The Effect Of Ostracism On Risk-Taking

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Abstract

Ostracism, defined as being ignored or excluded by an individual or group, is a ubiquitous social phenomenon that threatens key psychological needs. Prior research has shown that ostracism elicits diverse behavioural responses, including aggression, prosocial behaviour, and social withdrawal, however, little research has examined whether ostracism leads to risky decision-making. This thesis presents a series of studies examining how both the experience of ostracism and the recollection of past ostracism influences changes in risky decision-making, and what individual differences moderate these effects.

In experiment one, I used a social influence health risk perception task to examine how recalling an experience of ostracism influenced perceptions of health risks. I also investigated how exposure to peer-provided risk ratings shaped participants' adjustments in their own risk perceptions. In experiment two, I tested how ostracism impacted risk-taking behaviours in a rewards-based task. I further explored how peer behaviours and individual differences, such as rejection sensitivity moderated participants' decision-making processes. In experiment three, I adapted a behavioural paradigm previously used to induce heightened affective judgements to test how recalling ostracism influences risk and benefit perception across distinct risk domains (health, financial and social). In studies four and five, I extend these findings to test how recalling ostracism influences how individuals learn and respond to wins and losses (feedback sensitivity) in two novel reward gambling paradigms and investigate what individual differences moderate these effects.

The findings of this thesis identify ostracism as a significant predictor of risk-taking and susceptibility to peer influence, while underscoring the role of several crucial individual differences in moderating these effects. I then finish with a discussion of the implications of these findings for psychological interventions, educational settings, and future research directions.

Impact Statement

This thesis examines the impact of ostracism on risk-taking behaviours, susceptibility to peer influence, and feedback sensitivity, while examining what individual differences moderate these effects. The presenting findings advance our understanding of how ostracism shapes decision-making processes in risk contexts. The research presented in this thesis demonstrates that ostracism is a potent social threat that disrupts cognitive and motivational processes, leading to varied behavioural responses across different domains, including financial, health, and social risks. Importantly, the findings highlight key individual differences, such as rejection sensitivity and baseline risk-taking tendencies, in moderating these effects. This thesis also underscores the importance of the social context in shaping risk-related behaviours, with ostracised individuals showing increased conformity to peer norms and differential responses depending on whether the environment favours risk-taking or risk aversion.

In terms of dissemination, the work presented here has contributed to three papers, with one published **(Chapter 3)**. A novel risk-perception task, developed as part of Chapter 3, is freely available for use by other researchers and has been validated across multiple domains of risk perception. This task offers a valuable tool for researchers exploring how social and emotional factors influence risk perceptions across key domains (social, financial and health). In addition to the empirical contribution and the sharing of this work in conferences, the findings of this work have been presented in several leading academic labs, such as Professor Sarah Jayne Blakemore's Developmental Neuroscience Lab (University of Cambridge), Professor Kipling Williams' Lab (Purdue University), and Professor Selma Rudert's Lab (University of Kaiserslautern-Landau).

Finally, I conclude this thesis by highlighting the implications of this work for academic research and speculate on how this work could inform clinical practise and educational changes. Furthermore, the thesis contributes broadly to understanding how social factors influence cognitive and behavioural processes involved in decision-making. This broader understanding may be useful in informing practical strategies across domains, such as public health, education, and workplace management.

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Abbreviations

ACC - Anterior Cingulate Cortex

AIC – Akaike Information Criterion

BAS - Behavioural Activation System

BIS - Behavioural Inhibition System

CARE – Cognitive Appraisal of Risky Events

GDT – Game of Dice Task

HPA - hypothalamic-pituitary-adrenal

IGT – Iowa Gambling Task

M – Mean

NAc - Nucleus Accumbens

PFC – Prefrontal Cortex

RS – Rejection Sensitivity

SD – Standard Deviation

SE – Standard Error

SEM – Standard Error of Mean

TNTM – Temporal Need-Threat Model

rTPJ - right temporoparietal junction

vACC - Ventral Anterior Cingulate Cortex

VTA - Ventral Tegmental Area

Statement of Authorship

Aspects of this thesis have been published or included within the following manuscripts:

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JN contribution: **75%**

JN built the experiment, collected and cleaned the data, wrote the first draft and made changes to the manuscript. UVH, TP and GH assisted in the conceptualisation of the project, as well as writing and editing of the paper.

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Chapter 1: Introduction

Ostracism, the act of being ignored or excluded by others, is a ubiquitous social phenomenon that has profound, immediate and lasting effects on individuals' psychological and behavioural well-being (Baumeister & Leary, 2017; Williams, 2007). Throughout history and across cultures, ostracism has been used as a powerful social control mechanism, inflicting significant distress on those who experience it. This distress stems from the fundamental human need for social belonging and acceptance, which, when thwarted, leads to a cascade of negative emotional and behavioural outcomes (Williams, 2009). In this thesis, I test the hypothesis that the distress induced by ostracism also leads to cognitive and behavioural changes which lead to increases in risky decision-making. I further test how this effect is influenced by key individual differences, heightened affect, the social context (social influence), and the domain of risk (health, social and financial).

In the first part of this introduction, I describe findings that demonstrate the pervasive and profound impact of ostracism on individuals' psychological and behavioural functioning. I review evidence from human and animal studies in neuroscience, biology, and psychology to show how ostracism influences psychological and behavioural functioning. I then discuss ostracism-specific theoretical models that have suggested a sequence of responses to being excluded. Next, I review behavioural and epidemiological research that identifies significant predictors of greater risk-taking, including individual differences, age, emotion and the role of peer influence. Finally, I link these findings to broader psychological mechanisms of threat and social disconnection, highlighting a theoretic cal basis for how ostracism can lead to increased risk-taking, greater susceptibility to peer influence, and heightened sensitivity to reward.

1.1 Ostracism – The Journey Through Time

Ostracism permeates nearly every facet of human interaction, from playgrounds to workplaces, manifesting across cultures and age groups. The impact of ostracism is profound and threatens fundamental psychological needs and evokes intense emotional responses (Williams, 2007). Ostracism has historical roots dating back to ancient practices of exclusion and exile. The word ostracism originates from the Greek word "ostrakon," referring to pottery shards used in voting for the exclusion of individuals from the community (Williams

& Zadro, 2001). In Ancient Greece, ostracism was viewed as an instrumental tool in maintaining political stability and preventing the rise of demagogues or tyrants (Forsdyke, 2005). In an annual ceremony, citizens would write the name of a person on a shard, and if enough votes were cast, that person was exiled for ten years. This socio-political punishment was viewed equally to a death sentence (Salamanca, 2023). This practise was illustrated by the fate of the philosopher Socrates whose philosophical critiques of Athenian governance were seen as threatening social order. He was formally accused of corrupting the youth and irreverence towards the city's gods. Offered the choice between exile or death, Socrates elected for death, resulting in him drinking the poison hemlock, thereby emphasising the gravity of exclusion (Karavites, 1974). These ancient practices underscore how collective social mechanisms of exclusion have evolved alongside human societies to manage threats, both real and perceived, and to maintain elements of social cohesion and control (Forsdyke, 2000).

Throughout history, philosophers and scholars have recognized the severe impact of being ignored and excluded on psychological functioning. For instance, the famed Psychologist William James described the torment of ostracism, stating "If no one turned around when I entered, answered when I spoke, or minded what Idid, but if every person I met '*cut us dead*,' and acted as if I were non-existent things, a kind of rage and impotent despair would ere long well up in us, from which the cruellest bodily tortures would be a relief." (James, 1890, p. 293–294).

1.1.1 Evolutionary Detection System

The evolutionary costs of ostracism have driven humans to develop a heightened sensitivity to signals of exclusion. Missing signs of ostracism in ancestral environments could have had severe consequences, such as reduced access to resources, protection, and mating opportunities, which often meant certain death for social animals (Wesselmann et al., 2012). In contrast, detecting ostracism when it was not actually occurring (a false alarm) posed a far lower risk. This asymmetry has led to the proposition that humans evolved an adaptive bias towards over-detecting signs of ostracism (Spoor & Willaims, 2011). This sensitivity has been conceptualized as an immediate and adaptive response (Spoor & Williams, 2011). It allows individuals to quickly identify and correct behaviours that may risk exclusion, thereby minimising the severe consequences associated with ostracism. For humans, the historical

effects of being ostracized often involved expulsion from groups that provided critical social, emotional, and material support. Such exclusion was closely linked to psychological and physical impairment (Baumeister & Leary, 2017). This adaptive system underscores the evolutionary importance of detecting and responding to ostracism swiftly to ensure survival and maintain social bonds.

To date, there is a substantial amount of evidence that individuals are quick to detect ostracism even in its most minimal forms, and this detection elicits a strong emotional response in individuals. For instance, individuals detect and are negatively affected by ostracism even when it occurs in seemingly inconsequential contexts, such as ostracism by outgroup members, even despised groups like the Ku Klux Klan (Gonsalkorale & Williams, 2007), and even when being ostracised benefits them, such as when it improves one's monetary situation (van Beest & Williams, 2006). This effect has been demonstrated repeatedly using Cyberball, a computer-based ball-tossing game in which participants believe they are playing with two others, although the co-players are computer controlled (Williams & Jarvis, 2006; Zadro et al., 2004). After a brief period of fair play, the co-players stop passing to the participant, which reliably elicits the reflexive impact of exclusion and has been well validated in the literature (Hartgerink et al., 2016). In this thesis, Cyberball serves as a central manipulation in Chapter 3. Intriguingly, even when ostracism is delivered via computer-mediated paradigms such as Cyberball, it reliably threatens fundamental needs and elicits distress, although the precise equivalence of these effects to face-to-face exclusion has not yet been firmly established (Hartgerink et al., 2015; Kothgassner, 2021). Furthermore, research has shown that factors which ordinarily reduce the negative impact of aversive situations do not mitigate the effects of ostracism. For example, sharing the ostracism experience with another co-player does not lessen the negative impact of being excluded (Thibault et al., 2022).

Collectively, these findings suggest that humans have evolved a heightened sensitivity to cues of ostracism. This tendency toward ‘false alarms’ can be considered adaptive, as it promotes swift behavioural adjustments to avert potentially severe consequences of exclusion.

1.2. How Individuals Respond To (Social) Threat

1.2.1 Disruptions to Social Homeostasis

Given the evolutionary significance of social connections, which are considered both innate and essential for survival (Baumeister & Leary, 2017), the consequences of social disconnection have become closely linked with survival threats (Buss, 1990). Consequently, it has been proposed that there are specific neural circuits that underlie the regulation of social behaviours, enabling individuals to detect aversive social threats and engage in physiological and psychological responses aimed at fulfilling social needs. This regulatory process, which has been called *social homeostasis* (Matthews & Tye, 2019), functions similarly to other physiological systems that maintain balance, such as those governing hunger and thermoregulation. Disruption of this system leads to behavioural and motivational adaptations that interact with the environment to correct behaviour, and to restore social connection.

The disruption of social homeostasis, whether acute or chronic, triggers adaptive behavioural and motivational responses aimed at restoring social connection. For example, acute disruptions often result in heightened *vigilance* and arousal, which serve as immediate responses to potential threats posed by social isolation. For example, human studies show that perceived social disconnection is associated with increased anxiety and hypervigilance towards social stimuli (Bernstein et al., 2008; Mogg et al., 2004; Proudfit et al., 2013). This hypervigilance is thought to result from the brain's prioritisation of self-preservation in socially threatening environments. Neurobiological evidence supports these behavioural observations, as acute social isolation has been shown to activate the hypothalamic-pituitary-adrenal (HPA) axis, a central stress-regulating system. Activation of the HPA axis results in elevated glucocorticoid levels, such as cortisol in humans and corticosterone in rodents, which enhances attentional processes and heightens sensitivity to environmental threats (Cacioppo et al., 2014; Matthews & Tye, 2019;). Rodent models further illustrate this effect, with isolated adult rodents exhibiting increased escape behaviours, reduced exploratory activity, and heightened self-directed behaviours, such as grooming (Hilalkivi et al., 1989; Hol & Spruijt, 1992). These findings suggest an evolutionary drive towards hypervigilance aimed at mitigating the risks associated with social isolation.

In addition to hypervigilance, acute disruptions in social homeostasis enhance social motivation, driving affiliative behaviours aimed at restoring social bonds. In rodent studies, acute social isolation has been shown to increase affiliative behaviours upon reintroduction to social contexts. For example, isolated rodents exhibit heightened interest in social interactions, a phenomenon that appears to be mediated by neurobiological changes rather than simple deprivation effects (Matthews & Tye, 2019; Tomova et al., 2020). Neurochemical analyses indicate that these behavioural changes are underpinned by rapid adaptations in dopaminergic pathways. Specifically, social isolation enhances the reward value of social contact by increasing dopaminergic activity in the VTA-NAc circuit, thereby motivating reconnection (Gunaydin et al., 2014; Matthews & Tye, 2019). Similar findings have been observed in human studies, where social deprivation increases sensitivity to social cues and enhances the perceived value of social interactions (Cacioppo et al., 2014; Panksepp, 1998). These findings underscore how social deprivation recalibrates neural circuits to motivate reconnection, supporting an adaptive response to deviations from expected social interaction.

1.2.2 The General Process Model Of Threat & Defence

In addition to disrupting social homeostasis, the General Process Model of Threat and Defence (GPMTD; Jonas et al., 2014) offers a comprehensive framework for understanding how individuals respond to various forms of threat by integrating multiple theoretical perspectives. According to the GPMTD, threats, whether existential or situational, activate a shared motivational pathway that shifts from initial anxiety to an approach orientation.

A threat arises when individuals perceive a discrepancy between their expectations or needs and their current reality (Jonas et al., 2014). Such discrepancies may stem from situational factors, such as blocked personal goals related to fostering social relationships (McGregor et al., 2010), or existential concerns, such as the inevitability of death (Greenberg et al., 1986). Once triggered, this perceived threat elicits an immediate proximal response characterized by behavioural inhibition and anxiety, mediated by the Behavioural Inhibition System (BIS; McNaughton & Gray, 2000). The BIS heightens vigilance and interrupts ongoing activity, culminating in an aversive affective state often experienced as anxiety (Hart, 2014; Proulx & Inzlicht, 2012). Critically, this anxiety functions as a motivational signal that corrective action is needed, reflecting a heightened arousal commonly described as “anxious uncertainty”

(McGregor et al., 2010) or “generalised insecurity” (Hart, 2014), and indicating the activation of a defence-oriented system (Jonas et al., 2014).

The GPMTD further posits that engaging in defensive actions - whether resolving the threat directly or alleviating its associated anxiety - initiates a transition toward approach motivation. This transition is mediated by the Behavioural Approach System (BAS; Harmon-Jones et al,, 2013), which is marked by increased positive affect and a stronger drive to pursue rewarding outcomes or goals (Harmon-Jones et al., 2011). Threat responses can be categorized as direct resolution, indirect resolution, or palliation. Direct resolution entails addressing the threat head-on, such as resolving a conflict or mitigating a health risk (Arndt et al., 2007). Indirect resolution involves meeting the underlying need in alternative ways, for instance by reaffirming a sense of control through collective identification (Fritsche et al., 2008). Palliation aims to reduce the anxiety itself, rather than confronting the original threat, an example being the endorsement of cultural worldviews to cope with mortality awareness (Kosloff et al., 2016).

Empirical research supports the GPMTD’s claim that both direct and palliative defences promote increased approach motivation following the initial anxiety response. For example, studies on mortality salience (Agroskin et al., 2016) and relationship threats (McGregor & Marigold, 2003) have shown that defensive engagement, regardless of its specific form, correlates with enhanced approach-related affect (Jonas et al., 2014). Such findings highlight a broader transition toward a more positive and active motivational state.

1.2.3 The Temporal Need-Threat Model (TNTM)

Research into understanding how ostracism impacts an individual has proliferated since the early 2000’s. Several theoretical frameworks have been developed to explain how individuals respond to ostracism, with one of the most influential being Williams' Need-Threat Model (Williams, 2007), which has guided much empirical work as a theoretical basis. This model suggests that ostracism threatens four fundamental human needs: belonging, self-esteem, control, and meaningful existence. Building on this, Williams introduced the Temporal Need-Threat Model (TNTM) (Williams, 2009), which elaborates on the dynamic sequence of

emotional and behavioural responses to ostracism, progressing through reflexive, reflective, and resignation stages.

Within the TNTM, the *reflexive* stage, described as the immediate reaction to ostracism, captures the universal and automatic nature of social pain. This stage draws on findings from neuroscience, highlighting that the brain regions implicated in processing physical pain - such as the anterior cingulate cortex - are similarly activated during experiences of ostracism (Eisenberger et al., 2003). Critically, the reflexive stage centres on the simultaneous threat to four fundamental psychological needs: belonging, self-esteem, control, and meaningful existence, and represents an immediate and automatic response to signals of exclusion.

Following the reflexive stage, the TNTM posits that individuals enter a *reflective stage*, where the primary goal is to make sense of and to fortify thwarted needs. The TNTM outlines three primary behavioural responses in response to ostracism: *pro-social behaviours*, such as efforts to regain acceptance; *anti-social behaviours*, aimed at reasserting control or self-esteem through retaliation; and social *withdrawal*, characterised by social disengagement to avoid further harm.

Finally, if the exclusion is chronic, or if the individuals are unable to resolve the threat, then it is said that they enter a *resignation stage.* The resignation stage represents the culmination of unresolved ostracism, characterised by diminished need satisfaction, feelings of helplessness, and long-term psychological harm. This stage aligns with evidence linking chronic ostracism and social isolation to a variety of adverse mental health issues, including depression (Cacioppo et al., 2010; Heinrich & Gullone, 2006; Santini et al., 2020), anxiety (Buetel et al., 2017; Lim et al., 2016) and physical health deterioration (for meta-analysis, see: Holt-Lunstad et al., 2010).

Recent theoretical advancements have expanded upon the Temporal Need-Threat Model (TNTM) by incorporating additional psychological mechanisms beyond the four core threatened needs of control, self-esteem, belonging, and meaningful existence (Williams, 2009). Empirical research has demonstrated that ostracism also undermines safety (Dean et al., 2019) and certainty (Hales & Williams, 2018), suggesting that the scope of need-threat is broader than initially proposed. Additionally, increasing evidence highlights that ostracism not only disrupts fundamental psychological needs but also impairs self-regulation and

induces both affective and cognitive changes, shaping how individuals respond to exclusion (Baumeister et al., 2005; Riva et al., 2017).

Building on these findings, Chen et al. (2025) developed an updated framework, presented below in Figure 1.1, that extends the TNTM by integrating multiple interacting processes. This framework highlights self-regulation failure, affective dysregulation, and cognitive alterations as core pathways through which ostracism influences mental health, cognitive function, behavioural responses (e.g., aggression, extremism), and setting-specific outcomes (e.g., workplace disengagement, academic withdrawal, cyberaggression). Furthermore, the model incorporates individual and contextual moderators (e.g., cultural influences), which shape how ostracized individuals adapt to exclusion over time. This updated theoretical lens has allowed for a multi-pathway conceptualisation, providing a more nuanced and comprehensive understanding of ostracism's consequences across diverse social and psychological domains.

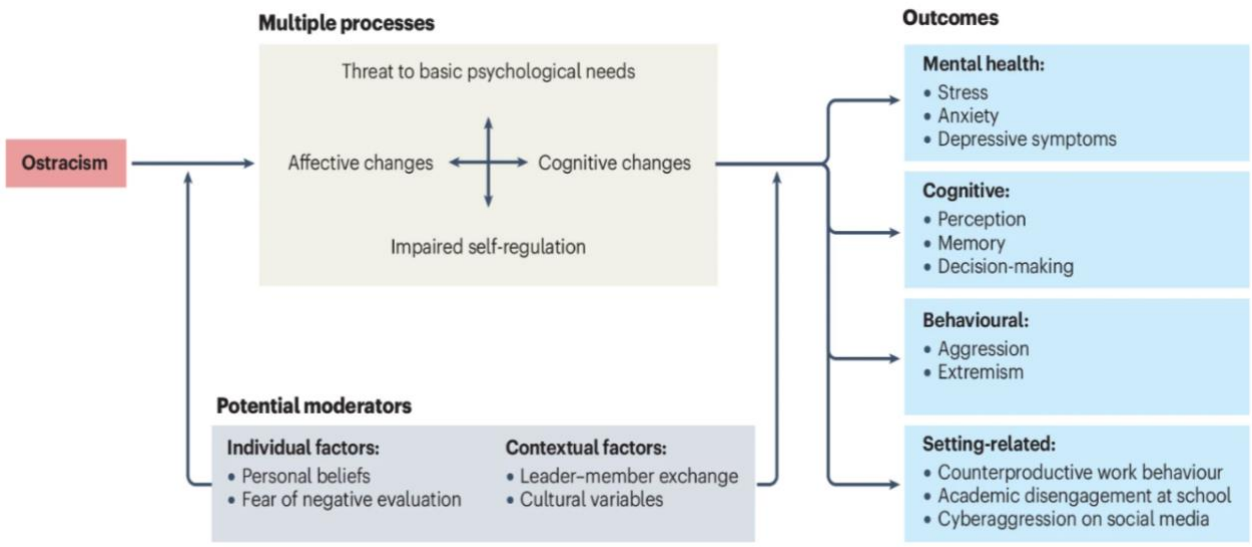


Figure 1.1: A multiple-process framework for the consequences of ostracism. This model extends the Temporal Need-Threat Model (TNTM) by integrating self-regulation failure, affective dysregulation, and cognitive alterations as core mechanisms linking ostracism to mental health, cognitive, behavioural, and setting-related consequences. The framework also incorporates individual and contextual moderators, offering a more comprehensive perspective on the impact of ostracism across diverse social contexts. Reprinted from Chen et al. (2025).

1.2.4. Age-related differences in how individuals respond to ostracism

Adolescence, defined as the developmental period from ages 10 to 24, is characterised by profound neurobiological and psychosocial changes that increase sensitivity to social cues and amplify vulnerability to social rejection (Blakemore, 2018). I focus on adolescence below for two reasons. First, the empirical studies reported in Chapters 2–4 recruit late-adolescent and emerging-adult samples (primarily university students). Second, adolescence is a period of heightened sensitivity to peer evaluation and exclusion, making it theoretically pertinent to the predictions tested later in the thesis.

Compared to adults, adolescents demonstrate heightened susceptibility to the adverse effects of ostracism. For example, research shows that adolescents aged 11–15 experience sharper declines in mood and greater increases in anxiety following social exclusion compared to adults aged 22–47 (Sebastian et al., 2010). Similarly, adolescents and emerging adults (18–22) report stronger psychological need threats, such as diminished self-esteem and belonging, in response to exclusion compared to older adults (Pharo et al., 2011).

Neuroimaging studies further highlight age-related differences in responses to ostracism. Adolescents show reduced activity in the ventrolateral prefrontal cortex (VLPFC) - a region critical for regulating negative emotions - relative to adults (Sebastian et al., 2010). This suggests that adolescents may struggle more with managing the emotional impact of social rejection. Longitudinal research provides additional insight, linking heightened activity in the ventral anterior cingulate cortex (vACC) during exclusion at age 13 to increased depressive symptoms one year later (Masten et al., 2011). Positive social experiences, such as spending more time with peers during high school, appear to buffer against these neural vulnerabilities, as they are associated with reduced insula activation during exclusion in subsequent years (Masten et al., 2012).

Adolescents also exhibit stronger physiological responses to social stress compared to both children and adults. For instance, laboratory studies indicate that adolescents release higher levels of cortisol in response to socially evaluative stressors, reflecting heightened activation of the stress response system (Gunnar et al., 2009; Stroud et al., 2009). These physiological differences align with everyday experiences, as adolescents report greater self-conscious emotions, such as embarrassment, compared to other age groups (Westenberg et al., 2004).

Notably, when adolescents are observed by others, they exhibit increased medial prefrontal cortex (mPFC) activity and stronger connectivity between the mPFC and striatum - neural regions implicated in motivated social behaviour (Somerville, 2013).

In contrast, adults tend to show greater emotional regulation and resilience to ostracism, supported by cognitive-emotional strategies developed with age. Socioemotional selectivity theory suggests that older adults prioritise emotionally meaningful relationships and are less preoccupied with broad social acceptance, reducing the emotional impact of exclusion (Carstensen et al., 1999). This developmental shift contributes to greater emotional stability and adaptive coping in the face of social rejection (Charles & Carstensen, 2010).

Despite these differences, meta-analytic evidence indicates that ostracism universally impacts fundamental psychological needs, such as self-esteem and belonging, across all age groups (Hartgerink et al., 2015). However, the intensity of these effects appears to vary across developmental stages, with adolescents showing heightened vulnerability due to ongoing neurodevelopment, particularly in regions involved in social and emotional processing.

1.3. Risk-taking

Risk-taking is a multifaceted behavioural construct that is commonly defined by the pursuit of engaging in actions where the outcomes are uncertain and often include a potential for both positive rewards and negative consequences (Byrnes et al., 1999). Understanding risk-taking is crucial because it reveals how individuals and societies make decisions under uncertainty, affecting health, safety, and economic prosperity (Kahneman & Tversky, 2013). Various academic fields have spent considerable amounts of time attempting to understand why an individual or group will engage with a risk or not. For instance, psychological science has examined cognitive and emotional influences on risky behaviours (Slovic, 1987); neuroscience has explored the brain mechanisms underlying decision-making and reward-seeking processes (Bechara et al., 1999); economics has analysed how risk affects market behaviours and individual choices (Arrow, 1965); sociology has examined the impact of social structures and cultural norms on risk perceptions (Beck, 1992), while medicine has examined biological and clinical aspects of risk-taking, including genetic predispositions and

the effectiveness of medical interventions (Reyna & Farley, 2006). The interest across a diverse array of fields highlights that the experiment of risk-taking is a paramount topic.

