempt to be less short-tempered but more self-controlled (e.g., Fujita,

Trope, Liberman, & Levin-Sagi, 2006).

Moral judgements in the moral dilemma paradigm can also be analysed in terms of construal level: Whereas utilitarian judgements represent a superior consideration of accomplishing "overarching goals" (e.g., to save five people even though one person will be killed), non-utilitarian judgements represent a superior consideration of "means" to accomplish the goal (e.g., an innocent person is killed; Amit & Greene, 2012). Thus, whereas utilitarian judgements are associated with a broader scope and abstractive, high-level construals, non-utilitarian judgements are associated with a "present bias" (Frederick, Loewenstein, & O'Donoghue, 2002) and more concrete, low-level construals. In line with this notion, Amit and Greene (2012) showed that visualised processing (e.g., imagery) of a moral dilemma boosts a non-utilitarian judgement, and verbalised processing of it boosts a utilitarian judgement. Recent research has suggested that visualised processing is associated more with low-level construals, and verbalised processing is associated more with high-level construals (e.g., Amit, Algom, & Trope, 2009). Consistently, assuming that CRT performance was a potential measures for level of thinking, our results also suggest such a link between moral judgement and construal level (Study 3).

Second, positive affect literature suggests that mild positive affect gives rise to flexible, thoughtful processing and high-level construals (see Isen, 2007, 2008, for reviews). In Chapter 2, I noted that positive mood seems to be associated with a moral flexible processing style. This notion was based on the review that, whereas individuals in a negative mood tend to employ a systematic, careful processing approach regardless of external demand, those in a positive mood do not do so until the necessity is explicitly highlighted (e.g.. Bless et al., 1990, 1996c; Bodenhausen et al., 1994), and that positive-mood people are better at solving creative tasks through perceiving unusual links between given items (e.g., Isen et al., 1987; Isen & Daubman, 1984). These are merely two specific illustrations of the idea of "flexibility" in terms of "cognitive organisation" (Isen, 2008). Accordingly and beyond, a more advanced idea is that positive mood can broaden processing scope, give rise to high-level construals and trigger considerations of multiple aspects of the situation (Fredrickson, 2001; Isen, 2007). In support of this view, research shows that positive mood leads to improved self-regulation (Isen & Reeve, 2005) and broad-mind coping (Fredrickson & Joiner, 2002). And, as mentioned earlier, Trope et al.'s studies suggest that people in a positive mood have greater self-control and are more likely to accept negative yet useful feedback (Gervey et al., 2005; Raghunathan & Trope, 2002). More relevantly and recently, Pyone and Isen (2011; Study 4) showed that positive-mood participants, relative to neutral-mood ones, were more prone to delayed than immediate gratification, suggesting that positive mood gives rise

to a forward-looking perspective. Together, the evidence of the promoting effect of positive mood on high-level construals and broad processing scope, and that of the link between moral judgement and construal level and processing scope, suggests that positive mood may increase utilitarian judgement by heightening thinking level and/or broadening processing scope.

6.4 Contextual variation

Earlier, I discussed our results from the perspective that moods may influence moral judgement through modulating the subjective value of moral orientation (Study 3). Given that Study 3 tested one specific moral personal dilemma (i.e., the Rescue-911 dilemma), the question would be whether this pattern of mood effect on moral judgement is subject to the dilemma in question. To illustrate, below I consider a specific comparison between our result with the Rescue-911 dilemma and Valdesolo and DeSteno's (2006) result with the footbridge dilemma.

Recall that the Rescue-911 dilemma showed a proportion of utilitarian judgements being approximately 50% (Studies 2 & 3). At an individual level, this suggests that a person would be 50% likely to make a utilitarian judgement in the face of the dilemma, regardless of his moral orientation. By extension, if we consider a person's moral orientation as a utilitarian-deontological continuum that is sensitive to dilemma scenario, this is analogous to saying that most people's moral inclination would be at the midpoint of the continuum. Thus, there would be equal space to evaluate one's inclination in the direction favouring either end. Hence, for such a mildly difficult dilemma, mood can affect people's moral judgement by conferring valence-congruent value onto their moral orientation.

In contrast, the footbridge dilemma engenders rather intense tension, illustrated by a utilitarian judgement rate of approximately 20% (Study 2 in the current thesis; also consistently shown in Valdesolo and DeSteno, 2006, as well as other studies, e.g., Moore et al., 2008). This suggests that most people have a non-utilitarian inclination when confronted with this dilemma. In keeping with the idea that moral orientation is a utilitarian-deontological continuum that is responsive to the dilemma in question, most people's inclination in the face of the footbridge dilemma would be much closer to the deontological end than the utilitarian end. Thus, merely weighting one's moral inclination as more positive or negative might be insufficient to drive a utilitarian response. Instead, high-level and broad-scope thinking should be more advantageous in this respect, because it can fix the tension by facilitating a consideration of consequence at an aggregate level. Therefore, for moral dilemmas as difficult as the footbridge dilemma, positive but not negative mood would be expected to foster utilitarian

judgements, as shown in Valdesolo and DeSteno's (2006) study.

Broadly, the above analysis is in accordance with the *contextualist* approach (McGuire, 1983), according to which different standpoints (or, experimentally, different or seemingly contradictory result patterns) can be converged by considering the contextual boundary. Indeed, with respect to mood effect on cognitive processing, there is evidence that mood may initiate multiple kinds of effects simultaneously, and the observed one depends on the context under consideration (e.g., Hirt, Levine, McDonald, Melton, & Martin, 1997). Accordingly, the initial thesis hypothesis emphasising a determinant role of mood's processing effect might have been overextended in the emotion/deliberation dilemma contexts we considered.

The contextualist approach also helps explain the lack of mood effect on responders' decisions in the mini-UG (Study 1). In the mini-UG, payoff distribution dominates intention in shaping reciprocity behaviour. Possibly, this priority has been built into social convention due to its self-protective utility. Thus, mood, as a diffuse extraneous factor, cannot influence decisions in such a situation, where a certain normative solution is highly outstanding. This is also in line with the argument highlighting the limitation of mood's informational value in contexts where decision-relevant information is salient (Schwarz & Clore, 1987, 2007).

Somewhat related to the contextualist point, an intriguing idea is that the extent to which one finds it difficult to make a choice in a dilemma depends not only on the degree to which the dilemma is emotion-laden in itself, but also on the compatibility between the person's moral orientation in general and the extremity of the dilemma. Consider a modified version the footbridge dilemma in which the choice is between not killing one person and saving 50, instead of five, people. When faced with this dilemma, an individual who is deontological in general would probably also feel tempted to make a utilitarian choice. In such an instance, people not only are confronted with a moral issue but also experience a dissonance such that the momentary, spontaneous thought is at odds with their predisposition. The dissonance may also contribute to the subjective difficulty in responding to a moral dilemma.

This idea has been similarly advanced in quite recent model by Baron et al. on moral judgement (Baron, Gurcay, & Stracke, 2012; called the BGMS model henceforth). The key assumption of the BGMS model is that a person's moral judgement or decision is a function of the comparison between his "ability" (i.e., the degree to which he is utilitarian in general) and the "difficulty" of the dilemma (an easy dilemma would receive utilitarian response from most people). In particular, the model predicts that when faced with an easy dilemma, both high- and low-ability people can make a utilitarian judgement, but the latter would spend more time doing so. Using response time as a dependent variable, the BGMS model has fitted several data sets in this respect (see Baron et al., 2012). Our results suggest that for a mildly difficult

moral dilemma, mood can affect moral judgement by providing the value of one's initial moral disposition. This, combined with the BGMS model, suggests that when a generally deontological person is dealing with a relatively easy dilemma, mood may influence response latency through affecting the degree of the incompatibility between the moral disposition and dilemma extremity. Specifically, positive mood may enhance the dissonance by conferring a positive value onto a person's moral disposition, whereas negative mood may reduce the dissonance by conferring a negative value onto the disposition. Future research may test the idea.

So far, dilemma difficulty has been discussed in terms of the likelihood of utilitarian judgements. Of course, distinguishing moral dilemmas based on this quantitative criterion is in a simplified manner. Underlying causes for the distinction can be various moral-related factors integrated into dilemmas .Questions such as whether and how mood's influence on moral judgement depends on any specific moral-related factor should be considered in future research.

6.5 Practical implications

Our findings may have implications for legal decision making. Drawing on psychological principles, recent research shows that legal decisions are largely prompted by emotions embedded within moral intuitions (referred to as "moral indignation" by Sunstein, 2008, for example). Research also emphasises that affective states such as personal mood can affect jurors' decision making (see, e.g., Feigenson & Park, 2006). Generally in line with this, the finding of the current thesis imply that mood may affect jurors' decisions through interaction with individual moral outlook. It seems possible that in ambiguous situations where the morally acceptable behaviour is not clear and/or people's moral notions are sparse, mood may acts as a form of inner feedback on individual moral perspective at the outset. In this respect, factors that can potentially induce a long-lasting mood, such as weather, stress and court atmosphere (this can be especially important for complicated cases lasting over multiple trials), may deserver attention.

6.6 Methodology limitations

Several experiment-specific problems have been mentioned in the empirical chapters, including the inability of the mini-UG to incorporate an emotion/deliberation dilemma to a useful degree (Study 1), undesired confounding effects due to the presentation of multiple moral dilemmas

(Study 2), and a possible mismatch between mechanisms underlying the mood effect on moral judgement and on self-control (Study 3). Additionally, several methodological limitations with respect to the general approach of our design should be noted.

One limitation is that mood was measured using self-reporting. In addition to being used to check the effectiveness of mood manipulation, an important usage of mood self-report in this thesis was to examine the relationship between mood and targeted variables (i.e., moral judgement (Studies 2 & 3), CRT performance and willingness to accept negative feedback (Study 3)). Self-reporting was of questionable validity because it could have been affected by uncontrolled factors such as subjective criteria of feeling emotionally positive or negative, and personal usage of the scale in question (Isen, 2007). Thus, as noted in previous chapters, the results from the relational analyses in the current studies should be considered with caution due to such problems led by self-report measurement.

Another methodology limitation in the current studies is that we assessed decisions and judgements with dichotomised responses (i.e., whether to accept an offer; whether a utilitarian solution is appropriate). This means that, by examining mood effects on moral judgements and socio-economic decisions using binary data, we might have suffered from weakened statistical power. This can be understood in light of a divergence between dichotomised response and response specified on certain sub-category scales. For example. a person who perceives pushing the giant man in the footbridge dilemma as being highly morally acceptable may not agree that it is appropriate to do so. Likewise, a responder may indeed agree that an 8:2 offer in the No-alternative game is unintentional, but is still unwilling to accept it. Thus, possibly, mood effect on mini-UG decisions and moral judgements would be detected if continuous dependent variables were measured. For example, for decision making in the mini-UG, the variable can be the degree to which one thinks intention should matter; for moral judgement, the variable can be the degree to which one thinks a utilitarian act is morally acceptable. Indeed, most recent studies of moral judgement using the moral dilemma paradigm asked participants for their ratings on the moral acceptance of harmful acts for majority-saving goals (e.g., Greene et al., 2009; Paxton et al., 2012). A related issue is that the question accessing moral judgement, i.e., whether "it is appropriate" to initiate a utilitarian act, might lack definiteness, such that participants might have responded to the question on varied bases, e.g., moral acceptance, desirability. Future research should not only access judgements and decisions using continuous variables, but also look at various underlying components for final judgements and decisions, and examine on which dimension mood, or broadly, extraneous affect may have an effect.

Finally, it should be stressed that, although we assume that the experimental paradigm

used here, especially the moral dilemma one, incorporate an emotion/deliberation tension, we do bear in mind that they might be over-hypothetical. Thus, the extent to which the current findings can be generalised to real-life contexts is still questionable.

6.7 Concluding remarks

The current thesis demonstrates that mood can affect JDM when emotionally compelled an more deliberative, cognitively controlled choices are in tension, and final choice is related to others' welfare. Adding to the line of research on affect and JDM, this thesis suggests that the influence of mood on judgements and decisions in such emotion/deliberation dilemmas may be through its informational value, and that whether and how the informational input of mood is put into effect may be determined by its interaction with contextual (e.g., environmentally induced extreme disadvantage to oneself) and dispositional (e.g., personal moral inclination) factors. It also hints at specific questions for future research, including whether mood can influence other-regarding emotion/deliberation dilemmas by affecting willpower exertion and processing scope, and whether and how mood's influence on moral judgement depends on any specific moral dimension.

Appendix A

Moral dilemmas materials [22]

1/25 – BURNING BUILDING

Personal
You and five other people are trapped in a burning building. There is only one emergency exit through which all of you could escape to safety, but it is blocked by burning debris. You notice another person in the hallway leading to the exit who has been injured but is about to crawl to safety through a small hole at the bottom of the exit door.You and the five people behind you do not have time to climb through the small hole.

You realize that you could grab the injured man and use his body as a battering-ram to break through the burning blockage in the hallway that is preventing your escape.

Doing this is certain to kill him. However, if you do not do this, you and the five people behind you will die.

Is it appropriate for you to kill this man in order to save yourself and the other five people?