While only limited evidence directly links ostracism with risk-taking, several established models and factors provide valuable insights into the candidate mechanisms that offer further insight into why ostracized individuals may engage in riskier decision-making. In the following sections, I review key theories and predictors - prospect theory, the affect heuristic, social influence, individual differences, and age - to provide an understanding of the factors that may impact risk-taking in the context of ostracism.

1.3.1. Prospect Theory

A multitude of empirical and theoretical frameworks have been conceptualised to provide insights into the cognitive and emotional mechanisms underpinning risk-taking. For instance, Prospect Theory, introduced by Kahneman and Tversky (1979), offers an understanding of decision-making under risk, primarily through the mechanisms of loss aversion and reference dependence. This theory posits that individuals evaluate outcomes relative to a subjective reference point - typically their current state or expected outcome - and display a pronounced asymmetry in sensitivity, valuing losses more heavily than comparable gains. This disproportionate impact of losses drives a predictable behavioural shift: individuals become risk-averse when outcomes appear as potential gains but exhibit risk-seeking tendencies when confronting potential losses. This effect is especially prominent in financial contexts, where individuals often choose to gamble to avoid a loss, despite high probabilities of adverse outcomes.

To date, there has been a significant amount of empirical validation for Prospect Theory, with a wealth of studies replicating and expanding upon its core tenets. Thaler and Johnson (1990), for example, demonstrated a "break-even effect," showing that prior losses increase individuals' willingness to take risks to recover them. Likewise, Rabin and Thaler (2001) illustrated the inconsistency in risk preferences by observing that individuals often reject small, unfavourable gambles while paradoxically accepting higher-stakes risks when faced with significant potential losses. Neuroeconomic studies further substantiate these behavioural patterns; Tom et al. (2007) demonstrated that gains and losses are represented by shared neural regions, including the striatum and ventromedial prefrontal cortex

(VMPFC), with activity increasing for potential gains and decreasing for potential losses. Loss aversion, a behavioural tendency to weigh losses more heavily than equivalent gains, is mirrored by steeper neural declines in response to losses. Behaviourally, participants were less likely to accept 50/50 gambles unless potential gains were at least double the losses, and this sensitivity was predicted by neural responses. These findings link loss aversion in decision-making to asymmetric neural valuation, providing insight into risk-related behaviours and clinical conditions.

1.3.2 Individual Differences

Personality traits play a critical role in shaping an individual's propensity for risk, influencing both short- and long-term decision-making. One key personality dimension is impulsivity, often defined by an inclination toward immediate rewards and a diminished capacity for delayed gratification (Zuckerman, 1994). A seminal longitudinal experiment by Moffitt et al. (2011) demonstrated that childhood impulsivity robustly predicted adult criminal behaviour and substance abuse, underscoring the enduring impact of this trait on risk-related activities. Additionally, sensation seeking, characterised by the pursuit of novel and intense experiences, has consistently emerged as a strong predictor of engagement in risky pursuits (Zuckerman, 1994). Individuals high in sensation seeking frequently participate in extreme sports, substance use, and unprotected sex, driven by a desire for heightened stimulation despite potential negative outcomes (Stanford et al., 2009).

As an overarching framework for understanding these personality-driven variations, the Behavioural Inhibition System (BIS) and Behavioural Approach System (BAS) illuminate why people differ in their responsiveness to rewards and punishments (Carver & White, 1994; Gray, 1982; Gray & McNaughton, 2000). BIS is associated with anxiety and avoidant behaviours triggered by cues of punishment or uncertainty (Johnson & Carver, 2016; Li et al., 2022), whereas BAS heightens reward sensitivity and approach-focused motivations (Carver & White, 1994; Gray, 1982). Epidemiological research reveals that elevated BAS correlates with an increased likelihood of risky activities, such as problem gambling and substance misuse (Franken & Muris, 2006). In contrast, heightened BIS generally manifests as cautious or risk-averse decision-making (Corr, 2013). Furthermore, large-scale studies indicate that regional variations in average personality traits, such as sensation seeking, correspond with differences in public health outcomes and risk-related behaviours (Terracciano & Costa,

2004). These findings collectively underscore the profound influence of individual differences on risk-taking, offering valuable insights into both typical and maladaptive decision-making processes at both personal and societal levels.

1.3.3 Affect

The affect heuristic serves as a central mechanism in shaping human risk perception, positing that affect, or the immediate emotional response elicited by a stimulus, significantly influences how risks are appraised and subsequently acted upon (Slovic et al., 2007). Unlike analytical processing, which involves deliberate evaluation of risks and benefits, the affect heuristic implies that individuals use affective responses as shortcuts for judging the potential danger or appeal of a particular choice (Kahneman, 2011). The heuristic's rapid, intuitive nature is particularly influential in situations of heightened emotion or ambiguity, where individuals rely on affect-laden cues rather than cognitive assessment to guide decisions (Finucane et al., 2000). Highlighting this, Porcelli and Delgado (2009) conducted an experiment where participants were subjected to acute stress via the Cold Pressor Test before engaging in a risk-based decision-making task. The results indicated that stressed individuals displayed altered risk preferences, tending to make more conservative choices in the gain domain and riskier choices in the loss domain. This shift aligns with the predictions of Prospect Theory, suggesting that stress can intensify loss aversion. Further, Starcke et al. (2008) found that elevated cortisol levels, induced by stress, affected performance on the Iowa Gambling Task, a widely used measure of decision-making under uncertainty. Participants with higher cortisol levels made more disadvantageous choices, indicating impaired decision-making and increased risk-taking behaviour.

1.3.4 Peer Influence

Peer influence plays a critical role in amplifying risk-taking behaviours, particularly during adolescence, a period characterized by heightened sensitivity to social contexts. Behavioural studies have consistently shown that adolescents are more prone to engage in risky activities when in the presence of their peers compared to when they are alone (Steinberg et al., 2008). For instance, Gardner and Steinberg (2005) demonstrated through experimental tasks that adolescents made riskier decisions and displayed a greater preference for immediate rewards when peers were watching. Meta-analytic reviews reinforce these findings,

indicating that peer presence not only increases the likelihood of risk-taking across various domains - such as substance use and reckless driving, but also that the effect size is substantial during adolescence (Albert et al., 2013). However, while adolescence is well documented as a sensitive period for peer influence, this effect has also been replicated in several ways in older adults. For instance, Young et al. (2011) found that peer norms and behaviours were strong predictors of substance use among adults. Epidemiological studies further support this, with Christakis and Fowler (2007) showing that smoking cessation patterns spread through social networks, indicating that peer behaviour can both encourage and discourage risk-taking. Moreover, in a landmark, 32-year longitudinal study, Rosenquist et al., (2003) used social network modelling to track drinking patterns every in close social networks (N = 12,067). Indeed, it was shown that changes in the alcohol consumption of one network member directly influenced immediate social network nodes. This highlights a basic premise that our closest social network has a large and significant effect on mental and physical health. Additionally, a meta-analysis by Sheeran et al. (2016) showed that social influence interventions effectively alter health-risk behaviours in adults, highlighting the role of peer dynamics. These findings underscore the pervasive impact of peer influence on risk-taking behaviours across the lifespan, emphasizing the importance of incorporating social context into interventions aimed at reducing harmful risk-taking.

As such, the role of peer influence in shaping risk-related behaviours is dualistic: while it can encourage risk-taking, it may also foster caution and conformity to safer social norms (Gardner & Steinberg, 2005). This dual influence effect is underpinned by the theory of normative social influence, which suggests that individuals alter behaviours to adhere to group norms and avoid rejection (Cialdini & Goldstein, 2004). Conformity pressures can result in risk-promoting behaviours when the group values such actions, but they can also temper impulsivity when the group favours caution, revealing a nuanced relationship between peer dynamics and risk.

1.3.5. Adolescence

Risk-taking propensities shift across the lifespan, shaped by neurobiological development, cognitive maturation, and changing importance of social contexts. As shown in Figure 1.2. below, adolescence (age 10–24) is strongly associated with heightened risk-taking (Blakemore, 2018; Duell et al., 2018). During this period, subcortical reward circuits (e.g., the

striatum) mature more rapidly than prefrontal regulatory regions, creating an imbalance that can predispose teenagers to impulsive, reward-driven choices - especially in emotionally charged or peer-influenced settings (Casey et al., 2011; Steinberg, 2008). These tendencies often reflect amplified sensation seeking and socioemotional reactivity, which can, in turn, foster experimentation with behaviours such as reckless driving, substance use, and other forms of risk-taking (Andrews, 2021; Shulman et al., 2016). However, this tendency is not uniform across all adolescents; individual differences in temperament, the social context, and parental oversight may moderate risk-taking in this developmental stage (Figner & Weber, 2011).

As individuals enter emerging and young adulthood, expanding responsibilities - such as career and family - and improving executive functions typically temper this impulsivity (Arnett, 2000; Rolison et al., 2012). By middle adulthood, risk-taking often declines further, although domain-specific patterns may persist or intensify. For instance, financial risk-taking sometimes remains elevated in professional contexts where experience and expertise offer tangible rewards (Figner & Weber, 2011). In older adulthood, concerns about health, shortened time horizons, and age-related cognitive changes tend to encourage loss aversion and cautious decision-making (Samanez-Larkin & Knutson, 2015). However, some older individuals still demonstrate high levels of calculated risk-taking, particularly in familiar domains where accumulated knowledge helps offset cognitive decline (Mata et al., 2011). Collectively, these age-related variations underscore how biological, psychological, and situational factors interact to shape risk-taking across the human lifespan.

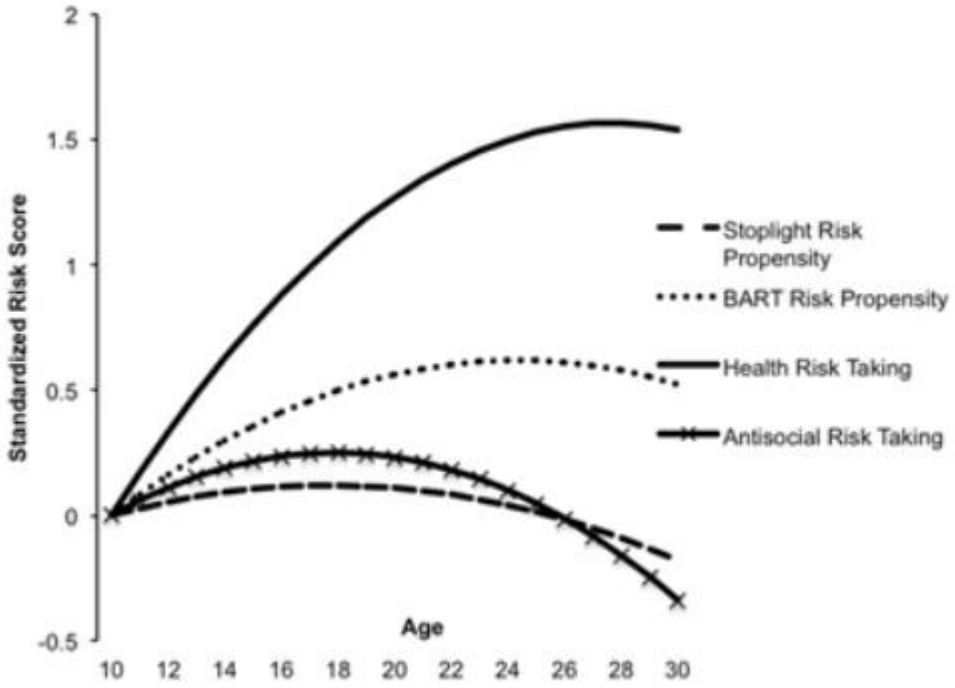


Figure 1.2. Age differences in risk-taking propensity and real-world risk-taking.
Self-reported health risks include behaviours such as alcohol consumption, riding in a car with a drunk driver, smoking, and unprotected sex. Self-reported antisocial risks include actions such as vandalism, theft, fighting, and walking through dangerous areas. The figure presents standardized regression coefficients for age and its quadratic term, adjusted for country, gender, parental education, and intellectual ability. Slopes were standardised specifically for visual comparison across measures. Reprinted from Duell et al., (2018).

1.4. Ostracism and risk-taking

While limited empirical research has directly examined the relationship between ostracism and risk-taking, several studies have explored the broader cognitive and behavioural consequences of ostracism. These studies, along with theoretical frameworks, provide insight into potential mechanisms that may explain how ostracism influences risk-related behaviours.

One potential mechanism posits that cognitive impairments caused by ostracism undermine key abilities required for effective risk assessment and decision-making. Research suggests that ostracism reduces working memory and attentional control, impairing individuals' capacity to evaluate potential consequences and increasing susceptibility to poor decision-making. Additionally, ostracism disrupts core psychological needs, such as belongingness and self-esteem (Williams, 2007), which may drive individuals toward behaviours prioritising

immediate gratification over long-term outcomes, including impulsive health-related decisions. A second mechanism draws on cognitive-motivational theories, suggesting that social threats, such as ostracism, activate a heightened state of goal-directed behaviour aimed at restoring social connection and regaining control. In this state, individuals may engage in risk-taking as a means of rebuilding social bonds, reasserting agency, or regulating mood. Such behaviours can be context-dependent, with risk-taking perceived as socially rewarding in certain environments or providing a sense of control. Importantly, post-ostracism behaviours can vary widely, manifesting as either prosocial or antisocial actions, highlighting the flexibility of coping strategies in response to social exclusion. Additional theoretical perspectives, such as compensatory control theory (Landau et al., 2015) and principles of mood repair (Twenge et al., 2002), propose that ostracism may prompt individuals to engage in risk-taking in unrelated domains (e.g., financial or health) as a way of compensating for lost needs in the social domain. These theories suggest that the type of risk context plays a crucial role in determining behavioural responses following ostracism.

Despite these insights, the field has yet to converge on a definitive explanation for why ostracized individuals take more risks, what are the mechanisms are that underlie this process, or what individual differences matter most within this process. Across two experiments, Buelow and Wirth (2017) found that ostracised participants chose riskier options on the Iowa Gambling Task (IGT) and the Game of Dice Task (GDT), but not on the Balloon Analogue Risk Task (BART). The IGT requires participants to gradually learn ambiguous probabilities through feedback, while the GDT involves integrating explicit odds with outcomes across trials. By contrast, the BART presents immediate gains and losses without stated probabilities, inviting more intuitive, trial-by-trial responding. It has been suggested that this pattern reflects ostracism's specific impact on reflective, feedback-sensitive decision processes, rather than a generalised increase in risk-taking across all domains. Moreover, in one of the few studies to examine potential mechanisms underlying the ostracism–risk link, Svetieva et al. (2016) found that excluded participants reported greater willingness to engage in risk-taking and displayed more risky driving behaviour in a simulator. Across studies, anger mediated this effect, whereas sadness and threats to control did not. These findings suggest that ostracism's impact on risk-taking may be amplified by specific affective responses, particularly approach-oriented emotions such as anger.

In the following sections I explore these mechanisms in greater detail, drawing on theoretical models and empirical evidence to support each perspective. Additionally, I examine how ostracism may influence risk-taking differentially depending on the domain in question.

1.4.1. The effect of ostracism on cognitive processes

While there has been limited empirical literature examining the link between ostracism and risky decision-making, biological, experimental and longitudinal research have provided a compelling link showing that ostracism undermines core cognitive functions across the lifespan, such as working memory, attentional control, and cognitive flexibility, which are essential for managing emotions and navigating complex decision-making scenarios (Buelow et al., 2015; Wentzel & Caldwell, 1997). Executive functions, which are critical for planning, organization, and goal-directed behaviour (Lezak et al., 2004), when these functions are compromised, the potential for downstream consequences increases, affecting everyday decision-making and a general ability to make adaptive and considered decisions.

Neuroimaging studies reveal that ostracism activates brain regions associated with social pain, including the anterior cingulate cortex (ACC) and medial prefrontal cortex (mPFC), both of which are implicated in emotional regulation and executive functioning (Baird et al., 2010; Eisenberger et al., 2003). This overlap between physical and social pain systems suggests an evolutionary basis for the distress caused by ostracism, where neural circuits for detecting social threats evolved to protect against exclusion from critical social groups (MacDonald & Leary, 2005). Furthermore, social stress has been linked to activation of the hypothalamic-pituitary-adrenal (HPA) axis, resulting in elevated cortisol levels and stress responses that impair cognitive functions such as working memory and attention (Dickerson & Kemeny, 2004). This stress-induced reallocation of cognitive resources likely contributes to observed deficits in executive functions, as neural energy is diverted toward managing the immediate emotional consequences of exclusion (Baumeister et al., 2005).

Experimental findings corroborate this neurobiological evidence. For example, experimental research using Cyberball has shown that excluded individuals exhibit deficits in tasks requiring working memory and cognitive manipulation (Hawes et al., 2012). Similarly, Baumeister et al. (2002) demonstrated that ostracism selectively impaired performance on

challenging cognitive tasks without affecting simpler information processing, highlighting the disproportionate burden ostracism places on executive resources. Supporting a developmental sensitivity, Sebastian et al. (2010) conducted a comparative experiment between adolescents and adults using the Cyberball paradigm. Adolescents exhibited greater affective reactions and more difficulty regulating distress during and after ostracism events. This heightened sensitivity suggests that adolescents may have a lower threshold for processing social rejection, leading to longer-lasting cognitive impairments compared to adults. While examining the cognitive effects of older adults, Buelow et al. (2015) found that excluded individuals showed decreased performance on tasks measuring cognitive flexibility and task persistence, indicating that ostracism disrupts key aspects of executive function in adults as well. The depletion of cognitive resources following ostracism has also been linked to impaired decision-making, with excluded individuals more likely to make impulsive choices and less likely to consider long-term consequences (Baumeister et al., 2005). For example, Twenge et al. (2002) randomly assigned participants to receive personality-based forecasts that they would either spend life “future alone” (anticipated exclusion), “future belonging” (stable relationships), or experience “future misfortune” (bad luck and accidents). Across three experiments, those assigned to the exclusion condition consistently performed worse on demanding cognitive tasks, including IQ-style reasoning items, GRE analytical problems, and recall of complex passages, while performance on simpler tasks such as rote recall remained intact. These decrements reflected reductions in both speed (fewer attempts) and accuracy, suggesting a broad impairment of executive, controlled processes. Importantly, the effects were not explained by mood or by the general receipt of negative information. These findings suggest that the effects of ostracism extend beyond immediate executive functioning deficits to more complex decision-making scenarios requiring careful evaluation and planning. Additionally, ostracism has been associated with selective memory biases. Ostracized individuals tend to recall social events more than non-social ones, an adaptive response believed to enhance the likelihood of social reconnection (Gardner et al., 2000).

Importantly, there may be significant and lingering effects that ostracism can have on cognitive performance. Indeed, longitudinal research has linked peer rejection to decreased academic performance, heightened aggression, and social withdrawal, suggesting that

ostracism undermines the emotional regulation and cognitive flexibility necessary for adaptive decision-making (Buhs et al., 2006; Parker & Asher, 1987; Wentzel & Caldwell, 1997).

Together, there is considerable empirical evidence which highlight the impact of ostracism on cognitive processes. These effects are likely particularly pronounced in adolescents due to neurodevelopmental changes and heightened sensitivity to social rejection.

1.4.2. Motivational responses to social threat

While one perspective suggests that cognitive impairments following ostracism may undermine higher-order functions critical for effective risk assessment and adaptive decision-making, another emphasises the motivational processes activated by ostracism as a potent social threat. Empirical and theoretical evidence supports the idea that ostracism induces motivational states that may lead to risk-taking behaviours.

When individuals experience a social threat such as ostracism, they enter a state of acute psychological imbalance, characterised by heightened anxiety, diminished self-worth, and disrupted emotional regulation. As highlighted in **(1.2.1)** According to the General Process Model of Threat and Defense (GPMTD; Jonas et al., 2014), social threats activate a common affective-motivational mechanism aimed at alleviating anxiety and addressing threat-related situations. This process begins with an initial phase of anxious hypervigilance, where individuals become acutely aware of the social threat and motivated to resolve it. This heightened vigilance drives compensatory behaviours designed to restore psychological stability and satisfy threatened needs, such as belonging, control, and self-esteem. Among these compensatory responses, risk-taking behaviours may emerge as deliberate strategies, particularly when they provide an opportunity to reclaim agency, rebuild social bonds, or counteract feelings of powerlessness. This shift from avoidance-oriented states to approach-driven behaviours reflects a dynamic and adaptive strategy employed in response to ostracism (Stollberg et al., 2024).

The GPTMTD offers a similar adaptive motivational drive perspective that is discussed in **(1.2.2)** the neural drivers of regulating social homeostasis by Matthews & Tye (2019). Through this perspective, It has been suggested that these responses are governed by neural systems associated with social homeostasis, which regulate efforts to recalibrate social

connections and maintain balance when individuals experience social deficits. Social homeostasis is underpinned by an adaptive predisposition - a motivational drive to reconnect - that is vital for mitigating the adverse consequences of social isolation. This reconnection drive is not merely reactive but serves as a fundamental mechanism aimed at protecting individuals from the detrimental effects of prolonged exclusion. Within this framework, behavioural responses to ostracism are conceptualised as attempts to restore threatened needs, such as regaining control or reducing the psychological discomfort caused by exclusion.

1.4.3. Domain Specific Risk

Research on risk-taking suggest that risk is not a uniform construct but rather a collection of domain-specific orientations that can differ substantially across financial, health, and social settings. Financial risks typically centre on potential monetary gains or losses, and individuals may weigh these outcomes in terms of calculable probabilities or rational expectations (Weber et al., 2002). Health-related risks, by contrast, focus on threats to physical well-being and longevity, which often introduce heightened emotional and perceptual biases (Weinstein, 1989). Social risks, such as voicing a controversial opinion or defying group norms, involve potential harm to one's social standing or relationships and thus tap into fundamental human needs for belonging and self-esteem (Blakemore, 2018). Importantly, as ostracism does not yield uniform behavioural responses (Wesselmann et al., 2015), responses to it are context-dependent, varying across different domains of risk.

Compensatory Control Theory (Landau et al., 2015) suggests that when individuals perceive a loss of control, they are motivated to restore a sense of order and autonomy through compensatory strategies in domains outside of where they have experienced the threat. These strategies may include affirming structure in their environment, bolstering personal agency, or affiliating with systems that provide a sense of stability. In the context of ostracism, which inherently threatens an individual's sense of belonging and control, risk-taking in other domains (e.g., financial risk) may serve as a compensatory mechanism to reassert autonomy and restore self-worth. Empirical evidence supports this proposition. For example, in a notable study by Duclos et al., (2013) participants were first ostracised or included**,** then made hypothetical financial choices between safer, lower-payoff options and riskier, higher-payoff options (e.g., lottery/portfolio-style choices with different variances

and expected values). Across five studies, exclusion reliably increased selection of the higher-risk/higher-reward options. Mediation analyses indicated that this effect was explained by an increased instrumental valuation of money, rather than changes in mood or self-esteem, suggesting that ostracised participants placed greater importance on monetary outcomes when making financial decisions. Further, Buelow and Wirth (2017) found that ostracized individuals displayed increased risk-taking in a novel gambling task, further supporting the notion that financial risk-taking functions as a compensatory response to social exclusion. Together, these findings suggest that engaging in financial risks may provide ostracized individuals with a means to restore their threatened sense of control and agency.

In contrast to risk observed in financial contexts, risk-taking in the health domain, it has been reasoned that health risk-taking following ostracism is driven by immediate mood regulation and mood repair. Indeed, the *deconstructed state hypothesis* (Twenge et al., 2003) offers a framework for interpreting health risk behaviours following ostracism, suggesting that ostracism induces emotional numbness, leading to impulsive or short-sighted acts aimed at escaping distress. Highlighting this, across four experiments, Twenge et al. (2002) demonstrated that socially excluded participants were more likely to engage in self-defeating risks such as choosing unhealthy over healthy food options suggesting that the desire to alleviate negative affect overshadowed concerns about long-term health. Further evidence has supported this showing that ostracism has been shown to increased alcohol consumption (Bacon & Engerman, 2018; Rabinovitz, 2014). In adolescent research, Ranganath et al., (2022) found that negative experiences on social media, such as ostracism was associated with trying alcohol and binge drinking respectively. Collectively suggesting that ostracism leads individuals to take steps to immediately boost their mood.

Interestingly, while empirical research suggests that ostracism increases risk-taking in financial and health-related domains, several lines of thought suggest that ostracism may lead to reduced social risk-taking. Across six experiments, Maner et al. (2007) tested the *social reconnection hypothesis* using three approaches to induce exclusion. Participants were either given personality feedback predicting a “future alone,” asked to recall past exclusion, or experienced direct rejection in a lab setting. They assessed outcomes such as interest in new friendships, willingness to work with others, impressions of novel targets, and generosity in reward allocations. Exclusion consistently increased affiliative motivation

toward potential new partners, but not toward those who had enacted the exclusion or toward partners with whom no face-to-face contact was expected. These effects were moderated by fear of negative evaluation, such that socially anxious individuals did not display the same reconnection tendencies. The findings indicate that exclusion elicits strategic and selective efforts to restore belonging. These behaviours suggest a pronounced desire to regain social acceptance while minimizing the risk of further exclusion. Complementary findings support the notion that ostracism reduces social risk-taking. For instance, ostracized participants have been shown to exhibit increased obedience (Riva et al., 2014) and greater compliance with charitable requests (Carter-Sowell et al., 2008). In a notable paper by Ren et al., (2016), solitude-seeking was proposed as a third response to ostracism. In one correlational study and three experiments, ostracised participants preferred being alone and avoided the same group, with no reliable increase in choosing a new group, and trait introversion further amplified solitude-seeking. A meta-analytic summary across studies showed moderate effects of solitude seeking following ostracism. These results broaden post-ostracism responses to include short-term, self-protective withdrawal, suggesting that seeking solitude may serve as a coping mechanism to alleviate social pain and facilitate emotional recovery. These findings collectively reveal a complex interplay of social responses to ostracism, characterized by a dual motivation to reconnect with others and to avoid additional rejection. This dynamic has also been observed in animal models, where healthy adult rodents demonstrated increased motivation to pursue social connection following acute isolation (Neisink & Van Ree, 1982). Together, these patterns support the hypothesis that, after experiencing ostracism, individuals may become less inclined to take social risks that could heighten the likelihood of further exclusion. Further evidence underscores the heightened social sensitivity that ostracism elicits. For instance, Mermier et al. (2023) examined the effects of ostracism on children's recognition of emotional expressions. Using the Cyberball paradigm, their experiment found that ostracized children - particularly five-year-olds - showed improved recognition accuracy and reduced misidentification rates for fearful expressions. This suggests that ostracism enhances attentiveness to social cues, potentially facilitating reintegration into social groups through heightened emotional sensitivity.

1.5. Methodological Approaches To Researching Ostracism

Experimental ostracism has been induced in a multitude of ways. Ostracism research utilises diverse methodologies to explore the dynamics and effects of social exclusion comprehensively. Experimental methods, such as Cyberball (Williams & Jarvis, 2000), Atimia (Wirth et al., 2015), social media ostracism (Wolf et al., 2015) have allowed researchers to manipulate inclusion and exclusion within a controlled environment, enabling the examination of immediate psychological and physiological responses. Contrastingly, self-report measures have been developed, like the Ostracism Experiences Scale for adolescents (OES-A) (Gilman et al., 2013) to gauge individuals' subjective feelings of exclusion. Longitudinal studies have also followed participants over extended periods to assess the long-term impacts of ostracism on mental health and social functioning (Buttner et al., 2024; Smith & Williams, 2017). Other methods of researching the effects of ostracism have included; qualitative approaches, including in-depth interviews (Leary & Kowalski, 1995).

Below, I outline the two primary approaches used in this thesis: Cyberball and recalling past ostracism. I focus on these because they are the main experimental manipulations employed throughout.

1.5.1. Cyberball

One of the most widely utilised experimental paradigms in rejection research is Cyberball, a computer-based ball-tossing game developed by Williams et al. (2000). This paradigm is designed to simulate social ostracism in a controlled setting. In standard research, participants are told they are engaging in a mental visualisation task with two other players. The game is framed as cooperative, and participants are assured that performance is not being evaluated, which helps minimise suspicion about the task's true purpose.

Unbeknown to the participant, the other "players" are pre-programmed computer avatars. In a typical experiment, participants are randomly assigned to one of two conditions: inclusion, where they receive the ball in an equitable pattern (e.g., approximately every third throw, or 10 out of 30 throws), or exclusion, where they receive the ball only sporadically (e.g., 2 out of 30 throws) after an initial brief period of involvement. The exclusion condition mimics real-life social rejection by creating the experience of being ignored and left out of a group interaction.

The paradigm effectively triggers strong emotional and cognitive responses, including feelings of rejection, isolation, and diminished belonging. These responses are underpinned by the TNTM model **(see 1.2.3)** (Williams, 2009), which posits that ostracism threatens four fundamental psychological needs: belonging, self-esteem, control, and meaningful existence. Importantly, these effects are not diminished by participants' awareness that the game is artificial. Even when participants are explicitly informed that the other players are computer-controlled, the exclusion still elicits significant distress, underscoring the automaticity of social pain (Zadro et al., 2004).

The robustness of Cyberball in inducing feelings of ostracism has been confirmed in a meta-analysis by Hartgerink et al. (2015), which synthesised findings from 120 studies that have used the paradigm (N = 11,869). The meta-analysis revealed a large effect size for Cyberball's impact on psychological needs (cohens d > 1.4), with consistent results across diverse populations, experimental setups, and cultural contexts, demonstrating the reliability of Cyberball in inducing ostracism across contexts.

1.5.2. Recalling Ostracism

The ubiquity of ostracism in everyday life is well documented across both early and contemporary research through naturalistic designs. For example, in a diary study, Nezlek et al. (1997) found that participants reported experiences of exclusion or being ignored in roughly 25% of their daily social interactions over a two-week period. These events, although often subtle, had reliable effects on mood, self-esteem, and perceived belonging, underscoring their psychological salience. More recently, Büttner et al. (2024) conducted a two-part experience sampling study that offers compelling support for the frequency of ostracism in real-world contexts. In a 14-day event-contingent sampling study (N = 323) and a 7-day time-based sampling study (N = 272), participants reported experiencing ostracism two to three times per week on average. Across both studies, episodes were logged in various interpersonal contexts and often emerged in minor, transient forms (e.g., being ignored or subtly excluded), yet they were consistently associated with perceived threat to fundamental needs, suggesting an empirical validity to recall based methods.

A well-established body of literature demonstrates that experimentally induced ostracism by Cyberball elicits immediate and substantial reductions in fundamental psychological needs,

including belonging, control, and self-esteem (Hartgerink et al., 2015). However, one ongoing question in rejection research has been whether ostracism truly lowers individuals below their normative baseline or whether inclusion artificially elevates them above it. Several studies using neutral control conditions help to clarify this point. For instance, Dvir et al. (2019) demonstrated that while inclusion and neutral conditions produced similar levels of need satisfaction and mood, ostracism conditions yielded significantly lower outcomes. Such findings suggest that ostracism actively suppresses well-being below baseline, whereas inclusion largely maintains a normative set point rather than enhancing it. Additional evidence supports this finding. Bernstein and Claypool (2012) showed that ostracism, relative to neutral conditions, undermined affective and need-related well-being, while inclusion only modestly exceeded the neutral baseline. Similarly, Wesselmann et al. (2012) reported that while ostracism depressed well-being, inclusion did not significantly surpass neutral conditions, pointing to a baseline-like role of inclusion.

Against this backdrop, alternative methodologies offer new avenues for understanding the experience of ostracism. For instance, other research has examined the effect of recalling previously experienced exclusionary episodes. This approach differs from immediate experimental manipulations (e.g., Cyberball) in that it draws upon autobiographical memory - requiring participants to retrieve personally significant episodes of social disconnection. Memory-based methods are sensitive to how social events are encoded, stored, and reappraised over time (Wessel & Merckelbach, 1997). Compared to the relatively standardised and artificial nature of Cyberball, autobiographical recall may capture richer cognitive, emotional, and contextual features of exclusion, potentially eliciting more pronounced affective and motivational responses. Another advantage to autobiographical recall, is that it offers a greater ease for participants to write about neutral or control conditions. This is important given that there are few studies that have compared whether participants are responding to threat broadly, or whether ostracism offers a unique social threat which leads to a diversity of responses.

From a neurocognitive perspective, the reactivation of social pain through recall is supported by evidence that remembering past exclusion may engage neural circuits like those recruited during the initial experience (Chen et al., 2008). While the intensity of such emotional re-experiencing can be modulated by time, cognitive reinterpretation, and the natural

mutability of memory, the act of recall nonetheless taps into deeper affective reservoirs than brief, lab-based manipulations. The influence of memory processes is well-documented in other domains: research on emotional memory suggests that the recollection of socially charged events, whether negative or positive, can significantly alter mood, self-esteem, and subsequent behavior (Baumeister et al., 2001; McGaugh, 2004). In contrast to the carefully delimited conditions of Cyberball, recall-based approaches may offer a window into how daily social experiences accumulate, persist, and shape ongoing self-concepts and interpersonal strategies.

1.6. Empirical contribution within this thesis

In the following three chapters of this thesis, I report the results of five studies that investigated the effect of ostracism on risky decision-making, sensitivity to feedback and susceptibility to peer influence, whilst controlling for individual differences. The studies within this thesis extend prior research by examining the link between exclusion and increases in risk-taking by (i) examining the role of risk-taking within peer contexts, (ii) testing domain-specific shifts in risk and benefit perception, and (iii) specifying for whom effects are strongest (e.g., key individual differences, such as rejection sensitivity, and baseline risk-taking).

A small amount of prior work shows that social exclusion can increase risk taking, but most studies test choices in isolation (outside of a peer context), focus on a single domain (eg., financial or risky driving), and rarely specify for whom effects are strongest (no testing of individual differences). In the following chapters in this thesis, I address these issues by embedding decisions within peer contexts, comparing risk across domains (financial, health, and legal), and incorporate key individual differences as moderators to test if it amplifies or mute effects.

In **Chapter 2,** I used existing risk-taking peer influence tasks to investigate how the role of peers' shape risk-taking behaviours following recalling ostracism. In addition, I examined whether the presence of a reward shaped behavioural responses. Additionally, I explore crucial individual differences such as baseline risk-taking and rejection sensitivity can moderate these effects. In **Chapter 3**, I adapted and created a novel behavioural task used to induce affect and deliberate reasoning, previously used by Finucane et al (2000) to

investigate risk and benefit perception across a series of distinct risk domains (financial, social and health), after recalling a bout of ostracism. In this task, ostracized participants rated the risk and benefit that they saw across a series of common health, social and financial risks. In this study, I test the hypothesis as to whether ostracism leads to a *bi-directional* change in risk perception, with ostracized participants perceiving social risks higher than financial and healthy risks. Finally, in **Chapter 4,** I test and analyse the effect that recalling ostracism has on feedback sensitivity in two novel gambling tasks. Specifically, I examine how winning and losing a trial influence whether ostracized participants take risks in the next trial. Here, I again control for several individual differences such as impulsivity and sensitivity to reward and punishment to attempt to test how specific individual differences moderate any effects.

Chapter 2: Peer influence on risk following ostracism: The moderating role of rejection sensitivity and reward availability

Every day, individuals make decisions involving risk. Consider deciding whether to pick up broken glass with bare hands, bike without a helmet or cross the road whilst texting; humans consistently encounter scenarios where an error in judgment could have a substantial impact on health and well-being. As such, understanding what prompts an individual to approach or to avoid when faced with risky decisions, and what influences perceptions of risk, is a field of experiment that spans academic disciplines. Specifically, researchers in the disciplines of psychology (Slovic, 1964; Trimpop, 1994; Zukerman et al., 2000), public health and epidemiology (Pound & Campbell, 2015), neuroscience (Schonberg et al., 2011), economics (Schoemaker, 1993), medicine (Hanoch et al., 2018) and environmental science (Bogner et al., 2000) have investigated predictors of risky decision-making, determining that factors such as loss aversion (Kahneman & Tversky, 2013), perceived control (Langer, 1975; Skinner, 1996), and social influence (Chien et al, 2011; Cialdini & Goldstein, 2004) all play crucial roles in shaping these decisions. Importantly, these studies often distinguish between risk-taking driven by *loss avoidance* and risk-taking driven by the *pursuit of rewards*, emphasizing how these two motivations can differentially influence decision-making processes.

Despite extensive research on risk-taking behaviors, only limited empirical research has linked ostracism - characterized by being ignored and excluded by an individual or group (Williams, 2007) - with increased risky decision-making. This lack of research is surprising given that ostracism affects fundamental psychological processes, including emotion regulation (Poon et al., 2020), self-esteem (Teng & Chen, 2012), and social belonging (Baumeister & Leary, 2017; Williams & Zadro, 2001). Understanding the significant role of peer influence in this process is essential, as the social context, peer norms, and the riskiness of the other peers heavily impact an individual's decision-making (Gächter et al., 2017). Additionally, individual differences, such as rejection sensitivity - characterised by an intense reaction to rejection (Downey & Feldman, 1996) and baseline levels of risk-taking (Fromme et al., 1997), also play a crucial role within this process. By examining how these factors interact with ostracism to influence risky decision-making behaviors, I can clarify the

psychological and social mechanisms driving these behaviors. Understanding these interactions is essential for identifying the conditions under which ostracized individuals are more likely to engage in risky behaviors.

To address this issue, I conducted two pre-registered experiments investigating how being ostracized affects individuals' health risk perceptions and their conformity to the risk judgments of peers. Experiment 1 focuses on health risk perceptions in terms of loss avoidance. I hypothesized that ostracized individuals would exhibit decreased risk perception and increased conformity to the risk judgments of their peers. Experiment 2 shifts the focus towards a reward-based task, examining how ostracism influences decisions in scenarios where opportunities for gain are present. The intent is to determine if ostracized participants are more inclined to align with the risk behaviors of their peers when the potential for rewards is emphasized. Through testing these conceptual differences, I aim to understand how ostracism differentially affects individuals' conformity to peer influences across domains of threat and reward.

Risk, Losses and Gains

Risk perception. To further understand how ostracism may lead to changes in risk related decision-making, it is crucial to differentiate between risk perception and risk behavior, as well as between loss avoidance and gain approach. *Risk perception* refers to an individual's subjective judgment about the severity and probability of a risk (Slovic, 1987). It involves cognitive evaluations and emotional responses to potential hazards, such as perceiving ostracism as highly detrimental to one's social standing and emotional well-being (Breakwell, 2014). For instance, an individual who has been ostracized may perceive social interactions as risky due to the heightened fear of further exclusion or rejection (Williams, 2007).

Risk behavior. Conversely, *risk behavior* encompasses the actual actions individuals undertake in response to perceived risks (Weber et al., 2002). This includes decisions such as choosing to avoid social gatherings to mitigate the risk of ostracism or, paradoxically, engaging in risky behaviors to regain social acceptance and attention. Toward this end, Laws et al. (2017) found that individuals who experienced social rejection were more likely to engage in self-defeating behaviors, such as substance abuse, in an attempt to cope with the

emotional distress. Similarly, Twenge et al. (2001) demonstrated that ostracized individuals exhibited increased aggression and risk-taking to reassert control and gain social acceptance. These studies underscore the complex ways in which ostracism can drive individuals toward divergent risk behaviors, highlighting the importance of understanding these dynamics for developing more nuanced models of social influence and peer dynamics.

Losses and gains. The concepts of loss avoidance and gain approach further elucidate the motivations behind risk-related decisions, particularly in response to ostracism. *Loss avoidance* is driven by the desire to prevent negative outcomes and is grounded in the psychological principle of loss aversion, where losses are perceived as more significant than equivalent gains (Kahneman & Tversky, 2013). Ostracism might manifest as an individual avoiding social situations to prevent the emotional pain associated with further exclusion, prioritizing the avoidance of loss of social status and emotional stability (Baumeister & Leary, 2017). Conversely, *gain approach* is motivated by the pursuit of positive outcomes and rewards, involving taking risks with the expectation of achieving beneficial results (Higgins, 1997). Ostracized individuals might engage in behaviors that seek to enhance their social standing or reconnect with others, such as adopting risky peer behaviors to gain acceptance or attention (Williams & Sommer, 1997). This dual-system theory suggests that these motivations operate through different cognitive and emotional processes, with loss avoidance often being more automatic and emotionally charged, whereas gain approach involves more deliberative and goal-oriented thinking (Kahneman, 2011).

In the context of ostracism, these distinctions are critical. Ostracized individuals may experience heightened sensitivity to both loss and gain contexts, influencing their decision-making processes. For example, psychological distress and the need to restore social connections may drive ostracized individuals to take greater risks, either to avoid the pain of continued exclusion (loss avoidance) or to achieve the reward of social reintegration (gain approach) (MacDonald & Leary, 2005; Maner et al., 2007). This dynamic interplay highlights the importance of considering both risk perceptions and risk behaviors, as well as the motivations of loss avoidance and gain approach, in understanding how ostracism shapes decision-making and social interactions.

Peer influence

A staple focus area of risky decision-making research is the peer environment. Peer influence is a critical determinant in risky decision-making, particularly within adolescent social dynamics, where susceptibility to peer pressure often precipitates increased risk-taking (Albert et al., 2013; Gardner & Steinberg, 2005; Van Hoorn et al., 2016). Empirical evidence has shown that the presence of peers can influence brain activity related to reward sensitivity, which in turn alters perceived risk and benefit. For instance, Chein et al. (2011) demonstrated that adolescents exhibit greater activation in reward-related brain regions, such as the ventral striatum, when making decisions in the presence of peers compared to when they are alone. This increased neural sensitivity to potential rewards in a social context was associated with a higher likelihood of risk-taking behavior, indicating that peer presence directly impacts how risks and benefits are perceived and evaluated. Further, social conformity, especially informational conformity, also impacts risk perception, as individuals often recalibrate their risk assessments to align with those within their peer groups, a phenomenon that has been substantiated across diverse age groups (Knoll et al., 2015; 2017).

While peers are often regarded as a determinant for promoting risk-taking, they can also foster prosocial behavior, indicating that social influence can have a multi-faceted effect on decision making. Importantly, risk-taking itself is not inherently at odds with prosocial behavior. In fact, certain forms of risk-taking, such as moral or creative risk-taking, can lead to actions that benefit others (Galinsky et al., 2003; 2008). Depending on the context, peer interactions may encourage risk-taking or support prosocial actions, highlighting the nuanced and context-dependent nature of social influence (Ciranka & Van Den Bos, 2019; Foulkes et al., 2018; Telzer et al., 2013). These bidirectional influences highlight the complexity of how peer interactions shape decision-making processes, as they can both encourage risk-taking and foster prosocial actions depending on the context.

Ostracism and Threat Compensation

Peers significantly influence risk-taking behaviors by shaping attitudes and actions, yet the impact of ostracism on such decision-making remains insufficiently understood. Williams' (2009) Need-Threat Model states that ostracism threatens four fundamental

human needs: belonging, self-esteem, control, and meaningful existence. When these needs are compromised, individuals experience profound psychological distress, which can manifest as reduced cognitive function, emotional pain, and a diminished sense of well-being (Baumeister et al., 2002; Smith & Williams, 2004; Williams, 2007). Importantly, the disruption of these essential needs can manifest in a variety of context-dependant ways, driving individuals to engage in compensatory behaviors such as peer conformity and risk-taking to restore their sense of self and social standing. The model helps explain why ostracized individuals might engage in greater risk-taking, become more attuned to social and environmental cues, as well as increasing levels of conformity to regain control, boost self-esteem, and ultimately restore psychological homeostasis.

While some evidence links ostracism to increased risk-taking behaviors (Buelow & Wirth, 2017; Duclos et al., 2013; Svetieva et al., 2016; Twenge et al., 2001), the mechanisms driving this behavior are not fully understood. A working hypothesis suggests that the psychological distress caused by ostracism leads to motivational and neurobiological changes associated with threatening experiences, which in turn prompt riskier behaviors. Prior research has confirmed that acute psychosocial threats increase cortisol levels, which can alter emotional regulation and cognitive function, leading to greater reward sensitivity and a preference for immediate, though potentially harmful, rewards (Starcke & Brand, 2012; Van Den Bos et al., 2009). Ostracism, as a potent social threat, can induce an approach-oriented motivational state, prompting individuals to seek new affiliations and pursuing achievements as a means of compensating for the perceived threat (Jonas et al., 2014; Proulx et al., 2012; Stollberg et al., 2024). The General Process Model of Threat Defense (GMPTD; Jonas et al., 2014) posits that when an individual faces a threat, the Behavioral Inhibition System (BIS) is first activated, resulting in heightened anxiety, increased inhibitory control, and greater sensitivity to environmental and social cues. This protective response makes the individual more cautious and focused on avoiding further harm. However, as the individual seeks to resolve the threat, they may engage in direct or indirect actions to alleviate the anxiety, which then activates the Behavioral Approach System (BAS), driving approach motivation. The BAS drives the pursuit of rewarding stimuli and goals, helping the individual shift from a state of avoidance and anxiety to one of action and goal-seeking, ultimately aimed at resolving the threat. Once the BAS is activated, the individual

becomes motivated to restore psychological balance by forging new connections, taking risks to regain a sense of control, or pursuing new opportunities that may offer personal growth or social reintegration. This shift helps alleviate the anxiety initially triggered by the threat, ultimately aiding in regaining control and restoring a sense of belonging following ostracism (Duclos et al., 2013).

Psychologically, ostracism initially triggers a reflexive threat response, impairing executive functioning and heightening sensitivity to social cues (Chen et al., 2025; Williams, 2007). Neurobiological research supports this by highlighting that aversive social interactions activate key components of the brain's reward circuitry, such as the Nucleus Accumbens (NAc) and dopamine neurons (DA) that are known as being crucial in reward-seeking behavior (Dölen et al., 2013; Gunaydin et al., 2014; Matthews et al., 2016). Additionally, it has been well established that social disconnection, such as ostracism, is an aversive experience that triggers prosocial efforts to reconnect. Across a series of studies, Maner et al. (2007) showed that ostracized humans showed increased motivation to seek reconnection, showing increased interest in making new friends and forming positive impressions of new social contacts. This indicates that the aversive experience of ostracism can drive efforts to re-establish social bonds, alleviating the pain of exclusion and regaining social inclusion. These responses suggest a complex interplay of psychological distress, motivational shifts, and neurobiological changes following ostracism, which not only affect psychological well-being and cognitive function but also influence risk-taking behaviors and motivates efforts to restore social bonds. Taken together, this framework suggests that the aversive experience of ostracism not only impairs immediate cognitive function but also motivates compensatory, reward-sensitive behaviours aimed at re-establishing social bonds.

Risk within the peer context

Two lines of thought suggest that ostracized participants may take greater risks, while also conforming more to their peers. This enhanced susceptibility to peer influence can manifest in various ways, including heightened pro-social behavior (Carter-Sowell et al., 2008; Wesselman et al., 2013) or more concerning tendencies, such as an increased openness to extremist ideologies (Hales & Williams, 2018, 2019; Pfundmair, 2019; Williams et al., 2019). I hypothesized that this tendency toward social conformity, influenced by the need to reconnect following the perceived threat of ostracism, encompasses both a

readiness to take risks and an inclination to adhere to social norms or peer pressures. This dual response can lead to increased risk-taking when conforming to a high-risk peer environment, or more cautious behavior when peers promote safety. For example, in a high-risk peer environment, an ostracized individual might decide to engage in risky activities such as binge drinking or reckless driving to align with the group's behavior and gain social acceptance. Conversely, in a peer environment that promotes safety, an ostracized individual might choose to avoid risky activities and adhere to safer behaviors, such as wearing a seat belt or abstaining from substance use, to conform to the group's norms and avoid risking further ostracism. Put differently, understanding the norms within a group may moderate the effect that ostracism has on an individual's behavior (Rudert & Greifender, 2016).

In this , I investigate the conditions under which ostracism influences an individual towards riskier choices or cautiousness. Specifically, I sought to identify the factors that predict whether ostracized individuals are likely to take more risks or become risk-averse due to peer influence. For instance, in environments where peers endorse risky behaviors, ostracized individuals might increase their risk-taking. Conversely, in contexts where peers encourage safety, conformity may lead to less risk-taking. This research aims to clarify whether the effects of ostracism on decision-making are uniform or vary depending on the peer context, potentially offering a protective effect against risk-taking through increased peer conformity when the peer group favours safety.

The present research

In Experiment 1, I investigated how recalling an experience of ostracism shapes risk perception and whether the social environment could further modify these perceptions. Participants first completed the Cognitive Appraisal of Risky Events (CARE; Fromme et al., 1997) questionnaire to establish a baseline of their attitudes toward risk. The CARE measures participants' past involvement in risky behaviors (e.g., using drugs and alcohol, engaging in unprotected sex, taking illicit drugs and high-risk sports) over the past six months. It also assesses participants' expectations of engaging in these behaviors over the next six months, as well as anticipated negative consequences and positive benefits of these behaviors.

Following this, participants were prompted to recall a personal experience of being either ostracized or included. Participants then assessed the riskiness of various moderately

risky everyday scenarios. Subsequently, to simulate peer influence, participants were presented with peer ratings of the same scenarios' riskiness (these ratings were pre-programmed). After exposure to these group opinions, participants were asked to reassess the risk levels of the scenarios. This methodology allowed us to test two hypotheses, both grounded in the idea that being ostracized will put an individual into approach-oriented, compensatory states: (a) ostracism alters an individual's risk perception, typically leading to a decreased risk perception (ostracism risk-perception hypothesis), and (b) this altered risk perception becomes significantly more susceptible to influence by the perceived opinions of peers (ostracism peer-conformity hypothesis). As an exploratory hypothesis, I investigated how the direction of influence (whether the peer risk-rating was higher or lower than the participant's initial risk-rating) influenced decision-making. Further, I correlated individual risk-taking judgments with their CARE scores to investigate whether differences in real-life risk-taking correlated with results on the task. The exploration aimed to determine if peer influence direction (higher or lower risk ratings than the participant's) modulates the degree of conformity in risk perception.

In Experiment 2, I sought to examine risk-taking behavior in a social context, focusing on a task that involved potential rewards rather than threat recognition. I used a modified version of the Balloon Analogue Risk Task (BART); the Social Balloon Analogue Risk Task (SBART; Tomova & Pessoa, 2018), in which participants were invited into the lab in groups of four to complete a peer influence task, believing that they were playing the game with each other in different rooms. This paradigm, like Experiment 1, involved individual decision-making followed by peer information for the same task, leading to an informed decision. I furthered Experiment 1 by (a) exploring whether I could replicate the same findings on a risk-*taking* task rather than a risk-*perception* task, (b) using a different ostracism manipulation (Cyberball 5.0; Williams & Jarvis, 2006), (c) exploring how the direction of peer influence (exposure to low, neutral, or high-risk peers) influences decisions, and (d) examining whether the effects of rejection sensitivity influenced the amount or direction of conformity. The use of Cyberball allowed us to compare the immediate experience of being ostracized in real-time, contrasting with the autobiographical recall task used in Experiment 1. This real-time manipulation offers a more controlled and standardized method for inducing ostracism. This experiment design aimed to test whether ostracism increases risk-

taking when rewards are at stake and how varying peer risk levels and individual differences in rejection sensitivity modulate this effect.