Impersonal
You and five other people are trapped in a burning building. There is only one emergency exit through which all of you could escape to safety, but it is blocked by burning debris. You notice another person in the hallway leading to the exit who has been injured but is about to crawl to safety through a small hole at the bottom of the exit door. You and the five people behind you do not have time to climb through the small hole.

The hallway's emergency system puts out fire by eliminating oxygen from the hall and you can activate the system by pressing a nearby button.

The fire will go out, but the injured person will suffocate and die. However, if you do not do this, you and the five people behind you will die.

Is it appropriate for you to activate the system in order to save yourself and the other five people?

2/26 – MODIFIED CRYING BABY

Personal
Enemy soldiers have taken over your village. They have orders to kill all remaining civilians over the age of two. You and some of your townspeople have sought refuge in two rooms of the cellar of

[22] Used in Studies 2 and 3. The 24 dilemmas scenarios were developed and used by Moore et al. (2008) based on an original version created by Greene et al. (2001).

a large house. Outside you hear the voices of soldiers who have come to search the house for valuables.

Your baby, who is with you in the room, begins to cry loudly. You put your hand over his mouth to block the sound.

If you remove your hand from his mouth his crying will summon the attention of the soldiers who will spare your baby's life, but will kill you and the others hiding in both rooms.

To save yourself and the others you must keep your hand on his mouth and smother your baby to death.

Is it appropriate for you to smother your baby in order to save yourself and the other townspeople?

Impersonal
Enemy soldiers have taken over your village. They have orders to kill all remaining civilians over the age of two. You and some of your townspeople have sought refuge in two rooms of the cellar of a large house. Outside you hear the voices of soldiers who have come to search the house for valuables.

Your baby begins to cry loudly in the other room.

His crying will summon the attention of the soldiers who will spare your baby's life, but will kill you and the others hiding in both rooms.

If you turn on the noisy furnace to block the sound, the other room will become uncomfortably hot for adults and children, but deadly for infants.

To save yourself and the others you must activate the furnace, which will kill your baby.

Is it appropriate for you to overheat your baby in order to save yourself and the other townspeople?

3/27 – MODIFIED SUBMARINE
Personal
You are a crewperson on a marine-research submarine traveling underneath a large iceberg. An onboard explosion has damaged the ship, killed and injured several crewmembers. Additionally, it has collapsed the only access corridor between the upper and lower parts of the ship. The upper section, where you and most of the others are located, does not have enough oxygen remaining for all of you to survive until you reach the surface. Only one remaining crewmember is located in the lower section, where there is enough oxygen.

There is an emergency access hatch between the upper and lower sections of the ship.

If released, it will fall to the deck and allow oxygen to reach the upper section.

However, a crewmember in the lower section was knocked unconscious and is lying beneath the hatch while you and the rest of the crew are almost out of air.

If you shove the hatch open you and the others will have air, but it will fall to the deck, crushing the unconscious crewmember.

Is it appropriate for you to open the hatch and crush the crewmember below to save yourself and the other crewmembers?

Impersonal
You are a crewperson on a marine-research submarine traveling underneath a large iceberg. An onboard explosion has damaged the ship, killed and injured several crewmembers. Additionally, it has collapsed the only access corridor between the upper and lower parts of the ship. The upper section, where you and most of the others are located, does not have enough oxygen remaining for all of you to survive until you reach the surface. Only one remaining crewmember is located in the lower section,

where there is enough oxygen.

There is an emergency access hatch between the upper and lower sections of the ship.

If released by an emergency switch, it will fall to the deck and allow oxygen to reach the area where you and the others are.

However, the hatch will crush the crewmember below, since he was knocked unconscious and is lying beneath it.

You and the rest of the crew are almost out of air though, and you will all die if you do not do this.

Is it appropriate for you to release the hatch and crush the crewmember below to save yourself and the other crew members?

4/28 – SHARK ATTACK

Personal

You are part of a U.N. humanitarian team of SCUBA divers who are deactivating old World War II underwater anti-ship mines. One member of your diving team scrapes himself while trying to deactivate a mine. The blood in the water has attracted several sharks in the area. A feeding frenzy is about to ensue, with the sharks eating everything and everyone in sight. You have a spear-gun, but only one spear and there are many sharks.

The bleeding diver is swimming toward the last protective shark cage and will reach it before you and the others.

The sharks, following the blood, are coming too close for you and the other divers to escape.

You realize that if you shoot and kill the injured diver with your spear-gun before he reaches the cage, the sharks would stop to eat him while you and the others escaped to safety.

Is it appropriate for you to kill this diver in order to save yourself and the rest of the group?

Impersonal

You are part of a U.N. humanitarian team of SCUBA divers who are deactivating old World War II underwater anti-ship mines. One member of your diving team scrapes himself while trying to deactivate a mine. The blood in the water has attracted several sharks in the area. A feeding frenzy is about to ensue, with the sharks eating everything and everyone in sight. You have a spear-gun, but only one spear and there are many sharks.

The bleeding diver is swimming toward the last protective shark cage and will reach it before you and the others.

The sharks, following the blood, are coming too close for you and the other divers to escape.

You realize that if you used the emergency remote to detonate one of the mines, the resulting explosion would kill the injured diver before he reached the cage, allowing you and the others to reach safety.

Is it appropriate for you to kill this diver in order to save yourself and the rest of the group?

5/29 – ORPHANAGE

Personal

You work in an orphanage in a war torn country. Rebel soldiers have staged a successful takeover of the government and are now killing everyone who did not support their regime. Soldiers have entered your town and are burning and killing all those whose loyalty is in question. You and the children in the orphanage did not support this regime. Furthermore, this group of soldiers is conducting an

"ethnic cleansing" genocide campaign to kill everyone of a particular ethnic group in the country. You have one child of this ethnic group in your orphanage.

You know smugglers who could safely get her out of the country but there is no way for you and the other children to escape, and the soldiers will certainly kill you all.

You could smother the one child to death with a pillow while she is sleeping.

Since the soldiers hate the ethnic group she is part of, they would see this as supporting their regime.

Consequently, they would spare you and the other children.

Is it appropriate for you to smother this one child to death to save yourself and the rest of the children?

Impersonal
You work in an orphanage in a war torn country. Rebel soldiers have staged a successful takeover of the government and are now killing everyone who did not support their regime. Soldiers have entered your town and are burning and killing all those whose loyalty is in question. You and the children in the orphanage did not support this regime. Furthermore, this group of soldiers is conducting an "ethnic cleansing" genocide campaign to kill everyone of a particular ethnic group in the country. You have one child of this ethnic group in your orphanage.

You know smugglers who could safely get her out of the country but there is no way for you and the other children to escape, and the soldiers will certainly kill you all.