Experiment 1

Method

Ethics and open practise statement

All experimental procedures were approved by our University's ethics review panel. Participants provided informed consent and were fully debriefed at the end of the experiment. I report all measures, manipulations, and participant exclusions for both studies. Experiment 1 (E1) and Experiment 2 (E2) pre-registration are available here: (E1) https://osf.io/yb8g7?view_only=98e9eb78970344a9adb88354206c5450, (E2) https://osf.io/dvpyu/?view_only=43c334cf2a0e425c9988b57a96f8cc55
The data and R script are available here: https://osf.io/m9ep8/?view_only=47c85483a2e34375bc998751c3fd74ff.

Participants

To establish the required sample size, an a priori power analysis was conducted using G*Power 3.1 (Faul et al., 2007). This analysis indicated that for a linear multiple regression detecting a moderate effect size (f^2 = .15), a sample of 85 participants would provide 80% power. Considering the anticipated interaction effects, which typically have half the effect size of main effects (Blake & Gangestad, 2020), the sample size was doubled to 170 participants to maintain adequate power. To account for potential data loss and technical issues, I aimed to recruit an additional 10-20% participants.

192 University Psychology students took part in the study, in return for course credit. Five participants were removed from the analysis due to not completing the Qualtrics form correctly. An additional 15 participants' data were lost due to technical issues with the experimental task (specifically, difficulties loading the task and coding issues with PsychoPy), resulting in no usable data for those sessions. Our final sample consisted of 172 participants (*M*age = 19.70, *SD*age = 2.81, range = 18–43; 146 Females, 24 Males, 2 Non-binary; 72% identified as White).

Materials and Procedure

At the beginning of the study, participants were given a pen and a piece of paper. They were told that they were taking part in an investigation that was examining the link between recalling past experiences and health risk-perception.

Participants first completed The Cognitive Appraisal of Risky Events (CARE) questionnaire (Fromme et al., 1997) which evaluates individuals' outcome expectancies and involvement in risky behaviors in domains such as illicit drug use, aggressive and illegal behaviors, risky sexual activities, heavy drinking, high-risk sports, and academic/work-related behaviors. The CARE questionnaire is divided into four sections: past involvement (frequency of engagement in risky behaviors in the past six months), expected future involvement (anticipated frequency of engaging in risky behaviors in the next six months), positive consequences (perceived benefits of engaging in risky behaviors), and negative consequences (anticipated unfavourable outcomes from such behaviors).

After completing the CARE questionnaire, participants were randomly assigned to one of two conditions; where they recalled either a time of being ostracized *(N = 86)* or of being socially included *(N = 86).* Participants were instructed to write (up to 150 words) about a memory that fitted the description as clearly and accurately as possible. In the ostracism condition, participants actively recalled and wrote about an experience of social exclusion, drawing from personal instances such as receiving the 'silent treatment' or being left out by friends. In contrast, the inclusion condition required participants to remember and describe times when they felt a deep connection to others, like a cherished moment with family or a friend.

This autobiographical recall method was chosen as it had been previously used in similar research as a method to generate feelings of ostracism and inclusion in risk research (Duclos et al., 2013). Recalling ostracism relies on subjective memory, engaging reflective cognitive processes, and may vary between individuals, while Cyberball provides a controlled, real-time exclusion experience that triggers immediate emotional and physiological responses. Cyberball ensures consistency, capturing acute effects, whereas recalling ostracism reflects longer-term impacts influenced by personal memory biases. Here, I used autobiographical recall to allow to explore how individuals interpret and

integrate past experiences of ostracism, tapping into the long-term cognitive and emotional impacts that might not be captured in real-time manipulations.

Following the recall task, participants were asked three questions related to the memory they had recalled. The first two questions addressed feelings of self-reported exclusion/inclusion (How excluded did you feel during the memory?; How excluded do you feel right now?), both of which were answered on a five-point scale (1 = Very excluded; 5 = Very included). The final question addressed participants' mood (How is your mood right now?), in which participants were able to select a choice out of 8 possible options split by valence. The positive options included feeling; good, friendly, pleasant, and happy, whilst, the negative valence included feeling; bad, unfriendly, angry and sad.

After completing the manipulation check, participants commenced the Social Influence Risk Perception task, which was based on the original task designed by Knoll et al. (2015). The task, presented via PsychoPy (v2023.2.2), included a series of 90 risk scenarios across three blocks, each containing 30 scenarios. A sample trial is depicted in Figure 2.1. Consistent with previous research (e.g., Knoll et al., 2015; 2017), these scenarios were designed to ensure: (a) the depiction of immediate health risks (e.g., driving while fatigued, crossing railway tracks, rooftop partying); (b) elicitation of a variety of individual risk perceptions; (c) avoidance of scenario repetition; and (c) medium to moderate risk levels to prevent floor or ceiling effects.

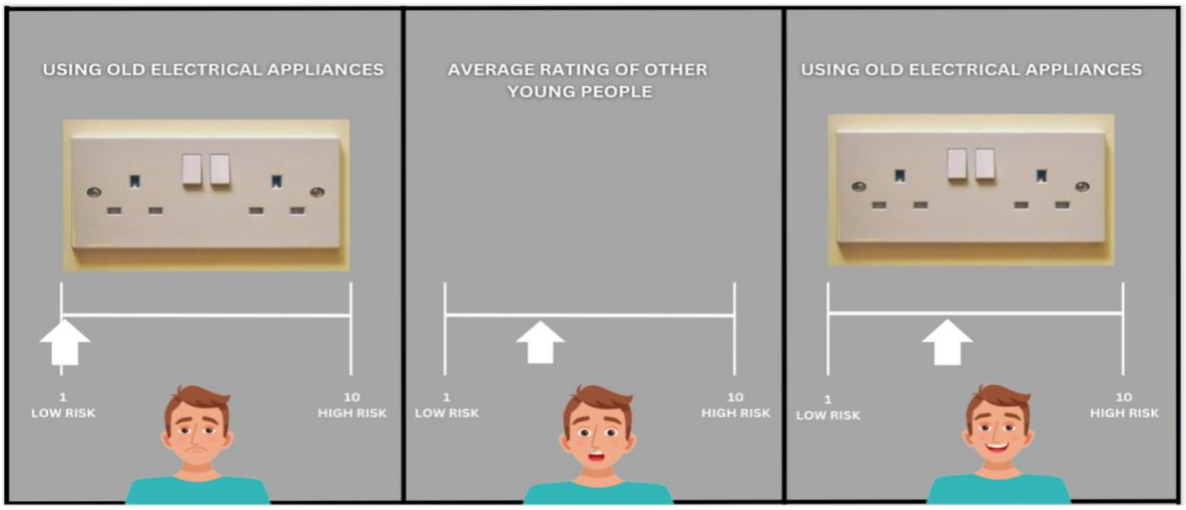


Figure 2.1: Illustration of the trial sequence. Participants were asked to rate a common risk scenario (1 – 10). After giving their rating on the sliding scale, participants were then shown a rating called 'average rating of other young people'. Following this they would then re-rate the same risk scenario. Attribution for image: http://www.freepik.com/macrovector

In the social influence task, participants were presented with a range of group risk-perception ratings, which I refer to as *social influence ratings*. The mean rating across the trials was 4.99, indicating a moderate level of perceived risk. There was a substantial variability in the ratings provided, as indicated by a standard deviation of 1.73 and a range from 2 to just under 8. This spread of scores indicates that while the condition often conveyed moderate risk, there was also exposure to both lower and higher risk evaluations.

Participants first completed a practice round to familiarise themselves with the sliding risk rating scale, which ranged from 1 (Not at all risky) to 10 (Very risky). They were then shown an image depicting a risky situation (e.g., Using Old Electrical Appliances) and asked to rate their initial perception of the risk. Subsequently, they were exposed to a pre-programmed average risk rating labelled as 'The average rating of other young people' before being prompted to rate the scenario again. The stimuli were presented visually, accompanied by a statement and an interactive rating bar. There was no time limit for rating each scenario. However, the influence rating was displayed for two seconds, followed by a blank screen with a central fixation cross for one second. To minimize anchoring bias, the cursor would then appear at the top centre of the screen. Participants could adjust their rating freely, but once the rating was stopped, the trial advanced automatically to the next

scenario without the option to revise their response. All scenarios were presented randomly, with blocks A, B, and C counterbalanced.

Results

Data analysis strategy

All analyses were conducted using R (R Core Team, 2013). Data visualisations were created with ggplot2, linear mixed models (LMM's) were estimated with the lmerTest package, and data manipulation was facilitated with dplyr and tidyr.

A sensitivity analysis was conducted to determine the minimum detectable effect sizes with 80% power at a 5% significance level. In Experiment 1**,** a 2x2 mixed ANOVA design (*Condition:* Ostracism vs. Inclusion; *Time*: Rating 1 vs. Rating 2) with 86 participants per cell indicated that the smallest detectable effect sizes were Cohen's f = 0.214 for the main effects of Condition and Time, and Cohen's f = 0.178 for the Condition * Time interaction. This analysis confirms that Experiment 1 is powered to detect small-to-medium effect sizes across primary and interaction effects.

I first tested the normality of the data using Kolmogorov-Smirnov tests and Levene's tests for equality of variances. Diagnostic plots, including residuals versus fitted values and Q-Q plots, indicated no substantial deviations from the assumptions of homoscedasticity and normality of residuals. Although slight deviations were observed, these do not undermine the model's utility, given the robustness of LMM's to minor violations, especially with moderate to large sample sizes (Gelman & Hill, 2006; Pinheiro & Bates, 2000). Furthermore, leverage plots did not reveal any unduly influential points, suggesting that the model's estimates were not being skewed by outliers.

To test our *ostracism-risk hypothesis,* I conducted an independent samples t-test on the initial risk perception rating (Risk Judgment 1) between the ostracism and inclusion conditions. To test our main hypothesis that ostracized participants would be more susceptible to peer influence, and an exploratory hypothesis to determine whether the direction of influence (whether the social influence ratings were higher or lower than the participants' initial ratings) significantly influenced changes in risk perception, I used an LMM.

To understand the dynamics of risk perception change (susceptibility to influence) after exposure to social influence ratings, I created our dependent variable, called here '*Rating Change'* which was operationalized as follows:

Rating Change = Risk Judgment 2 – Risk Judgment 1

Next, I constructed a continuous peer influence variable to capture both the direction and the magnitude of peer influence. I named this variable "*Signed Difference,"* which was created as follows:

Signed Difference = Social Influence Rating – Risk Judgment 1

As the risk perception scale in the experimental task was reverse-coded (1 = Low Risk Perception; 10 = High Risk Perception), a positive Signed Difference score indicates that the social influence rating was higher (i.e., more risk-averse) than the participant's initial rating, whereas a negative Signed Difference indicates that it was lower. In other words, the sign of this variable conveys the direction of social influence, and its absolute value (i.e., the magnitude) reflects how far the social influence rating diverged from the participant's rating.

For our main hypothesis, I tested the effect of *Condition* (Ostracism vs. Inclusion), *Signed Difference,* and their interaction on participants' Rating Change (Risk Judgment 2 – Risk Judgment 1). In this model (Model 1), Condition (a binary factor with two levels denoting the experimental condition; Ostracism and Inclusion) and Signed Difference (a continuous variable capturing the difference between the participant's initial rating and the social influence rating) were entered as fixed effects, along with their interaction. I also included random intercepts for participants and scenarios to account for individual differences and scenario-related variability. The full model is available in the Appendix (S1A).

Next, I conducted a second, more exploratory analysis (Model 2) to determine whether the direction of peer influence - whether social influence ratings were higher or lower than participants' own ratings - would lead to corresponding directional changes in risk-taking.

Specifically, our exploratory hypothesis posited that ostracized individuals might be differentially susceptible to peer influence depending on whether it pushes toward increased or decreased risk perception. Given that the peer influence task allowed for decimal-point responses, no participant's second rating (Risk Judgment 2) was identical to their first (Risk Judgment 1). Therefore, I dichotomised the Direction of Influence variable as either Higher (if the peer's risk rating exceeded the participant's initial rating) or Lower (if the peer's risk rating was below the participant's initial rating). I again specified random intercepts for participants and scenarios in our LMM. Post hoc tests using Bonferroni adjustments were then conducted to compare the Higher and Lower influence categories. This additional analysis clarifies whether peer influence in one direction (toward higher or lower risk perception) exerts a different effect on ostracized participants, directly linking to our broader aim of understanding how ostracism might moderate susceptibility to social influence. The full model specification for this analysis is presented in the Appendix (S1B).

In addition to having a baseline condition (Ostracism versus Inclusion), to address concerns about any significant effects of peer influence being driven by regression to the mean and the influence of confounded trials, I conducted an additional analysis, separating confounded and unconfounded trials. Trials were labelled as *confounded* if participants' rating adjustments shifted towards the mean initial risk perception, suggesting a possible bias towards regression to the mean. Unconfounded trials - where rating changes moved away from the mean - were analysed separately to test the robustness of our primary findings without potential regression to the mean effects. I report Model 1 in full in our Appendix on unconfounded data, which show a similar pattern of effects to the main analyses reported below (S1C).

Finally, I tested whether individual differences in risk tendencies shaped participants risk judgments by including participants' initial risk ratings (Risk Judgment 1) and their overall susceptibility to peer influence (Rating Change) by including participants results from the CARE scale in two models predicting Risk Judgment 1 and Rating Change. This enabled us to determine how individual risk orientations might influence susceptibility to social influence. The full model is available in the Appendix (S1D).

Manipulation Check

To examine if our manipulation was effective, I compared ratings of how alone and excluded participants felt during the memory that they recalled (and in the current moment). I averaged the scores of participants' feelings of inclusion both in their recalled memory and their current state, as these values were highly correlated in both conditions *(ostracism (r(86) = - 0.68, p < .001), inclusion (r(86) = - 0.76, p < . 001)).* An independent t-test showed a significant difference between the conditions. Participants in the ostracism condition reported feeling lower levels of inclusion *(M = 2.30, SD = 0.788)* compared to those who recalled inclusion *(M = 4.14, SD = 0.68),* t*(172.02) = 16.77, p < .001, 95% CI [1.67, 2.30], d = 2.52, 95% CI [1.63, 2.06]*. Thus, the manipulation was highly effective at inducing feelings of ostracism.

Ostracism risk-taking hypothesis

An independent samples t-test was conducted to test whether ostracized participants had a lower Risk Judgment 1 score compared to participants in the inclusion condition. The analysis showed a significant main effect, t*(167.37) = 2.650, p = .009, 95% CI [0.09, 0.60],* with ostracized participants reporting lower risk perception *(Risk Judgment 1: M = 5.58, SD = 0.93)* than included participants (*Risk Judgment 1: M = 5.93, SD = 0.79)*, *d = 0.40, 95% CI [0.10, 0.70*].

Peer Influence

To investigate the extent to which participants changed their risk ratings after exposure to social influence ratings, I used a Linear Mixed Model (LMM) to examine how Condition (Ostracism versus Inclusion) and peer influence jointly predicted susceptibility to rating adjustment.

The analysis revealed several significant findings. Firstly, the *Signed Difference* variable, capturing both the direction and magnitude of peer influence, had a significant positive effect on rating change *(β = 0.182, SE = 0.003, t(14140) = 54.362, p < . 001, r = 0.416, 95% CI [0.408, 0.424]).* This finding confirms that participants adjusted their risk perceptions more strongly as the discrepancy between their initial rating and the peer-provided rating increased. When presented with the social influence rating, participants adjusted their

ratings in line with the peer's suggestion, reducing their ratings when the peer suggested lower risk and increasing their ratings when the peer suggested higher risk. The size of these adjustments grew as the absolute difference between the peer's and the participant's ratings increased, highlighting participants' sensitivity to both the direction and magnitude of peer influence.

The main effect of Condition (Ostracism vs. Inclusion) on rating change was non-significant *(β = − 0.032, SE = 0.033, t(173) = −0.966, p = 0.335).* However, there was a significant interaction between Condition and *Signed Difference* (*β = − 0.035, SE = 0.0045, t(14760) = − 7.793, p < . 001, r = − 0.101, 95% CI [-0.127, -0.075]).* I then followed this analysis up with a simple slope analysis which showed that in the ostracism condition, *Signed Difference* significantly predicted *Rating Change (β = 0.182, SE = 0.003, z = 54.362, p < .001, r = 0.74, 95% CI [0.18, 0.19]),* confirming that ostracized participants strongly aligned their risk ratings with those suggested by the peer. In the inclusion condition, *Signed Difference* also significantly predicted *Rating Change* (*β = 0.146, SE = 0.003, z = 42.792, p < .001, r = 0.75, 95% CI [0.14, 0.15])*. However, a direct comparison of these effects *(β = 0.035, SE = 0.0045, z = 7.793, p < .001, r = 0.71, 95% CI [0.03, 0.05])* confirmed that ostracized participants were significantly more responsive to peer ratings than socially included participants.

Next, to test how the Direction of Influence (whether the social influence rating suggested a higher or lower risk perception than the participants) I followed this analysis up with pairwise comparisons, adjusted by the Bonferroni method, to test how the direction of influence altered rating change. The results showed that when the social influence rating was higher (more risk-averse), participants in the ostracism condition showed a significantly larger increase in their ratings relative to the inclusion condition *(Ostracism: M = 0.57, SD = 0.97; Inclusion: M = 0.40, SD = 0.81; β = 0.135, SE = 0.035, z(5982) = 3.720, p < .001, 95% CI [0.07, 0.20],* and a Cohen's d of 0.19, 95% CI [0.14, 0.24]). This suggests that ostracized participants conformed more to peer judgments with higher risk perceptions, amplifying their adjustments in more risk-averse ways, relative to socially included participants.

Conversely, when the social influence indicated a lower risk than the participants' initial ratings, the condition of ostracism or inclusion did not significantly affect participants' adjustments in their risk perceptions *(Ostracism: M = - 0.36 , SD = 0.78 ; Inclusion: M = -*

0.28, SD = 0.76), β = - 0.065, SE = 0.034, z(8864) = -1.930, p = 0.054, 95% CI [-0.13, 0.00], Cohen's d = - 0.10, 95% CI [-0.15, - 0.06] as shown below in Figure 2.2.

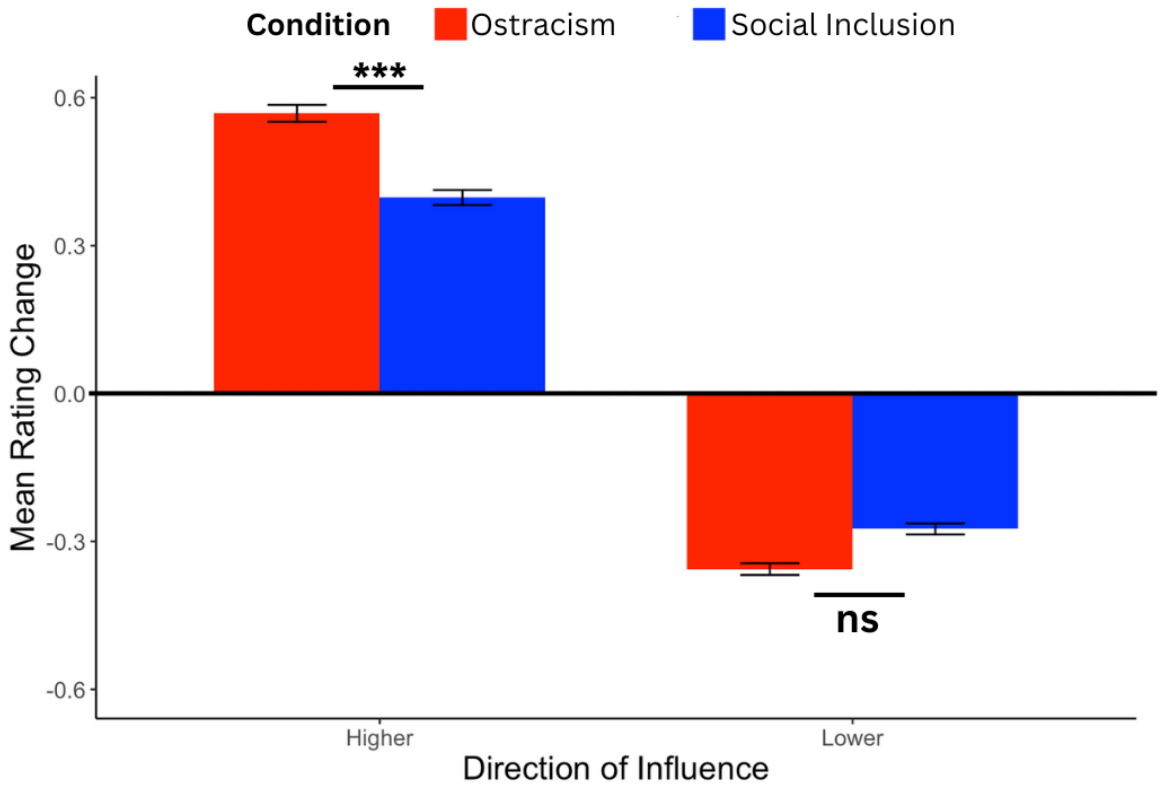


Figure 2.2: Ostracized participants conformed more to peers with a higher risk perception, than to peers with a lower risk perception. Error bars represent SE.

*** = $p < .001$, ns = not significant.

Individual Differences

I then investigated the effect of individual differences in trait risk-taking on both (a) Risk Judgment 1 and (b) the extent to which an individual changed their rating because of the experimental condition they were assigned to. Our analysis showed that past involvement in risky behaviours had a notable impact on both initial risk judgments and how individuals adjusted their ratings. Specifically, a higher past involvement in risky behaviours predicted a decrease in Risk Judgment 1 *(β = − 0.0049, SE = 0.0013, t(162.1) = −3.860, p < .001, r = −0.29, 95% CI [−0.42, − 0.15]),* suggesting that individuals with extensive histories of risk-taking perceived lower risk at the outset. Conversely, the same variable predicted an

increase in Rating Change *(β = 0.0019, SE = 0.0004, t(162.8) = 4.808, p < .001, r = 0.35, 95% CI[0.21, 0.48]).* This indicates that individuals with greater past involvement in risky behaviours were more likely to adjust their risk ratings significantly when confronted with new information, reflecting a dynamic response to changing risk environments.

Secondly, the perception of negative consequences also significantly influenced subsequent rating changes. Specifically, a higher awareness of potential negative outcomes was associated with a lesser degree of change in risk ratings *(β = − 0.068, SE = 0.033, t(158.9)= −2.081, p = .039, r = −0.16, 95% CI[−0.30, −0.01]).* This suggests that individuals who anticipated adverse outcomes were more conservative in revising their initial assessments. Additionally, there was a significant interaction between past involvement in risky behaviours and condition *(β = − 0.0018, SE = 0.0007, t(165.6) = −2.518, p = .013, r = −0.19, 95% CI [−0.33, −0.04]),* demonstrating that the social context alters how individuals with extensive risk-taking histories update their risk perceptions. Specifically, those with a stronger track record of risky behaviours exhibited different patterns of rating change depending on whether they were socially included or ostracised. The full models for both analyses are reported in the Appendix (S1E).

Discussion

Experiment 1 confirmed that recalling an experience of ostracism led to a significant decrease in risk perception ratings at Risk Judgment 1 compared to recalling inclusion, underscoring an immediate impact of ostracism on risk perception. After the manipulation, ostracized participants demonstrated a reduced perception of risk but also displayed heightened susceptibility to peer influence. This indicates an increase in peer conformity, thereby supporting our second hypothesis. Interestingly, exploratory analysis revealed that ostracized participants conformed more to the perceptions of risk-averse peers than to those of risky peers. These findings are consistent with threat-compensatory processes, which suggest that ostracism initiates an anxiety response, resulting in heightened sensitivity to threats (Jonas et al., 2014; McGregor et al., 2010).

In the context of a health risk perception task, the trend towards susceptibility to conservative judgments aligns with loss aversion theory (Kahneman & Tversky, 2013), which posits that individuals are more motivated to avoid losses than to pursue gains. The

conformity observed towards risk-averse peers can be viewed as a compensatory strategy, where ostracized individuals adjust their behavior to align with group norms to alleviate the social threat and re-establish a sense of belonging. This behavioral adjustment primarily functions to reduce anxiety, facilitate social reintegration, and enhance perceived control (Agroskin et al., 2016; Williams, 2009). Here, conformity to peer risk-aversion can be seen as a strategy to minimize the perceived threat of further social rejection. By aligning with the more conservative, risk-averse judgments of their peers, ostracized individuals may be attempting to restore their social bonds and reassert their belonging within the group, effectively compensating for the loss of social security, especially in a context in which no rewards can be attained. These findings extend existing literature (Buelow & Wirth, 2017; Duclos, 2013; Twenge et al., 2001) by showing that the compensatory mechanisms triggered by ostracism are not limited to increased risk-taking but can also involve strategic conformity to risk-averse behaviors, reflecting a complex and adaptive response to ostracism.

Experiment 2

Experiment 2 aimed to replicate and extend upon the findings of Experiment 1 in three main ways. First, I aimed to replicate the findings of Experiment 1 using another ostracism manipulation, Cyberball 5.0 (Williams & Jarvis, 2006), to test if the observed effects were not solely driven by the autobiographical recall task used in Experiment 1. Recalling an experience of ostracism involves participants reflecting on and describing a past personal experience where they felt excluded, which can vary widely between individuals. In contrast, Cyberball is a controlled, standardised virtual ball-tossing game where participants are systematically excluded by other players, providing a consistent and replicable method to induce feelings of ostracism. Cyberball has been previously used to demonstrate threat and compensatory processes in ostracism research (Sleegers et al., 2017), validating its effectiveness in assessing how individuals respond to threatening experiences. This allows us to test whether the decrease in risk perception and increased conformity observed in Experiment 1 are robust across different types of ostracism manipulations.