You could order the nurse to lethally overdose the child on sleeping pills.

Since the soldiers hate the ethnic group she is part of, they would see this as supporting their regime.

Consequently, they would spare you and the other children.

Is it appropriate for you to order the nurse to overdose and kill this one child to save yourself and the rest of the children?

6/30 – PREVENTING EBOLA
Personal
You are a Peace Corps health-worker who is volunteering in a rural African village. A prominent man from a nearby village has contracted an Ebola virus that is extremely contagious, incurable, and almost always fatal within a week. Miraculously, this man has survived for a month, and so he must be a rare carrier who is immune to the virus' deadly effects. However, this man wrongly believes that your health center can cure his disease.

You see him approaching and you know that if he enters the village he will spread the virus to hundreds of innocent people who, unlike him, will die.

There is a loaded gun in the health center.

You realize that the only way you can prevent him from entering the village and spreading the virus to you and the rest of the village is to shoot and kill him as he approaches.

Is it appropriate for you to kill the man in order to save yourself and the rest of the village?

Impersonal
You are a Peace Corps health-worker who is volunteering in a rural African village. A prominent man from a nearby village has contracted an Ebola virus that is extremely contagious, incurable, and almost always fatal within a week. Miraculously, this man has survived for a month, and so he must be a rare carrier who is immune to the virus' deadly effects. However, this man wrongly believes that

your health center can cure his disease.

You see him approaching and you know that if he enters the village he will spread the virus to hundreds of innocent people who, unlike him, will die.

The only way you can prevent him from entering the village and spreading the virus to you and the rest of the village is to warn the village council that he is coming.

This will result in him being shot and killed as he approaches.

Is it appropriate for you to warn the council in order to save yourself and the rest of the village?

7/31 – RESCUE 911

Personal

You are the sole paramedic riding on a rescue helicopter, responding to a devastating flood. You have rescued several critically injured people and you have been treating them to keep them alive. Suddenly, the pilot notifies you that there has been an engine malfunction and the helicopter can no longer support the weight of you, the pilot, and all the injured people on board.

If the helicopter crashes, it will kill everyone on board including you, the pilot, and the injured people that you have rescued.

In order to avoid a crash that will kill everyone on the helicopter, you realize that you must lighten the load enough to keep the helicopter aloft.

Because all of the equipment is bolted down, and you are needed by the injured people, the only way to do this is to throw one of the injured people off the helicopter.

This will lighten the load enough to keep the helicopter in the air but will cause the death of the person thrown off.

Is it appropriate for you to kill this injured person in order to save yourself and everyone else on board?

Impersonal

You are the sole paramedic riding on a rescue helicopter, responding to a devastating flood. You have rescued several critically injured people and you have been treating them to keep them alive. Suddenly, the pilot notifies you that there has been an engine malfunction and the helicopter can no longer support the weight of you, the pilot, and all the injured people on board.

If the helicopter crashes, it will kill everyone on board including you, the pilot, and the injured people that you have rescued.

In order to avoid a crash that will kill everyone on the helicopter, you realize that you must lighten the load enough to keep the helicopter aloft.

Because all of the equipment is bolted down, and you are needed by the injured people, the only way to do this is to cut the cable that is raising up the last rescued person.

This will lighten the load enough to keep the helicopter in the air, but it will also kill the person who is dropped.

Is it appropriate for you to kill this injured person in order to save yourself and everyone else on board?

8/32 – SPACE STATION

Personal

You are an engineer on the international space station, in orbit around the Earth. Suddenly, a fire breaks out in the cargo bay. The automatic fire safety system will open the outer door of the cargo bay, letting the oxygen out of the bay and thus putting out the fire. The automatic system only works when the inner portal to the rest of the station has been sealed. One member of the crew, a mechanic in the cargo bay, has put on half of his bulky space suit when the fire begins. He runs to the portal to climb through to safety, but the portal is too narrow to fit through while wearing a space suit.

You realize that if he tries to climb through, he will get stuck and the fire will spread through the rest of the station because the safety system will not operate with the portal open.

There is no time for him to take off the suit before the fire spreads.

The only way you can prevent the spread of the fire, and save your life and the rest of the crew, is to push the mechanic back through the portal and into the cargo bay.

This way, the safety system will seal the door and decompress the cargo bay, but it will also suck the mechanic into space and kill him.

Is it appropriate for you to push the mechanic back through the portal, and into space, in order to save yourself and the rest of the crew?

Impersonal
You are an engineer on the international space station, in orbit around the Earth. Suddenly, a fire breaks out in the cargo bay. The automatic fire safety system will open the outer door of the cargo bay, letting the oxygen out of the bay and thus putting out the fire. The automatic system only works when the inner portal to the rest of the station has been sealed. One member of the crew, a mechanic in the cargo bay, has put on half of his bulky space suit when the fire begins. He runs to the portal to climb through to safety, but the portal is too narrow to fit through while wearing a space suit.

You realize that if he tries to climb through, he will get stuck and the fire will spread through the rest of the station because the safety system will not operate with the portal open.

There is no time for him to take off the suit before the fire spreads.

The only way you can prevent the spread of the fire, and save your life and the rest of the crew, is to press a button in the control room that seals the portal before the mechanic gets there.

This way, the system will seal the door and put out the fire, but it will also suck the mechanic into space and kill him.

Is it appropriate for you to seal the portal and kill the mechanic in order to save yourself and the rest of the crew?

9/33 – NUCLEAR REACTOR
Personal
You are the inspector of a nuclear power plant that you suspect has not met its safety requirements. The plant foreman and you are touring the facility when one of the nuclear fuel rods overheats. The emergency coolant system fails to activate, and a chain reaction is about to begin which will result in a nuclear meltdown. This will release lethal radiation into the nearby town, killing thousands of people.

You realize that the only way to stop the meltdown is to push the foreman into the fuel rod assembly .

This will remove just enough heat energy from the rod assembly to prevent the nuclear chain reaction.

However, it will also incinerate the foreman instantly.

Is it appropriate for you to push and kill the foreman in order to save yourself and the nearby town?

Impersonal
You are the inspector of a nuclear power plant that you suspect has not met its safety requirements. The plant foreman and you are touring the facility when one of the nuclear fuel rods overheats. The emergency coolant system fails to activate, and a chain reaction is about to begin which will result in a nuclear meltdown. This will release lethal radiation into the nearby town, killing thousands of people.

You realize that the only way to stop the meltdown is to manually release liquid nitrogen into the fuel rod chamber.

This will remove just enough heat energy from the rod assembly to prevent the nuclear chain reaction.

However, it will also instantly kill an employee trapped nearby.

Is it appropriate for you to kill the employee in order to save yourself and the nearby town?

10/34 – CINDERBLOCK
Personal
You are the explosives expert for a company that has been hired to demolish a skyscraper. You are examining the last of the explosive charges when you notice a teenager below who is about to accidentally detonate one of the charges out of sequence. This explosion will result in the building's uncontrolled collapse onto you, the teenager, and the crowd of spectators.

The teenager is several floors below you and cannot hear you because of the loud demolition noise.

You realize that the only way to stop the teenager from detonating the charge is to drop a heavy cinderblock on his head.

This will crush his skull and kill him almost instantly but will prevent the out-of-sequence explosion.

Is it appropriate for you to kill the teenager in order to save yourself and the crowd of spectators?

Impersonal
You are the explosives expert for a company that has been hired to demolish a skyscraper. You are examining the last of the explosive charges when you notice a teenager below who is about to accidentally detonate one of the charges out of sequence. This explosion will result in the building's uncontrolled collapse onto you, the teenager, and the crowd of spectators.

The teenager is several floors below you and cannot hear you because of the loud demolition noise.

You realize that the only way to stop the teenager from detonating the charge is to flip a switch that reactivates the building's electricity.

Because he is touching an open circuit, this will electrocute him but will prevent the explosion.

Is it appropriate for you to kill the teenager in order to save yourself and the crowd of spectators?

11/35 – CLIFFHANGER
Personal
You are a construction worker. You and your crew are high on a scaffold, working on a skyscraper. Suddenly, the scaffolding partially collapses. You and several others are hanging on to a dangling crossbar, but it cannot hold all of your weight.

The worker next to you slips off the crossbar and grabs a hold of your one free arm.

However, you realize that the entire structure is about to give way.

The only way to avoid you and everyone else falling to your deaths is to repeatedly kick your co-worker in the stomach and chest until he lets go of your hand and falls to his certain death.

This will remove just enough weight that the rest of you can make it to safety before the scaffold collapses.

Is it appropriate for you to kill your co-worker in order to save yourself and the rest of the crew?

Impersonal
You are a construction worker. You and your crew are high on a scaffold, working on a skyscraper. Suddenly, the scaffolding partially collapses. You and several others are hanging on to a dangling crossbar, but it cannot hold all of your weight.

The worker next to you slips off the crossbar and catches himself on another portion of the scaffolding; however the entire structure is about to give way.

The only way to avoid you and everyone else falling to your deaths is to pull out a latch that will detach the section of scaffolding with your co-worker on it.

This will remove just enough weight that the rest of you can make it to safety before the scaffold collapses.

However, his fall will certainly kill him.

Is it appropriate for you to kill your co-worker in order to save yourself and the rest of the crew?

12/36 – BUS PLUNGE
Personal
You are the bus driver for a kindergarten field trip to the zoo. On the way, faulty tires cause the bus to overturn and plunge off of a bridge and into a roaring river. You and three of the children are still in the sinking bus, but the rest of the passengers have been swept away down the river to their deaths. You grab the two children nearest to you and begin to swim toward the exit door.

The third remaining child grabs onto your leg.

You realize that you are not strong enough to fight the current and swim with all three children holding on to you.

The only way to reach the surface before you and the children drown is to shake the third child off of your leg.

This will allow you to bring the two children to the surface with you, but the third child will drown.

Is it appropriate for you to shake the child off your leg in order to save yourself and the two other children?

Impersonal
You are the bus driver for a kindergarten field trip to the zoo. On the way, faulty tires cause the bus to overturn and plunge off of a bridge and into a roaring river. You and three of the children are still in the sinking bus, but the rest of the passengers have been swept away down the river to their deaths. You grab the two children nearest to you and begin to swim toward the exit door.

The two children you're holding onto cannot swim, nor can they hold their breath much longer.

Unfortunately, the exit door is blocked by some mangled seats.

You realize that the only way out is to pull the seats away from the exit, allowing you and the two children to escape the bus.

However, this will trap the third child at the other end of the bus, causing him to drown.

Is it appropriate for you to pull the seats away, trapping the third child, in order to save yourself and the two other children?

13/37 – MODIFIED TRANSPLANT

Personal

You are a doctor. You have five patients, each of whom is about to die due to a failing organ of some kind. A new person is rushed into the hospital after a serious car accident. This person is critically injured, and will die without immediate surgery.

It is likely you can save this accident victim, though it would involve long and complicated surgery.

You realize that if you purposely cut his carotid artery during surgery it would cause his death and no one would ever know.

Then you could harvest his organs for transplant into the bodies of the other five patients. If you do this, the other five patients will live, but the accident victim will die.

Is it appropriate for you to kill the accident victim in order to save your five patients?

Impersonal

You are a doctor. You have five patients, each of whom is about to die due to a failing organ of some kind. A new person is rushed into the hospital after a serious car accident. This person is critically injured, and will die without immediate surgery.

While involved in long and complicated surgery on the accident victim, you notice that a nurse is about to give him an inappropriate medication.

You know that this error will be lethal and by ignoring this mistake and allowing it to happen, the patient will die.

This would allow you to harvest his organs for transplant into the bodies of the other five patients.

If you do this, the other five patients will live.

Is it appropriate for you to ignore the lethal mistake in order to save your five patients?

14/38 – ON THE WATERFRONT

Personal

You are part of a shipyard dock team that attaches crane cables to huge transport containers that are to be unloaded from ships onto the shore. You and the others attach these cables and then ride on top of the containers, wearing safety harnesses, to make sure that the containers are unloaded properly. While you are riding on top of one container that is just being lifted out of the cargo bay, you see the red warning light that indicates that the crane cable is about to fail. You realize that if the cable fails and the container falls onto the deck of the ship, many of the crewmembers below will be crushed to death.

You see that the cable is in danger because two other crewmembers are fighting on top of the container, causing it to sway dangerously.

You could run over to the fight and push them apart, but one of the crewmembers has taken off his

safety harness, and will certainly fall to his death.

However, if you do not do this, the continued swaying will cause the cable to fail and the container to fall onto the deck, killing several people below.

Is it appropriate for you to push the un-harnessed crewmember off the container to his death to save the people below?

Impersonal
You are part of a shipyard dock team that attaches crane cables to huge transport containers that are to be unloaded from ships onto the shore. You and the others attach these cables and then ride on top of the containers, wearing safety harnesses, to make sure that the containers are unloaded properly. While you are riding on top of one container that is just being lifted out of the cargo bay, you see the red warning light that indicates that the crane cable is about to fail. You realize that if the cable fails and the container falls onto the deck of the ship, many of the crewmembers below will be crushed to death.

You could hit the emergency release button, thereby dropping the container back into the cargo bay while you and the others remain securely attached to the crane by your safety harness.