Second, I aimed to examine whether this finding extends beyond risk-perception to risk behavior in a novel social gambling task which featured the possibility of reward-attainment (gain approach), as opposed to identifying threat (loss aversion), whilst explicitly

investigating the effect of social influence from peers with different risk behaviors (low-risk, neutral-risk, high-risk).

Third, I aimed to investigate to what extent individual differences in rejection sensitivity – an individual's heightened anticipation of, and response to, social rejection (Downey & Feldman, 1996) – influences susceptibility to peer influence and conformity. I hypothesized that rejection sensitivity is a crucial individual difference driving greater conformity to peer behavior, driven by a heightened sensitivity to social cues and the potential desire to avoid further rejection. This rationale stems from the understanding that rejection sensitivity has been conceptualized as a defensive motivational response to social threats (Berenson et al., 2009). Research indicates that individuals with high rejection sensitivity exhibit heightened physiological reactions both in anticipation of and during experiences of rejection (Lang et al., 1990). Furthermore, these individuals often engage in behaviors aimed at reinforcing their sense of belonging within a group, even if these actions involve acting out against an outgroup (Knapton et al., 2015). This pattern of behavior suggests a compensatory mechanism in response to the perceived threat of social rejection. Additionally, this trait, linked to an aversion to engaging in social risk-taking (Andrews et al., 2020) and a greater susceptibility to peer influence (London et al., 2007) may be a key factor in predicting conformity responses, particularly, as our sample was predominantly late-stage adolescents, with adolescence being a period in which peer relationships and acceptance become increasingly pivotal (Zimmer-Gembeck & Nesdale, 2013). By focussing on this key individual difference variable, I can begin to explore the underlying psychological mechanisms that drive the observed conformity behaviors in ostracized individuals, and whether personal traits like rejection sensitivity exacerbate these tendencies.

Participants first completed the Rejection Sensitivity questionnaire, followed by an experimental game of Cyberball 5.0 to induce feelings of ostracism or inclusion. Cyberball is widely recognised for its efficacy in evoking feelings of social exclusion, as documented in a comprehensive meta-analysis by Hartgerink et al. (2015). After confirming the effectiveness of this manipulation through a manipulation check, participants engaged in the Social Balloon Analogue Risk-Task (SBART; Tomova & Pessoa, 2018). The SBART is specifically designed to assess risk-taking and peer influence within a simulated team environment. In this task, participants are led to believe they are interacting with real team members;

however, these 'players' are actually computer-generated and programmed to exhibit distinct risk behaviors - categorised as low-risk, neutral risk, and high-risk.

Based on the findings from Experiment 1, as well as our theoretical framework, I predicted that ostracized participants in Experiment 2 would exhibit increased risk-taking behavior, relative to those who were included. Furthermore, I expected that ostracized participants would be more susceptible to peer influence, however, this time that they would be more influenced by risky peers than by more risk-averse ones. This hypothesis is grounded in prospect theory (Kahneman & Tversky, 2013), which suggests that individuals are more likely to take risks when there is an opportunity for gains. This contrasts with Experiment 1, where there was no possibility of attaining a reward. Additionally, I hypothesized that individuals with higher rejection sensitivity would exhibit greater conformity to peer risk behaviors, amplifying the effects observed in ostracized participants, relative to the inclusion condition.

In sum, Experiment 2 was designed to test three key hypotheses that differentiate it from Experiment 1. First, I assessed the generalizability of the effects by utilising a different ostracism paradigm (Cyberball) to determine whether the findings from Experiment 1 would hold under a more controlled and standardised method of inducing ostracism. Second, I examined the impact of changing the task context from a loss avoidance framework to a gain-oriented approach, allowing us to test how the potential for reward influences the risk-taking behaviors of ostracized individuals. Third, I investigated the extent to which the risk-taking behaviors and peer conformity responses observed in ostracized participants are moderated by their level of rejection sensitivity. By addressing these hypotheses, I aimed to deepen our understanding of how ostracism, the social context and individual differences in rejection sensitivity shape risky decision-making behaviors in a context that includes the possibility of reward attainment.

Method

Participants

To determine the necessary sample size, an a priori power analysis was performed using G*Power 3.1 (Faul et al., 2007). According to this analysis, a sample size of 164 participants was deemed necessary to achieve 80% power, assuming a small effect size (f =

0.10; $p < .05$). In anticipation of data loss, our recruitment target exceeded this number, originally aiming for a slightly higher participation rate to accommodate for potential issues with the experimental task (e.g., partial data loss due to unexpected software malfunctions or incomplete questionnaire responses).

178 Psychology students from our University Psychology department participated as part of their course requirements. Due to technical issues that led to the non-saving of data files in MatLab, 20 participants needed to be excluded from the analysis. An additional participant was removed for failing to respond to questions about the Cyberball game. Thus, our final sample consisted of 157 participants (M*age* = 19.48; SD*age* = 1.69, age-range = 18-30, 128 Females, 25 Males, 4 Non-binary; 67% identified as White).

Materials and Procedure

Rejection Sensitivity and trait risk-taking

To assess participants' level of rejection sensitivity, I used the Rejection Sensitivity Questionnaire (RSQ; Berenson et al., 2009). This questionnaire presents participants with nine different scenarios that depict potential rejection situations, such as "*You ask your parents or other family members to come to an occasion important to you*" or "*You approach a close friend to talk after doing or saying something that seriously upset him/her*." Participants rate two aspects for each scenario: their level of concern about others' reactions (1 = being very unconcerned; 7 = being very concerned) and their expectation of being rejected (1 = very unlikely; 7 = very likely). The rejection sensitivity score for each scenario is calculated by multiplying the concern score with the reversed expectancy score (*RS = (rejection concern) * (7 - rejection expectancy)).* These individual scores are then averaged across the nine items to yield a total rejection sensitivity score, where higher scores indicate greater sensitivity to actual or perceived rejection.

Additionally, I used the CARE questionnaire to establish a baseline level of risk-taking. This step was crucial to ensure that any observed effects on risk behavior were not confounded by participants' pre-existing levels of risk-taking. By controlling for baseline risk-taking, I aimed to attribute any changes in risk behavior specifically to the experimental manipulation of ostracism or inclusion, rather than to individual differences in inherent risk-taking tendencies.

Cyberball

To induce feelings of exclusion, participants played a game of Cyberball 5.0 (Williams & Jarvis, 2006). Participants were told that they would be playing an online ball-throwing game with two other online players. Participants were told before-hand that this was a mental visualisation task, and that during the game, they were to visualise playing the game with two other people. Whilst playing, participants had on-screen information that stated how many players were in the game, how many balls they had received, and how many total throws there had been. Participants were randomly assigned to either ostracism or inclusion. In the ostracism condition, participants received the ball twice at the beginning of the game, and never again (2/30 throws). In the inclusion condition, participants received the ball one in every three throws (10/30 throws).

Manipulation check

Following the completion of Cyberball, participants completed a shortened version of the *reflexive need threat* questionnaire (Hales & Williams, 2018; Williams, 2009). Participants answered 3 questions relating to each need (Belonging, Self-esteem, Meaningful existence, Control, and Certainty) on a five-point Likert type scale (1 = not at all, 5 = extremely). As a manipulation check, participants rated to what extent they felt ignored and excluded during the game, and how many times they received the ball.

Social Balloon Analogue Risk Task (SBART)

To test risk-taking in a group setting, I used the Social Balloon Analogue Risk Task (SBART; Tomova & Pessoa, 2018). Participants were welcomed to the lab in groups of four, where they were tasked with accumulating points through a simulated balloon inflation exercise. The experiment was presented on PsychToolBox and was ran on MatLab R2023B.

During the experiment, participants were isolated from one another and could not influence each other during the task. Participants were told that they would be playing the game with other students with the goal of winning as many points as part of a group. Consistent with Tomova and Pessoa (2018), I told participants that the *solo-round* was separate from this, and that in that round, participants could exclusively focus on winning as many points as they wanted.

The task was designed so that choosing a riskier gamble (i.e., pumping the balloon more times) would allow participants to win more points. However, this also increased the risk of the balloon bursting, which would result in the participant winning no points. Participants were unaware of the number of safe pumps before the balloon would burst. This number varied, based on previous research (Pleskac et al., 2008), however, within a set of 10 trials, the balloon would, on average, explode at 64 pumps. This detail was shared with participants, framing 64 pumps as a typical choice, and ensuring a uniform experience for all, while minimising the potential for participants to develop strategic patterns over the course of the experiment.

Throughout the experiment, participants faced a total of 60 trials where they made two key decisions: an initial choice (*solo-decision*) on the number of balloon pumps that they wished to inflate the balloon, followed by a second decision after being presented with the choices of their supposed team members (*informed decision*). Feedback on the outcome of each trial, whether the balloon exploded, or points were earned, was provided through visual and auditory signals (e.g., a balloon being popped, or the sound of points being won).

The experiment was structured into three distinct trial types (low-risk, neutral-risk, and high-risk). As used in the original experiment by Tomova and Pessoa (2018), in the high-risk condition, the number of pumps ranged from 75 to 128. Participants received the other scores from three peers (Player 1, 2 & 3) per trial. The low-risk condition involved pumps ranging from 1 to 53, while the neutral risk condition fell in between, with pumps ranging from 54 to 74. Each condition comprised 20 trials, with the inclusion of neutral risk trials to enhance the realism of the task and to add variance to the decisions presented as those of team members. The feedback received from "other players" was within these ranges, influencing participants' subsequent risk judgments.

As in Experiment 1, I created a ‘Rating Change’ dependent variable (DV). Specifically, change in risk judgment was calculated as the difference between participants' initial risk ratings (Risk Judgment 1) and their revised ratings (Risk Judgment 2) after receiving feedback within the specified pump ranges. This structure allowed us to assess how feedback from team members in different risk conditions influenced participants' risk behaviors.

Results

Data analysis strategy

All data were analysed using R studio (R Core Team, 2020). I used the lme4 and lmerTest packages to run the statistical tests, and the effectsizes package to determine the magnitude of effects.

A sensitivity analysis was conducted to determine the minimum detectable effect sizes with 80% power at a 5% significance level. For Experiment 2, a 2x3 mixed ANOVA design (*Condition*: Ostracism vs. Inclusion; *Trial Type:* low-risk, medium-risk, high-risk) with 78 participants per cell revealed minimum detectable effect sizes of Cohen's f = 0.226 for the main effect of Condition, Cohen's f = 0.204 for the main effect of Trial Type, and Cohen's f = 0.167 for the Condition x Trial Type interaction. Additionally, for the three-way interaction (Condition * Trial Type * Rejection Sensitivity) the analysis revealed that the smallest detectable effect size for the three-way interaction was Cohen's f = 0.135, suggesting that our experiment is sufficiently powered to detect even small interaction effects involving rejection sensitivity. This confirms the robustness of our design to detect subtle effects across primary, two-way, and three-way interactions, including those specifically related to rejection sensitivity.

In our analysis, I ran two primary statistical approaches to test the impacts of ostracism, trial type, and rejection sensitivity on risk-taking and peer influence. First, I tested our ostracism-risk hypothesis by conducting an independent samples *t*-test comparing *Risk Judgment 1* (solo-round) between ostracized and included participants, thereby assessing whether ostracism influenced initial risk-taking behaviour. Second, I fitted two Linear Mixed Models (LMMs) predicting *Rating Change.* Our main model of interest (Model 1) included the three-way interaction (Condition × Trial Type × Rejection Sensitivity), allowing us to investigate whether rejection sensitivity moderated the relationship between ostracism/inclusion and risk-taking across varying trial types (levels of peer influence). For completeness and for model-fit comparison, I also ran a simpler two-way LMM (Condition × Trial Type) without rejection sensitivity. The complete specifications for both models are described in the main text and are available in Appendix S2A/S2B.

Again, the dependent variable, 'Rating Change', was calculated as follows:

Rating Change = Risk Judgment 2 – Risk Judgment 1

Similar to Experiment 1, to ensure that our results are not driven by any regression to the mean effects, I also ran Model 1 using unconfounded data (where rating changes moved away from the mean). This is available in the Appendix (S2C).

Manipulation Check

Participants in both groups showed an accurate estimation of how many times they received the ball. Participants in the inclusion condition reported receiving the ball significantly more often, averaging 10.97 times (SD = 4.13) compared to those in the ostracism condition, who reported receiving it on average only 2.95 times (SD = 3.50), *t(147.59) = 13.08, p < .001) 95% CI [9.23, 6.81], Cohen's d = 2.09, 95% CI [1.70, 2.48].*

I further tested participants' responses to five fundamental needs (belonging, self-esteem, meaningful existence, control and certainty). I directly scored items that were positively scored (e.g., I felt good about myself), and reverse scored items that were negatively worded (e.g., I felt rejected). After creating a composite score to all responses to the need threat questionnaire, participants in the Ostracism condition experienced reported significantly lower fulfilment of needs (M = 2.30, SD = 0.32) compared to participants in the Inclusion condition (M = 3.35, SD = 0.43), *t(139.33) = 17.39, p < .001, 95% CI [0.93, 1.17]*, Cohen's d = 2.79, 95% CI [2.35, 3.23]. These analyses confirm that the manipulation was effective in inducing a state of ostracism.

Ostracism Risk-Taking hypothesis

In testing the hypothesis that ostracism leads to greater levels of risk-taking during the solo-round of the SBART (Risk Judgment 1), I tested the mean risk-taking scores between participants in the ostracism and inclusion conditions. Ostracized participants had higher mean levels of pumps (M = 63.18, SD = 17.90) compared to participants in the Inclusion condition (M = 57.92, SD = 13.10), *t(149.52)= 2.11, p = 0.036, 95% CI [0.34, 10.17],* Cohen's d = 0.332, 95% CI [0.02, 0.65]. Thus, these findings are consistent with our prediction that ostracism is leads to elevated risk-taking behaviour.

Peer Influence

To examine whether rejection sensitivity (RS) moderates the effects of ostracism versus inclusion and the trial type-specific level of influence on changes in risk ratings - represented as the difference between participants' initial risk ratings (Risk Judgment 1) and their subsequent ratings (Risk Judgment 2) after exposure to peer influence (Trial Type), I ran a mixed-effects model including Condition (ostracism vs. inclusion), Trial Type (low-risk, neutral-risk, high-risk), and Rejection Sensitivity (RS), along with their three-way interaction (Condition × Trial Type × RS). I included the participant as a random effect to account for individual differences and repeated measurements, ensuring effects were due to experimental manipulations rather than baseline variability. I report the primary findings from this analysis below, while the full model details are provided in the Appendix (S2B). This approach allowed us to investigate how rejection sensitivity moderates the impact of condition and trial type on changes in risk behavior.

First, there was a significant main effect of Trial Type, demonstrating that the level of peer influence (low-risk, neutral-risk, high-risk) significantly affected rating changes (*F(2,9124.4) = 35.148, p < .001, f = 0.160, 95% CI [0.160,0.163])*. Breaking this effect down further, using Trial Type 1 as our baseline condition, in Trial Type 2 (neutral-risk peer influence), individuals significantly reduced their risk ratings (*β = −12.468, SE = 2.281, t(9124.053) = −5.466, p < .001, r = − 0.06, 95% CI [−16.94,−7.99]),* suggesting a heightened sensitivity to moderate peer influences. Similarly, in Trial Type 3 (high-risk peer influence), individuals also showed significant reductions in risk ratings *(β = −8.651, SE = 2.279, t(9123.991) = − 3.796, p < .001, r = −0.04, 95% CI [−13.12,−4.18]),* though these reductions were less pronounced than in Trial Type 2. This effect is depicted below in Figure 2.3, with the trial-by-trial descriptive statistics available in the Appendix (2D).

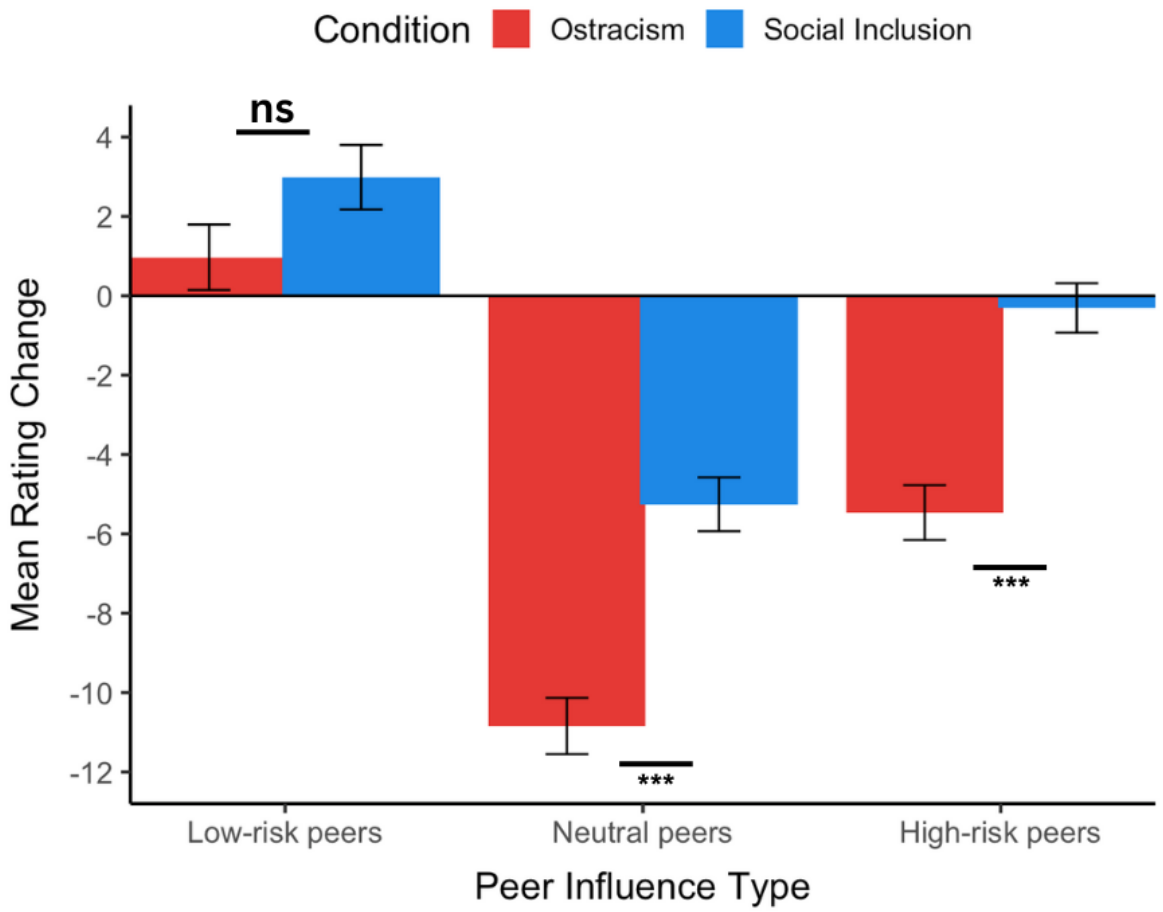


Figure 2.3: Mean rating change (Risk Judgment 2 – Risk Judgment 1) as a function of condition (ostracism, social inclusion) and peer influence type (low-risk, neutral, high-risk) in the Social Balloon Analogue Risk Tak (SBART). Error bars represent standard errors of the mean.

Second, while participants in the ostracism condition showed a greater change in ratings (M = -5.06, SD = 30.6) compared to participants in the inclusion condition (M = -1.45, SD = 27.7), the Condition × Trial Type interaction was non-significant (*F(2, 9124.4) = 1.436, p = .238, f < 0.10)),* suggesting that the effect of ostracism on rating changes did not significantly differ across the three levels of peer influence. This suggests that, regardless of whether participants were ostracized or included, they adjusted their risk ratings similarly in response to different levels of peer influence. However, there was an overall significant three-way interaction between *Condition, Trial Type, and Rejection Sensitivity* (*F(2,9124.3) = 3.166, p = . 042, f < 0.10),* suggesting that the extent to which ostracism influenced risk adjustments depended on both the trial type and an individual's level of rejection sensitivity.

Breaking this effect down further, using Trial Type 1 (low-risk peer influence) as our baseline condition, in Trial Type 2 (neutral-risk peer influence), individuals higher in rejection sensitivity showed significantly greater reductions in risk ratings when ostracized compared to those included (*β = 0.779, SE = 0.321, t(9124.341) = 2.427, p = .015, r = 0.03, 95% CI [0.15,1.41]).* However, in Trial Type 3 (high-risk peer influence), the interaction was not significant (*β = 0.204, SE = 0.320, t(9124.008) = 0.637, p = .524, r = 0.01, 95% CI [−0.42,0.83]),* suggesting that rejection sensitivity did not moderate the impact of ostracism in high-risk conditions.

These findings suggest that the relationship between ostracism, susceptibility to peer influence, and rejection sensitivity is most pronounced in moderate-risk scenarios, where individuals higher in rejection sensitivity exhibit greater social susceptibility.

Discussion

Experiment 2 was designed to replicate and extend the findings of Experiment 1 by introducing a different ostracism manipulation (Cyberball) and employing a rewards-based task (Social Balloon Analogue Risk Task) as opposed to the loss aversion task used in Experiment 1 (Health Risk Perception Task). Additionally, I aimed to investigate the role of rejection sensitivity in moderating behavioral changes following ostracism. Our results provide further support for our initial hypotheses, confirming that (a) ostracism increases risky decision-making, and (b) ostracism heightens susceptibility to peer influence. In this experiment, I observed that ostracized participants adjusted their risk-taking behaviors to align with the risk profiles of their peers. However, unlike in Experiment 1, where conformity was more pronounced in response to conservative peer risk perceptions, ostracized participants in Experiment 2 showed a greater tendency to conform to the behaviors of moderately risky peers. This suggests that the social context can either amplify or temper individual risk behaviors depending on the exhibited risk levels of peers, consistent with the literature highlighting the powerful role of peer influence in shaping decision-making (Gächter et al., 2017; Knoll et al., 2015; 2017).

An interesting conceptual difference between Experiment 1 and Experiment 2 is the nature of reward availability. Experiment 1 featured no potential for individuals to attain rewards, focusing solely on the avoidance of further losses. Prospect Theory (Kahneman &

Tversky, 1979) highlights that individuals tend to exhibit stronger aversion to losses than they do a desire for equivalent gains. This emphasis on loss aversion likely contributed to the more cautious behavior observed in Experiment 1, where ostracized participants were less influenced by risky peer judgment behaviors, instead opting to minimise further potential losses. In contrast, Experiment 2 featured reward availability, which might have shifted their focus towards potential gains, increasing the susceptibility to the peer influence of risky peers. The availability of rewards in Experiment 2 likely heightened participants' motivation to engage in riskier behaviors as a means of achieving social acceptance and regaining a sense of agency, and control. This difference in task domain and the associated framing of decisions (loss avoidance vs. potential rewards) may explain the divergent patterns of risk-taking and susceptibility to peer influence observed between the two experiments.

Our results also highlighted the critical moderating role of rejection sensitivity. This dimension significantly influenced the extent of risk behavior changes, particularly in riskier decision contexts. Specifically, individuals with higher rejection sensitivity in the ostracism condition showed greater changes in their risk behavior when exposed to peer information, indicating that personal sensitivity to rejection can magnify the impact of ostracism on risk behavior. This finding aligns with prior research demonstrating the heightened vulnerability of rejection-sensitive individuals to ostracism (Downey & Feldman, 1996), and is consistent with previous literature that has conceptualised rejection sensitivity as a defensive motivation to respond strongly against the threat of rejection (Berenson et al., 2009). Our findings align with this perspective, by showing that greater rejection sensitivity predicted greater conformity effects throughout the experiment.

The findings of Experiment 2 thereby provide robust evidence that ostracism, when combined with individual differences in rejection sensitivity, significantly impact risky decision making and susceptibility to risky peer influence in a rewards-based context. Experiment 2 adds to Experiment 1 by suggesting that the presence of a rewards may significantly affect the risk behavior of ostracized individuals. This underscores the necessity of considering both social and individual factors in psychological research and interventions aimed at addressing the effects of ostracism.

General Discussion

Across two experiments, I examined the effect of ostracism on risky decision-making and susceptibility to peer influence, while also considering the influence of individual differences in rejection sensitivity, baseline risk-taking tendencies, and the nature of the task (loss avoidance in Experiment 1 and gain approach in Experiment 2) on these outcomes. In line with my hypothesis, across both experiments I confirmed that ostracism is a potent social threat that heightens sensitivity to social cues, leading to increased susceptibility to peer risk behavior. Interestingly, I found that ostracized individuals displayed divergent patterns of conformity - aligning with either risk-averse or risk-seeking behaviour - based on whether the task included a potential reward. Specifically, when potential rewards were present, ostracized individuals were more likely to conform to moderately risky behaviours. In contrast, in the absence of rewards, they conformed more to risk-averse behaviours. Furthermore, baseline risk-taking tendencies and sensitivity to rejection moderated these effects, with high-risk takers and those sensitive to rejection showing stronger responses. This highlights the complex interplay between ostracism, individual traits, and social context, where the presence or absence of rewards shapes risk-related decision-making.

Ostracism and responses to threat

Prior literature has suggested that ostracism leads to risky decision making (Buelow & Wirth, 2017, Duclos et al., 2013; Pfundmair & Lermer, 2023; Svetieva et al., 2016; Twenge et al., 2001). Our results confirm that ostracism has a profound effect on risky decision-making. These effects can be understood within the framework of the Need-Threat Model (Williams, 2009). According to this model, ostracism threatens fundamental psychological needs such as belonging, self-esteem, control, and meaningful existence, which activate a motivational state, implicated by changes in increased reward sensitivity and cognitive changes reflecting decreases to non-social risk perception, aimed at returning an individual back to homeostasis and to alleviate the distress of ostracism. Our findings support this model, suggesting that when these fundamental psychological needs are threatened, individuals are more likely to engage in risky behaviors, potentially as a means of regaining a sense of control and belonging (Duclos et al., 2013). These results align with the General Process Model of Threat Defense (Jonas et al., 2014), which suggests that social threats, such as ostracism, trigger an increase in approach motivation and behavioral activation

aimed at resolving the threat. This resolution tends to happen as either a direct response to the threat, or through adapting one's feelings to aversive experience (Jonas et al., 2014; Proulx et al., 2012; Stollberg et al., 2024). In both experiments, ostracized participants showing an increase in risk-taking and conformity to peer influence can be understood as motivational defences against a threatening experience.