However, there is one person below you who is in the cargo bay and will be killed by the falling container because he has nowhere to go.

If you do not do this though, the container will fall onto the deck of the ship and kill several other crewmembers.

Is it appropriate for you to activate the emergency release, thereby killing the worker below, in order to save several other workers?

15/39 – MODIFIED VACCINE TEST
Personal
A viral epidemic has spread across the globe killing thousands of people. You are a medical researcher and have developed two substances in your laboratory. You know that one of them is a vaccine, but you don't know which because both of the vials have been mislabeled as vaccine. You also know that the other substance is deadly.

Once you figure out which substance is the vaccine you can create more to save thousands of lives.

You have two lab assistants who work with you, and the only way to identify the vaccine with certainty is to inject the two substances into these people against their wishes.

One person will live, the other will die, and you will be able to start saving lives with your vaccine.

Is it appropriate for you to kill one of these people with a deadly injection in order to identify a vaccine that will save thousands of lives?

Impersonal
A viral epidemic has spread across the globe killing thousands of people. You are a medical researcher and have developed two substances in your laboratory. You know that one of them is a vaccine, but you don't know which because both of the vials have been mislabeled as vaccine. You also know that the other substance is deadly.

Once you figure out which substance is the vaccine you can create more to save thousands of lives.

You could allow another doctor to inject two unsuspecting patients, who need the vaccine, with these substances without warning them or the doctor that one of the substances is deadly.

One person will live, the other will die, and you will be able to start saving lives with your vaccine.

Is it appropriate for you to let one of these people die from a deadly injection in order to identify a vaccine that will save thousands of lives?

16/40 – MODIFIED FOOTBRIDGE/TROLLEY

Personal

A runaway trolley is heading down the tracks toward five workmen who will be killed if the trolley proceeds on its present course. You are standing next to the track on which the trolley is traveling, but you are too far away from the workmen to warn them of the impending danger.

Next to you there is a very large stranger who is minding his own business.

It occurs to you that if you pushed this person onto the tracks in front of the trolley, it would stop the trolley and save the five workmen from certain death.

However, this would most certainly kill the stranger.

Is it appropriate for you to push this stranger onto the tracks to save the five workmen?

Impersonal

A runaway trolley is heading down the tracks toward five workmen who will be killed if the trolley proceeds on its present course. You are standing next to the track on which the trolley is traveling, but you are too far away from the workmen to warn them of the impending danger.

Next to you there is a control switch for the tracks that can reroute the trolley.

You could divert the trolley onto another track and spare the five workmen from certain death.

However, there is another workman on the new track that will certainly die if you divert the trolley.

Is it appropriate for you to divert the trolley and kill the lone workman in order to save the five workmen?

17/41 – NOBEL PRIZE

Personal

You and a fellow researcher have discovered a powerful new energy source that is cheap, safe, and clean. You realize that this could lead to the elimination of pollution and poverty around the world.

However, your colleague wants to sell this discovery.

You know your colleague well enough to know that he will sell the discovery to the highest bidder at the first opportunity.

You know that he plans to contact the potential buyers today, some of whom will certainly try to use this as a horrible weapon.

The only way that you can prevent him from doing so is to poison him with an extremely deadly chemical normally found in the lab working on these types of projects.

Everyone will think that it was just a lab accident, and the discovery will not be sold to those who might create a weapon out of it.

Is it appropriate for you to poison your colleague to keep this energy source out of the hands of those who might use it as a weapon?

Impersonal
You and a fellow researcher have discovered a powerful new energy source that is cheap, safe, and clean. You realize that this could lead to the elimination of pollution and poverty around the world. However, your colleague wants to sell this discovery to the military, which will turn it into a powerful new weapon.

You know your colleague well enough to know that he will sell the discovery to the highest bidder at the first opportunity.

You know that he plans to contact the potential buyers through email, some of whom will certainly try to use this as a horrible weapon.

You can prevent this by releasing a flammable gas in the lab, so that when he turns on his computer, it will cause an explosion.

Everyone will think that it was just a lab accident, and the discovery will not be sold to those who might create a weapon out of it.

Is it appropriate for you to release the gas, leading to an explosion, to keep this discovery out of the hands of those who might use it as a weapon?

18/42 – BIKE WEEK
Personal
You are an expert motorcycle rider and you have gone on vacation in order to participate in Bike Week. Thousands of other motorcycle riders from across the country have come to ride in this event. As you are riding down the road in the front of a large group of other riders you see that someone up ahead is losing control of their bike.

As you speed up to pull alongside the unstable rider, you realize that this person is going to crash at any second.

This would certainly result in a large pile-up and several deaths as the riders behind you run over each other trying to avoid the crashed rider.

You realize that you could physically run this rider off the road and into some trees.

This would cause him to crash and, at your current speed, almost certainly die, but it would prevent a crash in the middle of the street and the large pile-up of riders behind you.

Is it appropriate for you to crash the other rider to avoid the deaths of the riders behind you?

Impersonal
You are an expert motorcycle rider and you have gone on vacation in order to participate in Bike Week. Thousands of other motorcycle riders from across the country have come to ride in this event. As you are riding down the road in the front of a large group of other riders you see that someone up ahead is losing control of his bike.

As you watch him fall, you know that you could easily ride around the fallen rider but if you do, the riders behind you will run over each other trying to avoid the crash.

This would result in a large pile-up and several deaths.

You, as an expert, could lay your bike over on its side while throwing yourself clear, allowing the bike to slide into the fallen rider.

This would warn the riders behind you of a wreck and prevent a large pile-up, but would also certainly kill the fallen rider.

Is it appropriate for you to allow your bike to kill the rider ahead of you to prevent the deaths of the riders behind you?

19/43 – MODIFIED EUTHANASIA

Personal

You are the leader of a small group of soldiers, and all of you are out of ammunition. You are on your way back from a completed mission deep in enemy territory when one of your men steps in a trap set by the enemy. His leg is badly injured and caught in the trap. You cannot free him from this trap without killing him. However, if you leave him behind, the enemy troops will find him and torture him to death.

This soldier begs you not to leave him behind to be cruelly tortured to death.

The enemy troops are closing in on your position.

It is not safe for you or your men to remain with your trapped comrade any longer.

In order to prevent this man's needless suffering at the hands of the enemy, you could kill him yourself by stabbing him in the heart.

Is it appropriate for you to stab this man in the heart in order to prevent his needless suffering?

Impersonal

You are the leader of a small group of soldiers, and all of you are out of ammunition. You are on your way back from a completed mission deep in enemy territory when one of your men steps in a trap set by the enemy. His leg is badly injured and caught in the trap. You cannot free him from this trap without killing him. However, if you leave him behind, the enemy troops will find him and torture him to death.