Ostracism and susceptibility to peer influence

Our findings extend prior research by demonstrating that the effect of ostracism on risky decision-making is influenced by both the social context and the availability of rewards. Previous studies have suggested that ostracism increases conformity (Carter-Sowell et al., 2008; Riva et al., 2008; Williams et al., 2000). I build on this by showing that this conformity extends specifically to risk-taking behaviors, as ostracized participants exhibited a strong tendency to adjust their risk behaviors to align with their peers' risk profiles. This indicates that the drive to restore threatened social needs plays a crucial role in shaping decision-making under conditions of social threat, with the potential for reward amplifying these effects.

Across experiments, ostracized participants demonstrated a greater sensitivity to social cues relative to included participants. This sensitivity to social information reflects an approach strategy manifested by an increased susceptibility to peer influence, suggesting an increased desire to reconnect, and to avoid further exclusion (Williams, 2009). Prior research has shown that social disconnection, including ostracism, enhances an individual's motivation to reconnect with others. This has been evidenced at a neurobiological level by increased activation of notable aspects of the brains reward system, such as the Nucleus Accumbens (Dölen et al., 2013; Gunaydin et al., 2014; Matthews et al., 2016). This activation following ostracism drives approach-oriented behaviors as individuals seek to re-establish social connections (Jonas et al., 2014; Maner et al., 2007).

The divergent patterns of conformity observed between Experiment 1 and Experiment 2 further illustrate how this susceptibility to peer influence is context dependent. In Experiment 1, where the focus was on loss avoidance, ostracized participants conformed more to risk-averse perceptions. In contrast, Experiment 2, which involved a rewards-based task, showed that ostracized participants were more likely to conform to risky

peer behaviors. This represents a new empirical finding with the desire to regain social approval or mitigate the effects of exclusion being particularly pronounced in contexts where there is an opportunity for reward, driving individuals to align their behaviors with those of risky peers.

Rewards vs Losses

Prospect Theory (Tversky & Kahneman, 1979) posits that individuals are more likely to take risks when potential gains are emphasized. Our findings demonstrate that the nature of the task significantly modulates how ostracism affects susceptibility to risky peer behaviors, as seen in the contrasting outcomes of Experiment 1 and Experiment 2. In Experiment 2, which involved a rewards-based task, ostracized participants were more sensitive to the risky behaviors of their peers. This suggests that when potential rewards are at stake, the interaction between ostracism and the social context shifts individuals toward reward-seeking behavior. This shift is consistent with previous research that links such behavior to an increased desire to regain a sense of control and agency (Duclos et al., 2013).

This difference indicates that the framing of the task - whether it emphasizes potential gains or losses - plays a crucial role in how ostracism influences risky decision-making. Consistent with a vast body of prior literature, the presence of potential rewards appears to amplify the impact of social context on decision-making, particularly in situations where individuals are motivated to restore their social standing (Deci, 1985; Locke & Latham, 1981; Schultz, 1997; Thaler, 1981). This nuanced response indicates that the prospect of potential gains can significantly modulate risk-taking behaviors post-ostracism, elucidating the intricate balance between approach and avoidance tendencies as highlighted by threat-approach theories (e.g., Carver & White, 1994; Jonas et al., 2014).

Individual Differences

A notable aspect of this research was that I found that individual differences in rejection sensitivity and baseline levels of risk-taking play a significant role in moderating the effects of ostracism on risky decision making. I found that individuals high in rejection sensitivity, typically characterised by tendencies to anxiously expect, readily perceive, and overreact to social rejection (Downey & Feldman, 1996), to be more likely to conform to peer behaviors, particularly in contexts involving risky scenarios when the opportunities for

reward are present. Rejection sensitive individuals have previously been shown as having heightened physiological responses to the threat of rejection (Olsson et al., 2007), and have been characterised as showing heightened behavioral responses to alleviate the threat of rejection (Berenson et al., 2009), suggesting that this key individual difference is a crucial component in risky behaviors following ostracism. Additionally, baseline levels of risk-taking influenced how participants responded to ostracism. Specifically, individuals with a higher predisposition towards risk-taking were more likely to engage in risky behaviours after experiencing ostracism compared to those with lower predispositions. These findings demonstrate that individual predispositions, such as baseline risk-taking, play a crucial role in shaping behavioural responses to ostracism, underscoring the importance of considering both personality traits and social context when examining the effects of ostracism on risky decision-making.

Theoretical Contributions and Practical Implications

Our research confirms that ostracism increases risky decision-making and increases susceptibility to peer influence, whilst extending the existing literature by showing that the riskiness levels of peers, the availability of reward, and key individual differences such as rejection sensitivity and an individual's own propensity to take risks can significantly moderate the effects. This finding is crucial because it demonstrates that the effect of ostracism on risk-taking hinges upon what can be attained, the individuals' own characteristics and the social context. As such, I have added nuance to existing theories by showing that these effects are contingent upon specific factors. Specifically, I observed that when the task involved potential rewards, ostracized individuals were more likely to conform to risky peer behaviors. Our findings support the Need-Threat Model (Williams, 2009) and threat-defence frameworks (e.g., Carver & White, 1994; Harmon-Jones et al., 2009; Jonas et al., 2014; McGregor et al., 2010; Proulx et al., 2012; Stollberg et al., 2024), indicating that risk-taking and increased susceptibility to peer influence following ostracism function as a defence mechanism aimed at mitigating the perceived social threat. Importantly, this effect is further moderated by individual differences such as rejection sensitivity (Berenson et al., 2009) and baseline risk-taking tendencies, suggesting that those who are more sensitive to rejection are particularly prone to engaging in riskier behaviors under ostracism, as a means of regaining social acceptance. These findings contribute to the literature by showing that

the effect of ostracism on decision-making is shaped by social context (e.g., peer influence), individual differences (e.g., rejection sensitivity), and the specific characteristics of the task (e.g., potential for reward or loss)

These result offer substantial theoretical implications, suggesting that the social context, as well as an individual's own sensitivity to rejection, modulates the impact of ostracism on risk behaviors. Practically, these insights indicate that post-ostracism interventions should be context-sensitive, possibly involving the provision of environments that promote risk-averse behaviors or that highlight the benefits of such choices to mitigate the adverse effects of ostracism. Additionally, these findings highlight the potential to foster resilience and promote adaptive risk behaviors through positive peer interactions, especially during developmental stages like adolescence where susceptibility to peer influence is heightened (Steinberg & Monahan, 2007).

Limitations and Future Research

One must be cautious in interpreting these results, as across both studies, the consequences of laboratory-based experiments are vastly different to real life financial, health or legal decision-making. Adding to this, the effect-sizes across experiments were generally small to medium in size. Given that these effects were observed in brief, low-stakes laboratory tasks, it remains an open question whether they generalise to everyday settings. There is some evidence for external validity, given that performance on experimental risk tasks relates to real-world risk-related behaviours (Ju & Wallraven, 2023; Tomova & Pessoa, 2018). However, outside the lab, decisions occur under social evaluation and with tangible consequences, which plausibly magnify these processes. Within this context, direct field tests and more naturalistic research are required to fully investigate this link. Additionally, as our sample was primarily adolescents, with adolescents being more prone to risk-taking in the context of their peer group (Knoll et al., 2015;2017), the generalisability of the findings across different age groups and cultural contexts remains to be explored. Future research could consider longitudinal designs to examine the long-term effects of ostracism and experimental studies to test the efficacy of interventions designed to reduce risk-taking behavior following exclusion. Further, more research is needed to better understand the specific psychological and biological changes that drive the mechanism behind what drives risk-taking after ostracism. Finally, it also remains an unanswered question as to whether

ostracized participants are becoming more driven by informational social conformity (e.g. decreased confidence in their own thoughts), or if they are driven by a desire to be liked and are thus conforming. Future research should examine this by distinguishing between cognitive and social drivers of conformity following ostracism. This could involve testing whether ostracized individuals conform due to reduced confidence in their own judgments (a cognitive effect) or a heightened motivation for social acceptance (a social effect). Experimental designs could manipulate decision uncertainty versus social approval cues to determine which mechanism primarily drives post-ostracism conformity.

Conclusion

This research contributes to a deeper understanding of the psychological underpinnings of risk-taking behavior in the context of ostracism. I have provided further evidence that ostracism leads to riskier behavior in individuals. Additionally, I have contributed to the literature by suggesting that these effects may be influenced by the specific context, the availability of rewards, the risk level of the peers, and the individual's level of rejection sensitivity. This underscores the critical role of peer influence and individual differences in shaping responses to ostracism, offering valuable insights for developing targeted interventions to support those affected by social exclusion.

Chapter 3:

Newton, J., & Von Hecker, U. (2025). Pressure of the past: Recalling ostracism influences risk and benefit perception. *Journal of Social, Behavioral, and Health Sciences*, 19, 1–22.

The affect heuristic, a pivotal concept in behavioral decision-making, posits that emotional responses significantly influence perceptions of risk and benefit. Finucane et al. (2000) demonstrated that positive emotions towards an entity lead to the underestimation of its risks and overestimation of its benefits, while negative emotions elicit the opposite effect. This inverse relationship is central to understanding the affect heuristic's mechanism: affect acts as a mental shortcut that simplifies the complex evaluation of risks and benefits, often at the expense of analytical depth (Slovic et al., 2007). The strength of affective feelings, independent of factual content, has been reported as significantly swaying risk and benefit judgments (Alhakami & Slovic, 1994). This tendency, known as the "affect-as-information" theory, suggests that individuals rely on their emotional reactions as cues to evaluate the safety and desirability of a situation or object (Schwarz & Clore, 1983). However, despite extensive research on the affect heuristic, little is known about the effects of recalling specific social experiences, such as ostracism, on risk and benefit perceptions. This is surprising given that ostracism, defined here as the process of being ignored and excluded (Williams, 2007), is a ubiquitous phenomenon (Albath et al., 2023) that has been shown to impair essential executive functions involved in decision-making and risk assessment (Buelow & Wirth, 2015; Fuhrmann et al., 2019; Hawes et al., 2012). Given the significant impact that ostracism can have on individual behavior and the societal costs associated with chronic exclusion (Strachila & McMahon, 2010), understanding how ostracism influences risk and benefit perceptions across different domains is crucial.

Recognizing the distinction between risk and benefit perception is essential for understanding how individuals make decisions, particularly in risk-related contexts (Kassass et al., 2021). Risk perception involves the subjective assessment of the likelihood and severity of potential harm, reflecting evaluations of how dangerous a situation might be (Fischhoff, 1993). In contrast, benefit perception refers to the subjective evaluation of the potential positive outcomes associated with an action, such as the rewards or gains that may

result (Siegrist et al., 2003). These perceptions are shaped by various factors, including individual differences, situational contexts, and emotional states (Fischhoff et al., 1993).

I conducted an experiment to investigate how recalling contrasting social memories (ostracism and inclusion) influences risk and benefit perceptions across distinct domains: financial, health, and social. I hypothesized a *bi-directional* effect in which ostracized individuals would perceive lower risks in financial and health contexts but higher risks in social contexts compared to inclusion. I also hypothesized that benefit perceptions would be the inverse of this pattern, such that ostracized individuals would perceive greater benefits in financial and health domains, but lower benefits in social contexts. Past research has suggested that ostracized individuals engage in financial risk-taking as a compensatory strategy to regain control, seek pleasure, enhance self-worth, and improve social status, thereby alleviating psychological distress (Duclos et al., 2013). Additionally, due to lowered self-esteem and the associated psychological distress, literature has linked ostracism to self-defeating behaviors, including health risk-taking (Twenge et al., 2002). In contrast, within the social domain, I hypothesized that ostracized individuals would become more averse to social risks - defined as actions that could jeopardize one's social standing or relationships, such as voicing unpopular opinions or engaging in behaviors that might lead to further exclusion (Andrews et al., 2020). This prediction is strengthened through complimentary research which showed that ostracized individuals have an increased sensitivity to social information, such as improved accuracy in recognizing emotions in others (Mermier et al., 2023), and showing a greater desire to socially withdraw and seek solitude (Ren et al., 2016). As such, I hypothesized that this sensitivity would result in a greater social risk perception, leading ostracized individuals to avoid behaviors that could contribute to additional social isolation or negative social evaluation, which historically came with severe consequences, and often death (Buss, 1990).

To test this hypothesis, I adapted a time-pressure manipulation originally used by Finucane et al. (2000), which demonstrated that affective responses are heightened under time pressure. In the time-pressure condition, participants were given a strict time limit, requiring them to make decisions rapidly. In the non-time-pressure condition, participants had time to deliberate on their choices. This design allowed us to examine whether time constraints increase reliance on emotional responses rather than careful reasoning during decision-

making. Empirical evidence suggests that time pressure leads to greater reliance on immediate emotional reactions over analytical thinking (Maule & Mackie, 1990). Comparing the time-pressure and non-time-pressure conditions allowed us to test whether time constraints differentially affect risk and benefit perceptions across domains (financial, health and social) after recalling ostracism versus inclusion. In sum, this research seeks to advance our understanding of how domain-specific risk and benefit perceptions are shaped by recalling experiences of ostracism and social inclusion, and how these effects are further moderated by time pressure.

Ostracism

The fundamental human need for social connection and belonging is well-documented, with extensive evidence showing that social relationships are crucial for psychological well-being (Baumeister & Leary, 2017). Ostracism disrupts fundamental psychological needs for belonging, self-esteem, and control, resulting in a variety of behavioral responses such as aggression, withdrawal and compliance (Williams, 2007). The social reconnection hypothesis (Maner et al., 2007) states that individuals who experience ostracism show increased motivation to seek new social bonds. Across a series of studies, Maner et al. (2007) demonstrated that ostracized individuals showed a stronger desire to form new social connections, which included greater interest in making new friends, forming positive impressions of novel social targets, and assigning higher rewards to new interaction partners, suggesting a heightened desire to regain social acceptance, and to attempt to avoid risking further exclusion. Other experimental studies have found that ostracized participants were more obedient (Riva et al., 2014), and more compliant with charitable donations (Carter-Sowell et al., 2008). Taken together, these studies illustrate complex social responses following ostracism, which reflect a desire for reconnection and a motivation to avoid further exclusion. These findings have also been shown in animal model data, in which healthy adult rodents have been documented as showing increased motivation to pursue social connection after a period of acute isolation (Neisink & Van Ree, 1982). This enhanced motivation to reconnect leads to a general hypothesis that following an ostracism experience, individuals will become less likely to take a social risk, that could increase the likelihood of further exclusion. However, while ostracized individuals may perceive more risk in social domains, empirical evidence has suggested that ostracism will lead to decreased

risk perception in other domains. For instance, in the financial domain, over five experiments, Duclos et al. (2013) found that participants who were excluded were more likely to pursue riskier yet potentially more lucrative financial opportunities. Whereas in the health domain, Twenge et al. (2002) found that ostracized individuals took more health risks, such as consuming unhealthy foods and showing decreased motivation to exercise. These *bi-directional* differences suggest that ostracized exhibit increased social risk perception but decreased financial and health risk perception. Candidate explanations for these mechanisms have previously been given by financial risks being seen as opportunities to restore control, gain pleasure and improve self-esteem and social status (Zaleskiewicz, 2001), while social risks can be seen as situations that are to be avoided to prevent further ostracism (Ren et al., 2016). This is consistent with compensatory control theory, which posits that individuals seek to restore a sense of order and control in their lives by focusing on regulation in other domains (Kay et al., 2009; Landau et al., 2015).

Time-Pressure

A working hypothesis suggests that ostracism affects risk and benefit perceptions differently across financial, health, and social domains, but to our knowledge, no prior experimental research has tested how time pressure interacts with recalling positive or negative social experiences, such as ostracism. Dual-process theories of cognition propose that intuitive, affect-driven processes often guide behavior more than slower, deliberative reasoning, especially under time constraints (Evans & Stanovich, 2013). Research has shown that time pressure increases reliance on heuristic processing, leading to faster but often less accurate decisions. Behavioral experiments have found that time pressure reduces information search, heightens dependence on initial impressions, and increases the use of cognitive shortcuts (Kruglanski & Freund, 1983; Svenson & Edland, 1987). Additionally, time pressure has been shown to exacerbate stress effects, resulting in greater reliance on intuitive judgments over analytical reasoning (Maule & Mackie, 1990). For instance, decision-making under time constraints tends to increase functional fixedness, reduce creativity, and generally lower decision quality (Payne et al., 1993). It is also associated with more decision errors, as individuals often overlook critical information or fail to consider alternative solutions (Olshaysky, 1979; Svenson, 1979). In the context of ostracism, the affective

responses elicited by recalling exclusion may become particularly pronounced under time pressure, leading to significant changes in risk and benefit perception.

Domain Specific Risk

Different domains of risk, such as financial, health, and social, exhibit unique characteristics that shape how risks and benefits are evaluated. Financial risks involve tangible outcomes like monetary loss or gain (Weber, Blais, & Betz, 2002), while health risks pertain to physical well-being and longevity (Weinstein, 1989). Social risks, by contrast, concern potential damage to one's social standing or relationships (Loewenstein et al., 2001). The Domain-Specific Risk-Taking (DOSPERT) scale, developed by Weber et al. (2002), measures risk-taking behavior, risk perception, and attitudes across five domains: ethical, financial, health/safety, social, and recreational. This scale has demonstrated that individuals exhibit different risk behaviors and perceptions depending on the area of risk. For example, a person might be risk-averse in financial matters yet risk-seeking in health-related behaviors, highlighting that risk-taking is not a uniform trait but varies by domain (Blais & Weber, 2006). A meta-analysis by Shou and Olney's (2020) confirmed the reliability and validity of the DOSPERT scale across domains, reinforcing its effectiveness in assessing domain-specific risk attitudes. This variation underscores the need for a domain-specific approach when examining how ostracism influences risk perception.

The Present Study

Building upon seminal work on risk and benefit perception, I adapted Finucane et al.,'s (2000) paradigm to investigate the effect of recalling ostracism versus inclusion on risk and benefit perception across distinct domains. Our experimental design involved participants recalling either a time of being ostracized or socially included, followed by evaluating risk and benefit perceptions under conditions of time-pressure or no-time-pressure. I hypothesized that Ostracized individuals would exhibit decreased perceptions of risk in financial and health contexts but increased perceptions of risk in social domains relative to those who recalled inclusion. Additionally, I hypothesized that recalling ostracism will heighten the perceived benefits of financial risks and lower the perceived benefits of social risks. Importantly, I predicted that the presence of time pressure will amplify these effects, reflecting the impact of affective responses on rapid judgment formation.

Open Science Statement:

I report all measures, manipulations and results in full in-text and in the appendix. This experiment was ethically approved by Cardiff University's psychology ethic department. All data and R scripts used for analysis are available from the corresponding author on reasonable request.

Methods

Participants

To determine the sample size for this study, I conducted a power analysis using G*Power 3.1 (Faul et al., 2007). For a between-subjects ANOVA, the power analysis indicated a total sample size of 220 participants, with $\alpha = 0.05$, effect size of 0.25 and power at 0.8. I aimed to over-recruit by roughly 5-10% in case of loss of data. As such, a total of 238 participants were recruited from the Cardiff University School of Psychology. The sample consisted of 193 Females, 37 Males, 6 individuals identifying as non-binary, and 2 participants who preferred not to disclose their gender. The mean age of the participants was 19.59 years (SD = 1.68). 68.07% of the participants (N = 162) identified as White British. All participants received course credit for their involvement in the study.

Manipulation

Participants were welcomed to the lab, handed a piece of A4 paper, a biro pen and then directed to a private booth. Participants then opened Qualtrics and entered basic details such as age, gender and ethnicity. Following this, participants were then randomly assigned to one of two conditions; recall a time of being ostracized (N = 121) or of being social included (N = 116). Participants were then instructed to write (up to 150 words) about a memory that fitted the description as clearly and accurately as possible. In the ostracism condition, participants were asked to write about experiences such as receiving the 'silent treatment' or of 'being left out and ignored by a person or group'. In contrast, in the inclusion condition, participants were asked to write about a time in which they felt a deep connection to others, like a cherished moment with family or a friend. This methodological approach was chosen as it had been previously used in similar research to generate feelings of ostracism and inclusion in risk research (Duclos et al., 2013). After the experiment had

finished, participants shredded their paper in a paper shredder. No individual accounts were read through or retained.

Manipulation Check

Following the recall task, participants were asked to state what memory they were asked to recall. Participants were then asked two questions as part of a manipulation check.1) “how excluded did you feel during the recall?” & 2) “how excluded do you feel right now?” Participants were given a 5-point scale to answer these. The scale ranged went from “Very excluded” to “Very included”.

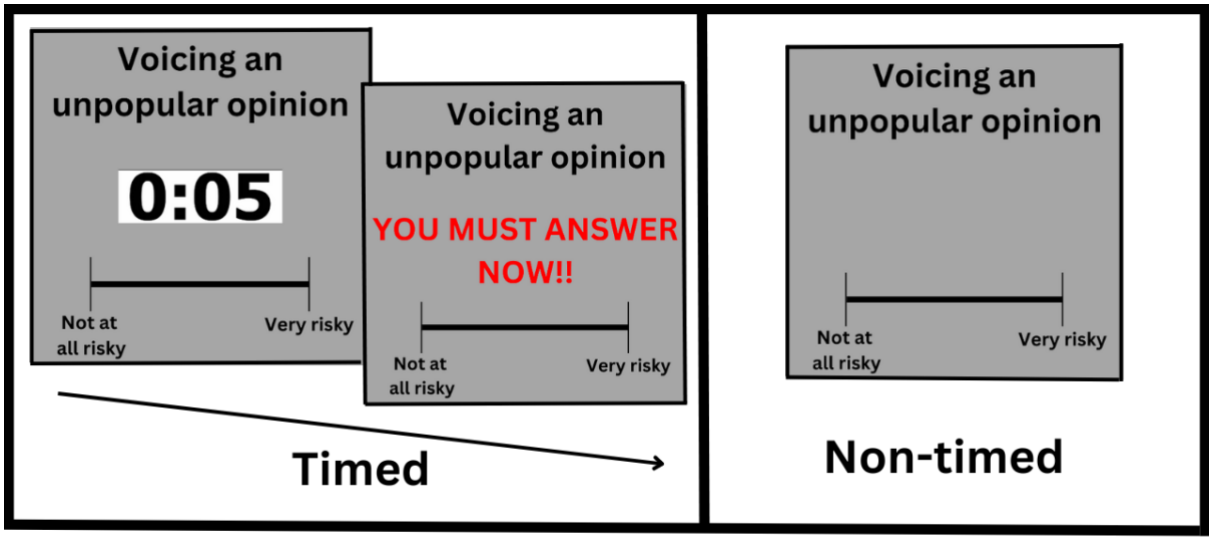
Risk & Benefit Perception Under Time-Pressure

To assess risk and benefit perceptions, I presented participants with common risk and benefit scenarios across financial, health, and social domains. I distinguished between financial, health and social risk scenarios that are commonly perceived as risky and are typically associated with negative outcomes (e.g., “Gambling a week’s wages on a bet that you think could win”, “Taking an illegal drug at a social event”, and “Defending an unpopular opinion”) and pro-financial, pro-health, and pro-social behaviors that are commonly associated with attaining positive outcomes (e.g., “Meeting with a financial advisor”, “Doing at least moderate exercise 3 times per week”, and “Helping a friend or colleague with a task”). Participants rated how much risk and benefit that they saw in each scenario. Each participant evaluated the same statements twice - once for risk and once for benefit - in a randomized order to avoid anchoring effects.

To induce time pressure, I modified Finucane et al.'s (2000) paradigm to test risk and benefit perceptions. Participants were presented with scenarios via PsychoPy V2022.2.4 and asked to make judgments that ranged from “1 - not at all risky” to “5 - very risky” for risk judgments and “1 - not at all beneficial” to “5 - very beneficial” for benefit judgments. The sequence of risk and benefit judgments, as well as the order of category and statement presentation, were randomized. To mitigate anchoring bias, the mouse cursor was automatically repositioned to the top of the screen at the start of each trial, preventing rapid, repetitive clicking. Each participant evaluated a total of 36 statements, with the same statements used to assess both risk and benefit, resulting in each participant rating 72 statements in total. The task breakdown is depicted below in Figure 3.1. In the non-timed

condition, I emphasized the importance of careful and considered reasoning, informing participants that accuracy was paramount. In contrast, the time-pressure condition required participants to respond within a limited timeframe. In the timed condition, a countdown clock from 5 seconds was displayed on the top of the screen, followed by a flashing red text box with the prompt 'You MUST give a rating NOW' at the end of the countdown. Simultaneously, a moderate beeping sound was played to signal the need for an immediate response.

Figure 3.1: A schematic representation of the two experimental conditions is shown. Participants were first randomly assigned to recall and write about a time when they were either ostracized or included. They were then randomly assigned to either the time-pressure condition (five seconds per response) or the no-time-pressure condition. Participants rated a series of 36 statements twice (once for risk and once for benefit), covering financial, health, and social domains. In the time-pressure condition, participants saw a five-second countdown timer and received auditory and visual prompts to expedite their responses. In contrast, the no-time-pressure condition allowed for careful and considered reasoning without time constraints.



Measures

To assess the dimensions of risk and benefit perception across financial, health, and social domains, I used six psychometrically validated scales. I adapted six questions from each scale, resulting in a total of 36 items, which are provided in the Appendix. Table 3.1 below presents a breakdown of the internal consistency measures for each scale.

To measure health and social risk perception, Iused the Health and Social Risk-Taking Questionnaire (HSRQ) by Andrews et al. (2020), which assesses participants' willingness to engage in health and social risk-taking behaviors. Examples of health risk items include “picking up broken glass with bare hands” and “eating food past its sell-by date,” while social risk items include “voicing an unpopular opinion” and “wearing clothes that your friends don’t approve of.”

To measure financial risk perception, I used the financial scale of the Domain-Specific Risk-Taking (DOSPERT) scale by Weber et al. (2002), which includes items such as “investing 10% of your annual income in a new business venture.”

To measure pro-social behaviors, I used the Prosociality Scale by Kanacri et al. (2021) to assess individuals' perceptions of helping others, with items such as “helping those in need.”

To measure pro-health behaviors, I used the Healthy Behavior Scale by Isozaki and Tadaka (2021) to assess participants' perceptions relating to common health-promoting practices, with items like “eating 5 or more servings of fruits and vegetables per day” and “taking some time for relaxation.”

Lastly, to measure pro-financial behaviors, I used the Financial Management Behavior Scale by Xiao (2011) to assess attitudes toward behaviors aimed at attaining financial prosperity, with items such as “attending a course on investing” and “meeting with a financial advisor.”

Table 3.1. *Cronbach's alpha's measured across scales for both risk and benefit perception.*

Subscale	Dimension	Cronbach's Alpha
Social Risk	Risk	0.860
Social Risk	Benefit	0.836
Financial Risk	Risk	0.800
Financial Risk	Benefit	0.817
Health Risk	Risk	0.774
Health Risk	Benefit	0.618
Pro Financial	Risk	0.816
Pro Financial	Benefit	0.878
Pro Health	Risk	0.653
Pro Health	Benefit	0.843
Pro Social	Risk	0.678
Pro Social	Benefit	0.775

Note: The Health Risk (HR) subscale exhibited moderate internal consistency, particularly for the Benefit dimension (Cronbach's Alpha = 0.618). Whilst generally considered low, this is consistent with other risk research that involves short scales (Di et al., 2014; Zou et al., 2018).

Data Analysis

All data were analyzed using R (R Core Team, 2021; version 4.1.2). Two-way ANOVAs were conducted to examine the effects of recalling ostracism versus inclusion and the presence or absence of time pressure on risk and benefit perceptions. When the ANOVAs showed significant results, I performed effect size calculations and Tukey's post-hoc tests for further analysis. Data visualization was done using GGPlot2.

Results

Manipulation check

To check the effectiveness of our manipulations, Iran two manipulation checks. First, I tested to see whether there was a significant difference in the effect of recalling ostracism versus inclusion on the following factors: 1) how excluded participants felt during the memory being recalled, and 2) how excluded the participant felt after completing the manipulation. Participants responded to how excluded they felt before and after the manipulation on a scale from 1 (very excluded) to 5 (very included), where lower scores indicated stronger feelings of exclusion.

An independent t-test confirmed that participants reported feeling significantly more excluded during the memory recall when assigned to the ostracism condition *(M = 1.54, SD = 0.56)* compared to inclusion *(M = 4.95, SD = 0.26), (t(169.98) = 60.31, p < .001, d = 7.72, 95% CI [6.98, 8.47])*. This confirms a large difference in how excluded participants felt during the memory being recalled. Additionally, when testing to see how excluded participants felt after recalling the memory, an independent t-test also confirmed a significant difference between those recalling ostracism *(M = 2.88, SD = 1.10)* and inclusion *(M = 3.62, SD = 1.18), (t(232.46) = 5.09, p < .001, d = 0.66, CI [0.40, 0.93])*, confirming that participants assigned to the ostracism condition, felt more excluded after the manipulation.

To test that our time-pressure manipulation was effective, I analyzed response times between participants in timed and non-timed conditions. There was a significant difference in response times (seconds), where participants in the non-timed condition (M = 4.34, SD = 1.42) took longer to respond compared to those in the timed condition (M = 3.00, SD = 0.73), (*t(174.2) = 9.12 , p < .001), d = 1.19 [0.91, 1.47].* This finding suggests that the time-pressure manipulation had a large effect on how quickly participants responded during our study.

Risk & Benefit Perception

I examined the combined influence of ostracism condition (ostracism vs. inclusion), time pressure (timed vs. untimed), and risk-taking domain on participants' evaluations. Two sets of linear mixed-effects models were specified: one for risk ratings and one for benefit ratings. In both models, domain (financial risk, health risk, social risk, pro-financial

behaviour, pro-health behaviour, prosocial behaviour) was entered as a within-subjects factor, while ostracism condition and time pressure were entered as between-subjects factors. Participant ID was included as a random intercept. I report full model outputs for each analysis, which are in the Appendix, along with an additional combined model that incorporates both risk and benefit ratings in a single analysis (3D).

Descriptive statistics for risk perception across the six categories (financial risk, health risk, social risk, pro-financial, pro-social, and pro-health) under different conditions (recalling ostracism vs. inclusion and timed vs. non-timed) were calculated. **Tables 3.2 & 3.3** below presents the means and standard deviations for each category and condition.

Risk perception

The model for risk ratings revealed a significant main effect of time pressure, $F(1, 233.5) = 14.02, p < .001, \eta p^2 = .06,$ with higher ratings under timed conditions. There was also a significant main effect of domain, $F(5, 8310.6) = 1635.45, p < .001, \eta p^2 = .50,$ indicating substantial differences in ratings across domains. The Domain × Time Pressure interaction was significant, $F(5, 8310.6) = 4.15, p < .001, \eta p^2 = .01,$ as was the Domain × Ostracism interaction, $F(5, 8310.6) = 35.06, p < .001, \eta p^2 = .02.$ Importantly, the three-way interaction between Domain, Ostracism, and Time Pressure was also significant, $F(5, 8310.6) = 2.70, p = .019, \eta p^2 = .002$, indicating that the joint effects of ostracism and time pressure on risk ratings varied across domains. The full model output for this analysis is available in the Appendix (3B)

Benefit perception

The model for benefit ratings showed a significant main effect of time pressure, $F(1, 232.6) = 4.12, p = .044, \eta p^2 = .02$, and a significant main effect of domain, $F(5, 8310.6) = 2043.62, p < .001, \eta p^2 = .55$. The Domain × Time Pressure interaction was significant, $F(5, 8310.6) = 2.69, p = .020, \eta p^2 = .002,$ as was the Domain × Ostracism interaction, $F(5, 8310.6) = 48.57, p < .001, \eta p^2 = .03$. In contrast to the risk model, the three-way interaction between Domain, Ostracism, and Time Pressure was not significant, $F(5, 8310.6) = 1.05, p = .387, \eta p^2 < .001.$ The full model output for this analysis is available in the Appendix (3C).

Table 3.2: Means and standard deviations for risk and benefit perception across six categories (financial risk, social risk, health risk, pro-social, pro-health, and pro-financial) in the non-timed condition. All participants rated the same statements for both risk and benefit in a randomized order.

Category	Condition	Rating Type	Mean	SD
Financial Risk	Not-timed, Inclusion	Risk	4.13	1.00
		Benefit	2.15	1.06
	Not-timed, Ostracism	Risk	3.93	1.15
		Benefit	2.67	1.24
Health Risk	Not-timed, Inclusion	Risk	3.73	1.09
		Benefit	1.57	0.78
	Not-timed, Ostracism	Risk	3.32	1.17
		Benefit	1.68	0.87
Social Risk	Not-timed, Inclusion	Risk	2.04	1.07
		Benefit	3.22	1.15
	Not-timed, Ostracism	Risk	2.37	1.20
		Benefit	2.86	1.23
Pro-Financial	Not-timed, Inclusion	Risk	1.72	1.04
		Benefit	4.19	1.07
	Not-timed, Ostracism	Risk	1.31	0.59
		Benefit	4.69	0.72
Pro-Social	Not-timed, Inclusion	Risk	1.75	0.93

Category	Condition	Rating Type	Mean	SD
		Benefit	3.98	0.97
	Not-timed, Ostracism	Risk	1.87	0.97
		Benefit	3.70	1.11
Pro-Health	Not-timed, Inclusion	Risk	1.29	0.58
		Benefit	4.76	0.55
	Not-timed, Ostracism	Risk	1.38	0.74
		Benefit	4.60	0.87

Table 3.3: Means and standard deviations for risk and benefit perception across six categories (financial risk, social risk, health risk, pro-social, pro-health, and pro-financial) when under time pressure. All participants rated the same statements for both risk and benefit.

Category	Condition	Rating Type	Mean	SD
Financial Risk	Timed, Inclusion	Risk	4.25	1.02
		Benefit	1.97	1.10
	Timed, Ostracism	Risk	3.74	1.25
		Benefit	2.54	1.24
Health Risk	Timed, Inclusion	Risk	3.85	1.07
		Benefit	1.59	0.87
	Timed, Ostracism	Risk	3.39	1.19
		Benefit	1.64	0.82

Category	Condition	Rating Type	Mean	SD
Social Risk	Timed, Inclusion	Risk	2.25	1.18
		Benefit	3.29	1.26
	Timed, Ostracism	Risk	2.56	1.20
		Benefit	2.84	1.17
Pro-Financial	Timed, Inclusion	Risk	1.88	1.07
		Benefit	4.08	1.11
	Timed, Ostracism	Risk	1.70	0.96
		Benefit	4.37	0.80
Pro-Social	Timed, Inclusion	Risk	1.96	1.10
		Benefit	3.87	1.07
	Timed, Ostracism	Risk	2.07	1.07
		Benefit	3.77	0.99
Pro-Health	Timed, Inclusion	Risk	1.43	0.85
		Benefit	4.61	0.88
	Timed, Ostracism	Risk	1.60	1.01
		Benefit	4.47	0.89

Risk Perception

A series of two-way ANOVAs was conducted to examine how the type of memory recalled (ostracism versus inclusion) and the presence of time pressure (timed versus non-timed) influenced participants' perceptions of risk and benefit across six distinct categories: financial risk, social risk, health risk, pro-financial behaviors, pro-social behaviors, and pro-health behaviors. Here, risk perception refers to participants' assessment of potential

negative outcomes associated with a behavior, such as the likelihood of losing money when gambling a day's wages. In contrast, benefit perception involves evaluating the potential positive outcomes, such as the gains associated with taking an investment course to enhance financial knowledge. Ifurther distinguished between risks and benefits related to harmful behaviors (e.g., gambling or taking illegal drugs) and beneficial behaviors (e.g., investing or helping others), allowing us to assess how the experimental conditions influenced participants' evaluations of different types of actions. These distinctions help differentiate between the perceived risks of harmful actions and those intended to achieve beneficial outcomes. Bar graphs demonstrating the results across conditions are depicted below in Figure 3.2 for risk perception, and Figure 3.3 for benefit perception.

Financial Risk Perception

Participants who recalled ostracism showed significantly lower financial risk perception (*M = 3.93, SD = 1.15)* compared to those recalling inclusion *(M = 4.13, SD = 1.00), (F(1, 1424) = 35.925, p < .001, ηp^2 = .02).* The main effect of time pressure was not significant *(F(1, 1424) = .581, p = .446*). However, there was a significant interaction between time pressure and the recall condition *(F(1, 1424) = 6.880, p = .009, ηp^2 < .01).* Post-hoc comparisons showed no significant effect of time pressure within the ostracism group *($M_{untimed}$ = 3.93, SD = 0.81; M_{timed} = 3.74, SD = 0.81), t(233) = 1.547, p = .122 (Holm), d = 0.20, 95% CI [−0.05, 0.45].* Similarly with the inclusion group *($M_{untimed}$ = 4.13, SD = 0.44; M_{timed} = 4.25, SD = 0.49), t(233) = 0.988, p = .326 (Holm), d = −0.13, 95% CI [−0.38, 0.13].* These findings indicate that recalling ostracism is associated with lower financial risk perception overall, and that time pressure does not significantly alter these perceptions within either recall condition.

Health Risk Perception

Participants who recalled ostracism showed significantly lower health risk perception *(M = 3.32, SD = 1.17)* compared to those recalling inclusion *(M = 3.72, SD = 1.09), (F(1, 1424) = 51.779, p < .001, ηp^2 = .04).* The main effect of time pressure was not significant *(F(1, 1424) = 1.974, p = .160),* and there was no significant interaction between time pressure and recall condition *(F(1, 1424) = 0.215, p = .643).* This suggests that recalling ostracism generally lowers health risk perception, irrespective of time pressure.

Social Risk Perception

Participants who recalled ostracism showed significantly higher social risk perception (*M = 2.37, SD = 1.20)* compared to those recalling inclusion *(M = 2.04, SD = 1.07), (F(1, 1424) = 27.239, p < .001, ηp^2 = .02).* Time pressure significantly increased social risk perception for both groups *(Ostracism: M = 2.57, SD = 1.20; Inclusion: M = 2.25, SD = 1.8, F(1, 1424) = 11.691, p < .001, ηp^2 < .01).* The interaction effect was not significant *(F(1, 1424) = 0.015, p = .903).* This indicates that ostracism increases perceived social risks, and time pressure further heightens this perception.

Risk Perception of Pro-Financial Behaviors

Participants who recalled ostracism showed significantly lower risk perception of pro-financial behaviors *(M = 1.31, SD = 0.59*) compared to those recalling inclusion *(M = 1.72, SD = 1.04), (F(1, 1423) = 36.519, p < .001, ηp^2 = .03).* Time pressure significantly increased these perceptions in both groups *(Ostracism: M = 1.69, SD = 0.96; Inclusion: M = 1.88, SD = 1.07, F(1, 1423) = 28.558, p < .001, ηp^2 = .02).* There was a significant interaction between time pressure and recall condition *(F(1, 1423) = 4.877, p = .027, ηp^2 < .01).* Post-hoc comparisons showed a significant effect of time pressure within the ostracism group *($M_{untimed}$ = 1.31, SD = 0.32; M_{timed} = 1.69, SD = 0.55), t(233) = 3.446, p = .001 (Holm), d = −0.45, 95% CI [−0.71, −0.19].* In contrast, within the inclusion group, the difference between timed *(M = 1.88, SD = 0.72) and untimed (M = 1.71, SD = 0.75)* conditions was not significant*, t(233) = −1.573, p = .117 (Holm), d = −0.21, 95% CI [−0.47, 0.05].* These results suggest that recalling ostracism is associated with lower perceived risk of pro-financial behaviours, and that time pressure increases these perceptions in the ostracism group but not in the inclusion group.

Risk Perception of Pro-Social Behaviors

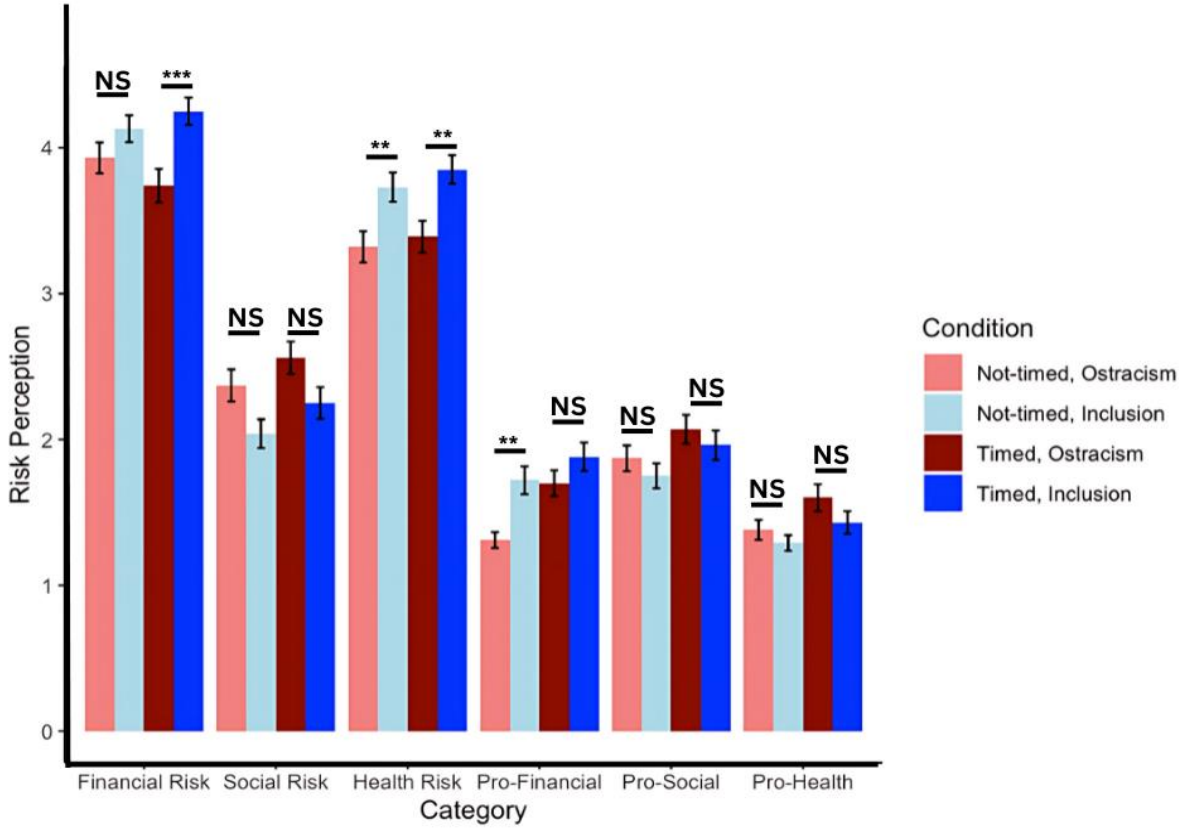
Participants who recalled ostracism showed significantly higher risk perception of pro-social behaviors *(M = 1.87, SD = 0.97)* compared to those recalling inclusion *(M = 1.75, SD = 0.92), (F(1, 1424) = 4.804, p = .029, ηp^2 < .01).* Time pressure significantly increased these perceptions in both *groups (Ostracism: M = 2.07, SD = 1.07; Inclusion: M = 1.96, SD = 1.09, F(1, 1424) = 14.786, p < .001, ηp^2 = .01)*. No significant interaction was found between time pressure and the recall condition *(F(1, 1424) = 0.008, p = .931).* These results suggest that

both ostracism and time pressure independently increase the perceived risks of pro-social behaviors, however, these effects do not depend on each other.

Risk Perception of Pro-Health Behaviors

Participants who recalled ostracism showed significantly higher risk perception of pro-health behaviors *(M = 1.37, SD = 0.74)* compared to those recalling *inclusion (M = 1.29, SD = 0.58), (F(1, 1424) = 9.065, p = .003, ηp² < .01)*. Time pressure significantly increased these perceptions in both groups *(Ostracism: M = 1.60, SD = 1.01; Inclusion: M = 1.43, SD = 0.85, F(1, 1424) = 19.047, p < .001, ηp² = .01).* No significant interaction was observed between recall condition and time pressure (F(1, 1424) = 0.746, p = .388). These results suggest that both ostracism and time pressure independently increase the perceived risks of pro-health behaviors, however, these effects do not depend on each other.

Figure 3.2: Risk perception across six categories: Financial Risk, Social Risk, Health Risk, Pro-Financial, Pro-Social, and Pro-Health behaviors. The conditions are displayed left to right as follows: Not-timed Ostracism, Not-timed Inclusion, Timed Ostracism and Timed Inclusion. Error bars represent the standard error of the mean (SE). Asterisks denote significant pairwise differences between ostracism and inclusion within each time condition (timed or non-timed) (NS = Non-significant, * = P <.05, ** = **p** < .01, *** = ***p*** < .001; Holm-adjusted). The full post-hoc results are available in the Appendix (3E).



Benefit Perception

Perceived Benefits of Financial Risk-Taking

Participants who recalled ostracism perceived greater benefits in financial risks *(M = 2.67, SD = 1.24)* compared to those recalling *inclusion (M = 2.15, SD = 1.06) (F(1, 1424) = 78.874, p < .001, ηp^2 = .05)*. Additionally, there was a significant main effect of time pressure *(F(1, 1424) = 5.511, p = .019, ηp^2 < .01).* Both groups, Ostracism *(M = 2.54, SD = 1.23)* and Inclusion *(M = 1.97, SD = 1.10),* perceived less benefit when under time pressure. However, the interaction

between time pressure and the recall condition (ostracism vs inclusion) was not significant *(F(1, 1424) = 0.185, p = .667).* These results suggest that recalling ostracism increases the perceived benefits of taking financial risks, and time pressure reduces this perception.

Perceived Benefits of Health Risk-Taking

No significant main effects were found for recalling ostracism vs. inclusion *(F(1, 1424) = 3.557, p = .060)* or time pressure *(F(1, 1424) = 0.036, p = .849)* on the perceived benefits of health risk-taking. The interaction between time pressure and recall condition was also not significant *(F(1, 1424) = 0.413, p = .521).* These results indicate that neither recalling ostracism nor time pressure significantly affects the perceived benefits of health risk-taking.

Perceived Benefits of Social Risk-Taking

Participants who recalled ostracism perceived significantly fewer benefits in social risk-taking *(M = 2.86, SD = 1.23)* compared to those recalling *inclusion (M = 3.22, SD = 1.15), (F(1, 1424) = 40.980, p < .001, ηp² = .03)*. Time pressure did not have a significant main effect *(F(1, 1424) = 0.039, p = .843)*, and no significant interaction effect was observed between time pressure and recall condition *(F(1, 1424) = 0.471, p = .493)*. These results suggest that recalling ostracism reduces the perceived benefits of social risk-taking, irrespective of time pressure.

Perceived Benefits of Pro-Financial Behaviors

Participants who recalled ostracism perceived significantly greater benefits in pro-financial behaviors *(M = 4.60, SD = 0.72)* compared to those recalling *inclusion (M = 4.19, SD = 1.07), (F(1, 1424) = 50.988, p < .001, ηp² = .03).* Time pressure had a significant main effect *(F(1, 1424) = 10.573, p = .001, ηp² < .01),* with both groups perceiving less benefit under time pressure *(Ostracism: M = 4.37, SD = 0.80; Inclusion: M = 4.07, SD = 1.11)*. No significant interaction effect was found *(F(1, 1424) = 1.285, p = .257).* These results suggest that recalling ostracism enhances the perceived benefits of pro-financial behaviors, but time pressure diminishes this perception.

Perceived Benefits of Pro-Social Behaviors

Participants who recalled ostracism perceived significantly greater benefits of pro-social behaviors *(M = 1.87, SD = 0.97)* compared to those recalling *inclusion (M = 1.75, SD = 0.92), (F(1, 1424) = 4.804, p = .029, ηp² < .01)*. Time pressure significantly increased perceived

benefits in both groups *(Ostracism: M = 2.07, SD = 1.07; Inclusion: M = 1.96, SD = 1.09, F(1, 1424) = 14.786, p < .001, ηp² = .01)*. No significant interaction effect was observed between time pressure and recall condition *(F(1, 1424) = 0.008, p = .931)*. These results suggest that recalling ostracism increases the perceived benefits of pro-social behaviors, and time pressure amplifies this perception.

Perceived Benefits of Pro-Health Behaviors

Participants who recalled ostracism perceived significantly fewer benefits in pro-health behaviors *(M = 4.59, SD = 0.87)* compared to those recalling inclusion *(M = 4.76, SD = 0.55), (F(1, 1424) = 13.142, p < .001, ηp² < .01).* Time pressure had a significant main *effect (F(1, 1424) = 10.430, p = .001, ηp² < .01),* reducing the perceived benefits in both groups *(Ostracism: M = 4.47, SD = 0.89; Inclusion: M = 4.61, SD = 0.88)*. No significant interaction effect was observed between time pressure and recall condition *(F(1, 1424) = 0.048, p = .827).* These results suggest that recalling ostracism reduces the perceived benefits of pro-health behaviors, while time pressure similarly diminishes these perceptions, independent of participants' assigned experimental condition.