This soldier begs you not to leave him behind to be cruelly tortured to death.

The enemy troops are closing in on your position.

It is not safe for you or your men to remain with your trapped comrade any longer.

By programming his location into your missile-targeting computer, the area would then be bombed and he would die without being tortured to death.

Is it appropriate for you to program his location into the targeting computer in order to prevent his needless suffering?

20/44 – MODIFIED FUMES

Personal

You are an orderly in a hospital during the night shift. You notice that a chemical has just been spilled in a room containing six patients. This chemical is highly toxic and if left on the floor will rapidly evaporate creating a poisonous gas. This will inevitably kill all the patients in the room. This chemical cannot simply be mopped up, nor can it be soaked up with towels or sheets.

However, because you have worked around this chemical before, you know that this chemical absorbs into human skin very rapidly.

You could pull one of the patients out of bed onto the spill so that the chemical will completely soak into this person's skin instead of evaporating into the air in the room.

This will quickly kill the one patient but save the other five patients from the gas.

Is it appropriate to put this person onto the spilled chemical in order to save the other five patients?

Impersonal
You are an orderly in a hospital during the night shift. You notice that a chemical has just been spilled in a room containing five patients. This chemical is highly toxic and if left on the floor will rapidly evaporate creating a poisonous gas. This will inevitably kill all the patients in the room. This chemical cannot simply be mopped up, nor can it be soaked up with towels or sheets.

You can flip a switch controlling the ventilation system that will draw the poisonous fumes out of the room in which the spill has occurred, saving the five patients.

However, the exhaust duct leads to a room upstairs containing one other patient in critical condition.

This patient will certainly die from exposure to the poisonous fumes before you can get to her, and there isn't anyone else around to help.

Is it appropriate to flip the switch to divert the air flow, killing one patient but saving five?

21/45 – MODIFIED ROWBOAT
Personal
You are in a rowboat with a tour guide while sight-seeing on a lake in Alaska. You notice that three children have overturned their boat nearby. They are now in danger of quickly freezing to death in the icy water. You begin to row over to rescue them when you realize that your boat will not hold you, the tour guide, and the three children.

Two of the children are closer to your boat than the third child.

As you and the tour guide pull in the first two it is obvious that one of them is too heavy and if you keep him on board your boat will sink and all of the children will die.

Neither you nor the guide can get out because you are rowing and the guide is performing CPR. The only way to save two children is to throw the large child off the boat and rescue the third one.

Is it appropriate to throw one child off the boat to die in order to save the other two?

Impersonal
You are in a rowboat with a tour guide while sight-seeing on a lake in Alaska. You notice that three children have overturned their boat nearby. They are now in danger of quickly freezing to death in the icy water. You begin to row over to rescue them when you realize that your boat will not hold you, the tour guide, and the three children.

Two of the children are closer to your boat than the third child.

As you and the tour guide pull in the first two it is obvious that they are too heavy and if you try to rescue the third child your boat will sink and all of the children will die.

Neither you nor the guide can get out because you are rowing and the guide is performing CPR.

The only way to save the two children is to row quickly away from the third one, leaving him to die.

Is it appropriate to leave the one child behind to die in order to save the other two?

22/46 – MINE SHAFT
Personal
You are a worker in a mine. The only way to exit the mine is to ride up in rock-buckets that can hold up to three people at a time. It is the end of the workday and miners from lower levels are riding past

you. As you are waiting for a bucket to ride in, you notice that the cable supporting the rock buckets is about to snap.

If the cable snaps, all of the miners in the buckets will fall to their deaths.

The only way to prevent this is to use your axe to hit the last bucket causing it to flip over and dump its contents, lightening the load enough to save the miners above.

There is one miner in this bucket who will be killed as a result.

Is it appropriate to flip over the last miner's bucket, killing him, to save the other miners?

Impersonal
You are a worker in a mine. The only way to exit the mine is to ride up in rock-buckets that can hold up to three people at a time. It is the end of the workday and miners from lower levels are riding up past you. As you are waiting for a bucket to ride in, you notice that the cable supporting the rock buckets is about to snap.

If the cable snaps, all of the miners in the buckets will fall to their deaths.

The only way to prevent this is to hit the emergency bucket release switch which will automatically detach the last bucket from the cable, lightening the load just enough to save the miners above.

There is one miner in this bucket who will be killed as a result.

Is it appropriate to detach the last miner's bucket, killing him, to save the other miners?

23/47 – TYCOON
Personal
You are an electrician who has been hired to fix an electrical problem in the home of a very wealthy steel tycoon who is terminally ill with a very slow-growing cancer. Recently it had been publicly announced that when this man eventually dies, his enormous personal fortune is to be given to the local children's hospital. You know that there are many children at this hospital who could be saved with this money, but who cannot wait much longer before they die.

It occurs to you that while you're in the house, fixing the electrical problem, you could quietly slip into the tycoon's room while he is sleeping and suffocate him by covering his nose and mouth with your gloved hands.

This would look exactly like he had died from a heart attack.

Then his money would go to the children's hospital where it would save many lives.

Is it appropriate for you to kill this man so that the children's hospital will get the money that it needs?

Impersonal
You are an electrician who has been hired to fix an electrical problem in the home of a very wealthy steel tycoon who is terminally ill with a very slow-growing cancer. Recently it had been publicly announced that when this man eventually dies, his enormous personal fortune is to be given to the local children's hospital.

You know that there are many children at this hospital who could be saved with this money, but who cannot wait much longer before they die.

It occurs to you that while in the house, instead of fixing the electrical problem, you could overload the circuits.

The next time someone turned on something electrical, it would short out the tycoon's life support equipment, causing him to die.

It would look like an accident, and the money would go to save the lives of children.

Is it appropriate for you to short circuit this man's house, which will lead to his death, so that the children's hospital will get the money that it needs?

24/48 – ENEMY SPY

Personal

You are an officer in the military during a war. Your soldiers have found a high-ranking enemy spy trapped and injured inside of a partially collapsed building. You have been informed over the radio that a large group of enemy soldiers is planning a surprise attack on one of several nearby towns. These soldiers will kill all the civilians in the town if you and your soldiers do not stop them, but you do not know which town they plan to attack.

You have questioned the trapped spy who is high ranking and surely knows these plans, but he has refused to tell you which town is the target of the impending enemy attack.

He will die soon from his many injuries.

You could begin to beat, burn, cut, and otherwise painfully torture him in order to force him to reveal this information.

He would die from this painful torture, but you and your soldiers could then protect the town from the surprise attack, saving hundreds of innocent lives.

Is it appropriate for you to torture and kill this enemy spy in order to protect one of the nearby towns?

Impersonal

You are an officer in the military during a war. Your soldiers have found a high-ranking enemy spy trapped and injured inside of a partially collapsed building. You have been informed over the radio that a large group of enemy soldiers is planning a surprise attack on one of several nearby towns. These soldiers will kill all the civilians in the town if you and your soldiers do not stop them, but you do not know which town they plan to attack.

You have questioned the trapped spy who is high ranking and surely knows these plans, but he has refused to tell you which town is the target of the impending enemy attack.

However, rats have begun to chew at the spy and he is in agony.

You could do nothing and leave him to the rats until he reveals this information.

He would almost certainly die from this, but you and your soldiers could then protect the town from the surprise attack, saving hundreds of innocent lives.

Is it appropriate for you to leave this spy to the rats in order to protect one of the nearby towns?

Appendix B

Non-moral dilemmas[23]

1. You are a farm worker driving a turnip-harvesting machine. You are approaching two diverging paths. By choosing the path on the left you will harvest ten bushels of turnips. By choosing the path on the right you will harvest twenty bushels of turnips. If you do nothing your turnip-harvesting machine will turn to the left.

   Is it appropriate for you to turn your turnip-picking machine to the right in order to harvest twenty bushels of turnips instead of ten?

2. You are bringing home a number of plants from a store that is about two miles from your home. The trunk of your car, which you've lined with plastic to catch the mud from the plants will hold most of the plants you've purchased. You could bring all the plants home in one trip, but this would require putting some of the plants in the back seat as well as in the trunk. By putting some of the plants in the back seat you will ruin your fine leather upholstery, which would cost thousands of dollars to replace.

   Is it appropriate for you to make two trips home in order to avoid ruining the upholstery of your car?

3. You are in charge of scheduling appointments in a dentist's office. Two people, Mr. Morris and Mrs. Santiago have called to make appointments for next Monday. The only available times for next Monday are at 10:00 AM and at 3:00. Mr. Morris's schedule is rather flexible. He can have his appointment either at 10:00 AM or at 3:00 PM. Mrs. Santiago's schedule is less flexible. She can only have her appointment at 10:00 AM.

   Is it appropriate for you to schedule Mr. Morris for 3:00 PM so that both he and Mrs. Santiago can have their appointments next Monday?

4. You have a headache. You go to the pharmacy with the intention of buying a particular name-brand headache medicine. When you get there you discover that the pharmacy is out of the brand you were looking for. The pharmacist, whom you've known for a long time and in whom you have a great deal of trust, tells you that he has in stock a generic product which is, in his words, "exactly the same" as the product you had originally intended to buy.

   Is it appropriate for you to purchase the generic brand instead of searching further for the name-brand product you were looking for?

[23] Used in Study 2. These nine non-moral dilemmas were developed and used by Greene et al. (2001); we made modifications in cases involving money, where we switched US to UK currency.

5. You have decided to make a batch of brownies for yourself. You open your recipe book and find a recipe for brownies. The recipe calls for a cup of chopped walnuts. You don't like walnuts, but you do like macadamia nuts. As it happens, you have both kinds of nuts available to you.

   Is it appropriate for you to substitute macadamia nuts for walnuts in order to avoid eating walnuts?

6. You need to travel from New York to Boston in order to attend a meeting that starts at 2:00 PM. You can take either the train or the bus. The train will get you there just in time for your meeting no matter what. The bus is scheduled to arrive an hour before your meeting, but the bus is occasionally several hours late because of traffic. It would be nice to have an extra hour before the meeting, but you cannot afford to be late.

   Is it appropriate for you to take the train instead of the bus in order to ensure your not being late for your meeting?

7. You are looking to buy a new computer. At the moment the computer that you want costs £1000. A friend who knows the computer industry has told you that this computer's price will drop to £500 next month. If you wait until next month to buy your new computer you will have to use your old computer for a few weeks longer than you would like to. Nevertheless you will be able to do everything you need to do using your old computer during that time.

   Is it appropriate for you to use your old computer for a few more weeks in order to save £500 on the purchase of a new computer?

8. A representative of a reputable, national survey organization calls you at your home while you are having a quiet dinner by yourself. The representative explains that if you are willing to spend a half an hour answering questions about a variety of topics her organization will send you a check for £200.

   Is it appropriate for you to interrupt your dinner in order to earn £200?

9. You have gone to a bookstore to buy £50 worth of books. You have with you two coupons. One of these coupons gives you 30% off of your purchase price. This coupon expires tomorrow. The other coupon gives you 25% off your purchase price, and this coupon does not expire for another year.

   Is it appropriate for you to use the 30%-off coupon for your present purchase so that you will have another coupon to use during the coming year?

Appendix C

Summary of moral judgement data for nine moral dilemmas in Study 2

Table C.1: Proportions of utilitarian judgements in MP and MI dilemmas of the nine scenarios that were tested on more than 30 participants in Study 2.

Numeric label	Dilemma's name	$p_{utilitarian}$ MP	$p_{utilitarian}$ MI
2/26	Modified Crying Baby	44.12%	50%
3/27	Modified Submarine	85.49%	91.89%
4/28	Shark Attack	55.88%	64.71%
6/30*	Preventing Ebola	70.27%	94/59%
7/31*	Rescue 911	56.41%	74.36%
10/34*	Cinderblock	62.86%	80%
12/36	Bus Plunge	66.67%	84.85%
16/40**	Modified Footbridge/Trolley	18.42%	81.58%
20/44**	Modified Fumes	38.24%	73.53%

* Cochran Q Test $p < .05$ (null hypothesis: judgements were not different between MP and MI dilemmas).

** Cochran Q Test $p < .01$ (null hypothesis: judgements were not different between MP and MI dilemmas).

Glossary of Abbreviations

AAI affect-as-information.

ACC anterior cingulate cortex.

AI anterior insula.

AIM affect infusion model.

CRT Cognitive Reflection Test.

DLPFC dorsolateral prefrontal cortex.

fMRI functional magnetic resonance imaging.

FTD frontotemporal dementia.

GEE dorsolateral prefrontal cortex.

GSC galvanic skin conductance.

GSR galvanic skin response.

IGT Iowa Gambling Task.

JDM judgement and decision making.

MI Moral Impersonal.

Mini-UG mini-ultimatum game.

MP Moral Personal.

NonM non-moral.

rTMS repetitive transcranial magnetic stimulation.

SC skin conductance.

SIM social intuitionist model.

SRW self-reflective writing.

UG ultimatum game.

UJ utilitarian judgement.

VAS visual analogous scale.

VMPC ventromedial prefrontal cortex.

WST Wason Selection Task.

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