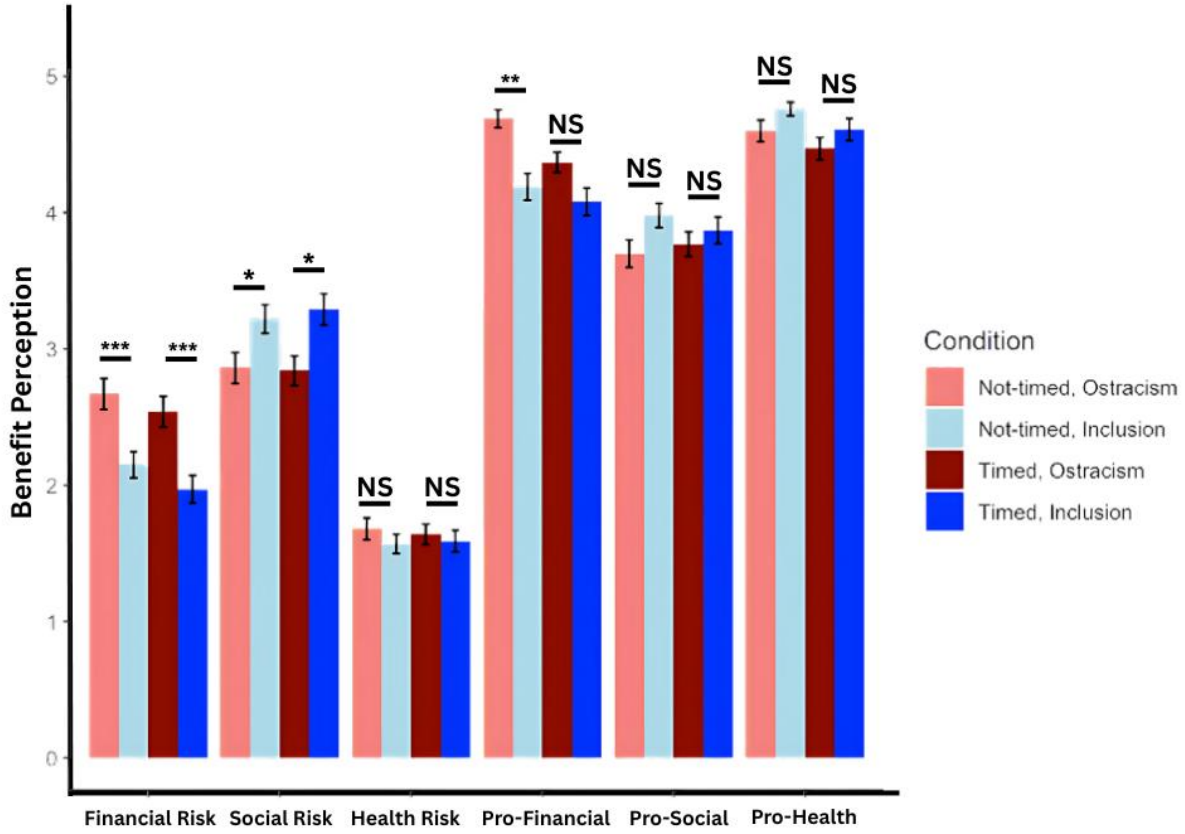


Figure 3.3: Benefit perception across six categories: Financial Risk, Social Risk, Health Risk, Pro-Financial, Pro-Social, and Pro-Health behaviors. The conditions are displayed left to right as follows: Not-timed Ostracism, Not-timed Inclusion, Timed Ostracism and Timed Inclusion. Error bars represent the standard error of the mean (SE). Asterisks denote significant pairwise differences between ostracism and inclusion within each time condition (timed or non-timed) (NS = Non-significant, * = P <.05, ** = **p** < .01, *** = ***p*** < .001; Holm-adjusted). The full post-hoc results are available in the Appendix (3F).

Risk and Benefit Correlation

In our study, I tested the effect of recalling two contrasting social experiences (ostracism versus inclusion), as well as a time pressure manipulation (timed vs. non-timed), on risk and benefit perception across distinct categories. To quantify the relationship between risk and benefit, I calculated Kendall's Tau-b correlations for each participant, providing a measure of the strength and direction of the association between their risk and benefit ratings. The results confirm a consistently negative correlation between risk and benefit perceptions, suggesting that as the perception of risk increases, the perception of benefit decreases, and

vice versa. In the ostracism condition, participants showed a mean tau of -0.699 (SD = 0.191) in the non-timed condition and -0.663 (SD = 0.207) in the timed condition. In contrast, participants that recalled inclusion demonstrated a stronger negative tau between risk and benefit perceptions, with a mean of -0.784 (SD = 0.149) in the non-timed condition and -0.761 (SD = 0.182) in the timed condition. To further investigate these differences, a two-way ANOVA was conducted with the time-pressure manipulation (timed versus non-timed) and recall condition (ostracism versus inclusion) as factors on the Taus. The ANOVA results showed a significant main effect of the type of memory being recalled (ostracism vs. inclusion) (*$F(1, 233) = 14.244, p < .001, \eta^2 = .06$)*, indicating that the type of social memory recalled influenced the correlation between risk and benefit perceptions. However, the effect of time pressure was not significant *($F(1, 233) = 1.694, p = .194$)*, and there was no significant interaction effect between time pressure and Condition (*$F(1, 233) = 0.090, p = .764$)*.

Discussion

In this study, I tested the effect of recalling ostracism versus inclusion on risk and benefit perceptions across financial, health, and social domains under conditions of time pressure or no time pressure. Our findings confirm that recalling ostracism significantly impacts risk and benefit perceptions across distinct domains, leading to differences in how participants evaluated both risky behaviors (e.g., taking a social risk) and behaviors commonly associated with positive outcomes (e.g., being prosocial).

The results of our experiment provide support for our *bi-directional* risk and benefit perception hypothesis. I found that recalling ostracism led to a decreased perception of risk in financial and health domains but an increased perception of risk in social domains, relative to the inclusion condition. In addition, I found that the inverse relationship between risk and benefit perception was further strengthened depending upon the social condition that participants recalled. This aligns with prior research suggesting that negative social interactions, such as ostracism, disrupt cognitive-emotional processes involved in decision-making (Buelow & Wirth, 2015; Fuhrmann et al., 2019; Twenge et al., 2002; Williams, 2007), and increase sensitivity to social information (Mermier et al., 2023), including showing heightened vigilance to the prospect of further exclusion, by making individuals perceive more risk in social contexts (Ren et al., 2016).

The differential impact of ostracism across domains underscores the complex interplay between emotional experiences and decision-making processes. Ostracism, by impairing fundamental human needs such as belonging, self-esteem, and control, leads to varied behavioral responses depending on the context. Our findings support dual-process theories of cognition (Evans & Stanovich, 2013), which suggest that affective responses, such as recalling an experience of being ostracized, can dominate and significantly influence decision-making processes differently dependent upon the domain. I show that this dominance of affect over deliberate reasoning may be particularly pronounced in distinct domains, such as financial and social areas, when individuals recall emotionally charged experiences such as ostracism.

Ostracism has been shown to engender feelings of worthlessness and social disconnection (Williams, 2007). It has been hypothesized that in response to ostracism, individuals will seek out opportunities to regain their sense of belonging, control and self-worth in non-social domains (Duclos et al., 2013). This hypothesis may explain why ostracized individuals in our experiment demonstrated a decreased perception of financial and health risks. Risky financial behaviors have been understood as compensatory responses to the distress caused by social exclusion, where the potential for financial gain helps restore a sense of control, well-being, and social status, thereby boosting self-worth and social standing (Duclos et al., 2013; Zaleskiewicz, 2001). In contrast, a decreased perception of health risks following the recollection of an ostracism experience may reflect mechanisms such as lowered self-esteem and a shift in focus to more immediate needs. This effect can be attributed to thwarted psychological needs and a heightened emphasis on addressing the immediate distress caused by ostracism (Leary, 1990; Twenge et al., 2002; Wesselmann et al., 2024). In line with my hypothesis, I showed that recalling ostracism led to a significant increase in social risk perception. This finding supports the idea that recalling ostracism heightens sensitivity to social information, and motivates individuals to avoid further ostracism. It has been previously shown that ostracized individuals become hyper-vigilant to social cues (Mermier et al., 2023), leading to cautious behaviors, such as social withdrawal aimed at avoiding further rejection (Kip et al., 2023). This heightened sensitivity likely exaggerates perceptions of social risks, such as the fear of expressing unpopular opinions or engaging in behaviors that might jeopardize social reintegration (Pfundmair & Lermer, 2023; Ren et al., 2016). At a

broader level, ostracism previously came with substantial evolutionary risks, including death (Buss, 1990). The importance of social relationships is supported by a plethora of scholarly work, demonstrating that humans have an evolutionarily ingrained need-to-belong, and that achieving social inclusion is a fundamental human motivation, which is incredibly important for psychological well-being and overall health. Failure to meet these needs can lead to increased conformity, and social anxiety, suggesting that after experiencing ostracism, individuals will present with an increased desire to avoid further exclusion (Baumeister & Leary, 1995; Leary, 2001; Williams, 2007).

Comparison with Prior Research

Previous research has suggested that ostracism can lead to increased risk-taking (Buelow & Wirth, 2017; Duclos et al., 2013; Svetieva et al., 2016; Twenge et al., 2002). The results of our experiment support this line of work while adding that the effects are domain-specific: ostracism decreases risk perception in financial and health contexts but increases it in social contexts. This nuanced understanding extends the literature by demonstrating that the impact of ostracism on risky decision-making is not uniform but varies across different domains. Additionally, our study's inclusion of time pressure as a moderating factor provides novel insights into the cognitive processes underlying risk perception. While Finucane et al. (2000) emphasized the role of affect in heuristic processing under time constraints, our findings suggest that the emotional salience of ostracism can either amplify or mitigate the effect of time pressure, depending on the domain. This interplay between affective memory recall and cognitive load highlights the complexity of decision-making processes and underscores the importance of considering both emotional and situational factors in risk research. The integration of these findings with theories of social pain and cognitive load (Eisenberger et al., 2003; Sweller, 1988) highlights the broader implications of our study. Social pain, induced by ostracism, can have profound effects on cognitive functions and decision-making processes. Our research aligns with the notion that ostracism can lead to immediate cognitive and emotional repercussions (Buelow & Wirth, 2015), influencing how risks and benefits are perceived and acted upon (MacDonald & Leary, 2005). Drawing on insights from affect heuristic theory and dual-process models of cognition, our experiment deepens the understanding of how social experiences shape risk and benefit perceptions. The findings underscore the need for targeted and nuanced interventions to counter the

negative effects of ostracism, especially in situations where decision-making involves domain-specific risks.

Limitations and Future Research

This research has several limitations. The sample was predominantly adolescent and drawn from a university setting, which limits the generalizability of the findings to the broader population (Henrich et al., 2010). Furthermore, there was a significant gender imbalance, with more female participants than males. These factors are important given that adolescence is a period of heightened risk-taking (Gardner & Steinberg, 2005; Steinberg, 2004; 2008), and males generally take more risks than females (Byrnes et al., 1999; Harris et al., 2006). Future research should aim to address these limitations. Another limitation is the absence of a neutral condition and the inclusion of non-social positive and negative memories, making it difficult to isolate the specific effects of ostracism or inclusion from the general effects of positive or negative emotional experiences. Additionally, this experiment did not account for individual differences, such as social anxiety, sensitivity to rejection, or personal propensity for risk-taking - factors that could be important in various domains of risk-taking (Downey et al., 1999; Leary, 2001; London et al., 2007). Future studies could incorporate measures that consider these individual differences and explore the real-world applicability of the link between ostracism and risk-taking. For example, using diary-like measures could help identify correlations between experiences of ostracism and risky decision-making.

Conclusion

Ostracism is a profoundly painful social experience. A body of research has suggested that being ignored and excluded can significantly affect behavior; however, limited prior studies have linked ostracism to changes in risky decision-making. This experiment enhances our understanding of how ostracism influences risk and benefit perceptions by demonstrating that recalling ostracism leads to distinct changes in these perceptions across financial, health, and social domains. Specifically, I present evidence of a bi-directional effect, with ostracism resulting in a heightened perception of social risks but a decreased perception of financial and health risks. The interplay between ostracism and time pressure - particularly regarding social and financial risk-taking - suggests that time pressure amplifies these

effects, leading to a greater reliance on affective processes. This experiment contributes to the growing literature on risk and benefit perception and opens avenues for exploring the broader implications of ostracism on everyday decision-making.

Chapter 4: Recalling Ostracism Increases Persistence in Risky Choices*, Especially in Impulsive Individuals*

Human decision-making in risk-reward contexts relies heavily on learning from feedback, where previous outcomes guide future choices by refining our sensitivity to risks and rewards. Consider navigating career choices, personal relationships or financial endeavours, our capacity to learn from experiences, both positive and negative, shape our choices and guide future behaviour (Schunk, 2003). This learning process, characterized by analyzing the outcomes of our decisions and adjusting our behaviors accordingly, is essential for survival and success (Dweck, 2006). In risk scenarios such as gambling, where each decision can result in either a gain or a loss, this sensitivity to feedback is crucial for learning adaptive, risk-sensitive behaviours (Bechara et al., 2000). However, while some adapt quickly, others demonstrate *loss-chasing* behaviour, persisting in risky choices even as losses accumulate (Dixon et al., 2015; MacKillop et al., 2006). This variability has been linked to individual differences in impulsivity, emotional regulation, and cognitive flexibility, which influence how people process feedback and assess risk (Folkman & Moskowitz, 2004; Kahneman & Tversky, 1979).

Recent research suggests that recalling distressing experiences can amplify risk-taking (Nolen-Hoeksema et al., 2008; Weissman et al., 2019). Specifically, recalling negative or distressing events can lead individuals to seek immediate rewards as a compensatory mechanism, even when these behaviours are maladaptive or risky (Kerig, 2019; Pechtel & Pizzagalli, 2011). Although prior research has shown that recalling past experiences can alter emotion and behaviour, it remains unclear whether recalling specific social experiences, such as ostracism, defined as being ignored or excluded (Williams, 2007), affects sensitivity to feedback in risky decision-making.

In this experiment, I examine how recalling experiences of ostracism versus inclusion influences individuals' ability to learn from feedback (wins or losses) during gambling tasks. I also test whether individual differences, specifically impulsivity and sensitivity to reward and punishment, moderate these effects. Through focusing on how individuals' traits shape behaviour after exclusion, I aim to identify why some individuals are more vulnerable to

persistent risk-taking, and to clarify the processes that link social experiences with impaired decision-making.

Ostracism and cognition

The evolutionary need to forge and maintain social relationships is well documented, with extensive research showing that social connection is crucial for psychological well-being (Baumeister & Leary, 2017; Cohen & Wills, 1985), physical health (Holt-Lunstad et al., 2010), cognitive development and functioning during childhood and adolescence (Fratiglioni et al., 2004; Seeman et al., 2001). Ostracism disrupts cognitive functioning by impairing both emotional regulation and executive processes essential for adaptive behaviour (Chen et al., 2025). For example, longitudinal studies have shown that exposure to peer rejection is linked to increased social withdrawal, decreased academic performance, and heightened aggression, suggesting that ostracism undermines critical cognitive functions required for emotional regulation and flexible decision-making (Buhs et al., 2006; Parker & Asher, 1987; Wentzel & Caldwell, 1997; Zhu et al., 2024). Experimental evidence supports these associations, showing that ostracism impairs executive functions such as working memory, attentional control, and inhibition, leading to poorer performance on complex reasoning tasks and reduced persistence in challenging activities (Baumeister et al., 2002; Chen et al., 2025; Lustenberger & Jagacinski, 2010).

Ostracism and Risk-Taking

While evidence suggests that ostracism impairs cognition, only limited work has directly linked ostracism with increased risk-taking. This gap is important, as deficits in executive functioning are reliably associated with impulsivity and heightened risk-taking across populations (Cyders & Coskunpinar, 2011; Kluwe-Schiavon et al., 2021).

A working hypothesis suggests that ostracism promotes risk-taking through two primary pathways. First, ostracism impairs higher-order executive functions like inhibitory control and attentional regulation, making it more difficult to weigh potential losses or resist impulsive urges (Chen et al., 2025; Twenge et al., 2002). Second, other theoretical perspectives hold that ostracism motivates risk-taking as it disrupts an individual's core psychological needs, such as belonging, meaningful existence, control, and self-esteem (Williams, 2009). In response, people seek to restore these threatened needs in ways that

involve heightened *approach motivation* (Jonas et al., 2014; Proulx et al., 2012). One route to restoration may involve engaging in riskier decisions to regain a sense of agency or significance. Supporting this, Duclos et al. (2013) found that ostracized individuals preferred riskier but more lucrative financial options. They also judged money to have greater instrumental value, suggesting that risk-taking may function as a deliberate way to regain control or enhance status. Similarly, Buelow and Wirth (2017) demonstrated that ostracized individuals showed increased propensity for risky choices in deliberative contexts.

Exclusion has been linked to greater risk-taking, but the processes behind this effect are not well understood. Emotional reactions may play a role. For example, anger has been shown to explain risky driving after ostracism (Svetieva et al., 2016). Yet emotion alone cannot explain why people sometimes continue to take risks even after losses, when negative feedback would normally discourage them. One possibility is that exclusion disrupts learning from feedback, making losses less effective in shaping behaviour. Individual traits may also matter. Impulsivity, for instance, is strongly associated with difficulties in self-control and with a greater willingness to take risks (Cyders & Coskunpinar, 2011). This suggests that impulsive individuals may be especially prone to continued risk-taking after exclusion. Identifying traits such as impulsivity in this context will further clarify why certain individuals are especially vulnerable to sustained maladaptive risk-taking.

Ostracism as a Meaning Threat and Defensive Process

Ostracism represents a distinct form of psychological threat relative to other threats (e.g., physical pain) as it disrupts core meaning structures rather than simply eliciting negative affect (Williams, 2009). Individuals typically assume they belong within their social groups, and when this expectation is violated, it creates a mismatch between anticipated and actual experiences (Taggart et al., 2024). Unlike physical pain, which has a clear source and resolution, ostracism poses as an unresolved disruption, undermining confidence in one's social value, interpersonal security, and future predictability (Buelow et al., 2015).

General process models of threat and defense offer a framework for understanding how such meaning threats elicit risk-taking as a compensatory response (Downey & Feldman, 1996; Jonas et al., 2014; Proulx et al., 2012). In the case of ostracism, when an individual experiences disregard or exclusion, this triggers a proximal response driven by the Behavioral Inhibition System (BIS) (Jonas et al., 2014; Stollberg et al., 2024). This stage is

marked by distress, vigilance, anxiety, and impaired executive functioning as individuals attempt to reconcile the threat. When direct repair of the exclusion is unavailable, individuals transition to distal defenses, facilitated by the Behavioral Approach System (BAS), aimed at restoring agency, positive affect, and a return to homeostasis (Jonas et al., 2014; Landau et al., 2015; Proulx et al., 2012). Some efforts centre on repairing social bonds, whereas others involve palliative strategies that provide temporary relief without resolving the exclusion. Risk-taking is one such strategy, given that it enables individuals to reassert autonomy, regain control, or symbolically elevate status (Duclos et al., 2013; Inzlicht et al., 2015; Landau et al., 2015). These compensatory behaviors, though seemingly disconnected from the original social threat, serve to counteract the powerlessness induced by ostracism, reinforcing the idea that exclusion not only disrupts immediate well-being but also motivates broad, self-regulatory adaptations in behavior. Neuroscience evidence supports this account. Exclusion activates the dorsal anterior cingulate cortex and insula, regions also involved in physical pain (Eisenberger et al., 2003), and social pain can be reduced by acetaminophen, a common analgesic (DeWall et al., 2010). Unlike physical pain, however, ostracism poses an unresolved disruption, undermining meaning structures and self-regulation (Wesselmann et al., 2015). Taken together, these findings suggest that exclusion is not simply distressing but a fundamental threat to psychological health, motivating defensive and compensatory responses that extend well beyond the immediate experience of rejection.

Recalling Ostracism

To date, the most widely used method in exclusion research is Cyberball, a virtual ball-tossing game in which participants are either included or excluded by others (Williams & Jarvis, 2006). This simple paradigm reliably reduces fundamental needs such as belonging, control, and self-esteem, and meta-analytic evidence shows that it produces large negative effects on mood (Hartgerink et al., 2015). However, debates persist over whether ostracism reduces well-being below baseline or whether inclusion elevates it above baseline. While some studies that include neutral conditions suggest that ostracism depresses well-being below normative levels, while inclusion tends to maintain a standard level of need satisfaction (Bernstein & Claypool, 2012). Autobiographical recall provides a complementary method to standardised tasks. Recalling socially meaningful events can influence current affect, self-esteem, and behaviour (Baumeister et al., 2001), consistent with evidence that

emotionally charged memories shape mood and motivation (McGaugh, 2004; Wessel & Merckelbach, 1997). This approach may therefore evoke stronger emotional and cognitive responses than laboratory paradigms, while also offering a valuable way to examine ecologically valid social and non-social memories, allowing for precise control conditions.

Loss Chasing, & Feedback Sensitivity,

When people gamble, they sometimes continue to bet after losses, a behaviour known as 'loss chasing'. This pattern reflects a diminished adjustment to negative feedback, as individuals persist in the hope of recouping prior losses rather than adjusting their behaviour. It has been shown that even small and infrequent wins can reinforce gambling behaviour, sustaining risk-taking despite repeated losses (Dixon et al., 2015). Such persistence is supported by neural activity in reward-related regions, including the ventral striatum and medial prefrontal cortex, which remain engaged even when overall outcomes are unfavourable (Campbell-Meiklejohn et al., 2008; Reuter et al., 2005). In the context of ostracism, these mechanisms may be particularly pronounced. Social exclusion disrupts mood and threatens psychological needs (Williams, 2007), which can reduce inhibitory control and heighten the appeal of potential rewards (Chen et al., 2025). From this perspective, risk-taking offers short-term relief from distress by providing opportunities to regain a sense of agency or belonging (Jonas et al., 2014). What remains unclear, however, is whether ostracism makes individuals less sensitive to losses, such that negative feedback no longer discourages risk-taking. Addressing this question is central to understanding whether exclusion fosters a general bias toward risk persistence or a specific desensitisation to negative outcomes.

The Game of Dice Task & The Iowa Gambling Task

The Iowa Gambling Task (IGT) and the Game of Dice Task (GDT) are widely used to examine how individuals adapt their choices over time in response to wins and losses. The IGT, for example, requires participants to balance short-term gains against long-term outcomes across multiple trials, thereby capturing both risk-taking persistence and sensitivity to feedback. Research shows that individuals with prefrontal cortex damage, who struggle to learn from negative feedback, persist in choosing immediate rewards despite long-term losses (Bechara et al., 2000). In contrast, the GDT provides explicit win/loss

probabilities and requires participants to make informed risk decisions; individuals with impaired decision-making, such as pathological gamblers, often rely too heavily on positive feedback and disregard losses (Brand et al., 2005). Importantly, adaptive decision-making in risk contexts critically relies on feedback sensitivity mechanisms, which differ according to how explicitly risk information is presented. Some tasks, like the GDT clearly outline probabilities and outcomes, allowing individuals to use explicit, rule-based strategies to guide decisions under known risk conditions. In contrast, tasks such as the IGT simulate real-world ambiguity by withholding explicit outcome information, requiring participants to implicitly infer risk levels through trial-and-error learning.

The Present Research

The central aim of this research is to test whether recalling experiences of ostracism reduces sensitivity to losses and promotes persistence in risky decision-making. I hypothesised that recalling ostracism would increase risk persistence, defined as continuing to make risky choices even after negative feedback, relative to recalling inclusion or other control conditions. A secondary prediction was that ostracism would increase overall risk-taking behaviour across tasks. To examine these hypotheses, I conducted two experiments using an autobiographical recall paradigm. In Experiment 1, participants recalled either an episode of ostracism, inclusion, or physical pain before completing the Game of Dice Task (GDT), which measures risky decision-making when probabilities are explicit. This design allowed me to test whether ostracism specifically, rather than general distress, diminished sensitivity to losses. In Experiment 2, I refined the control condition to a neutral task (a shopping list) and used the Iowa Gambling Task (IGT), which requires adaptive learning under uncertainty. This experiment also examined whether individual differences in impulsivity, BIS/BAS, and reward- punishment sensitivity moderated the effects of recall. Across both experiments, the primary outcome was persistence in risky decisions following feedback, with the frequency of risky choices as a secondary outcome.

Experiment 1

As an initial test of the hypothesis that recalling ostracism diminishes sensitivity to losses in risky decision-making, participants recalled an experience of ostracism, inclusion, or physical pain. The inclusion condition served as a positive social comparison, and the

physical pain condition tested whether effects of ostracism were specific to social threat rather than general distress. After the recall task, participants completed the Game of Dice Task (GDT; Brand et al., 2005), which presents explicit probabilities and payoffs and allows a direct assessment of how individuals adjust risky choices after feedback. The primary outcome was risk persistence, with the overall frequency of risky versus safe choices as a secondary measure. I predicted that recalling ostracism, compared to inclusion or physical pain, would increase persistence in risky decisions following losses, indicating reduced sensitivity to negative feedback.

Method

Ethics & Open Science Practises

All experimental procedures were approved by our university's ethics review panel. Participants provided informed consent and were fully debriefed at the end of the experiment. In this manuscript, I report all measures, manipulations, and data exclusions. Experiment 1 was not preregistered. Experiment 2 was preregistered here: https://osf.io/yfxbw/?view_only=b6f5b6f56b9449e2963af3b7bc95862b. All data and the R scripts used to analyse the experiments are available at: https://osf.io/x4b8t/?view_only=40363de1d0e5467e8d6b16c2109255cc

Participants

To determine the sample size for both experiments, I conducted a power analysis utilizing G*Power 3.1 (Faul et al., 2007). For a between subjects ANOVA, the power analysis indicated a total sample size of 103 for a between factors ANOVA with $\alpha = 0.05$, effect size of 0.25 and power at 0.8. In line with consistency with other studies of the Game of Dice Task & the Iowa Gambling Task (e.g., Brand et al, 2005; Buelow et al, 2017), I aimed to get 30 - 50 participants per cell across 3 experimental conditions, with the aim of over recruiting by 10-20%.

For Experiment 1, a total of 120 undergraduate students was recruited from the Psychology Department at Cardiff University. Participants were randomly assigned to one of three conditions (N = 40 ostracism, N = 40 inclusion, N = 40 physical pain). The physical pain condition served as a contrast to social threat (e.g., Jonas et al., 2014), relative to recalling

ostracism which serves as socially threatening experiencing, which has implications for the self (Williams, 2007) allowing us to isolate the effects of ostracism specifically. No participants were removed from the final analysis. The final sample consisted of 100 Females, 16 Males, 2 Non-Binary, 1 Trans-Masculine, 1 did not want to disclose. M*age* = 19.53, SD*age* = 1.17. Of the 120 participants, 69.2% were White British.

To assess whether Experiment 1 was sufficiently powered to detect the hypothesized effects, I conducted a sensitivity analysis using the Chi-squared test with an alpha level of 0.05 and a desired power of 0.80. A sensitivity analysis for Experiment 1 (N = 120) indicated a minimum detectable effect size of Cramér's V = 0.282, providing 80% power to detect moderate effects. This suggests that the experiment is well-powered to identify effects of this magnitude or greater.

Materials and Procedure

Participants were welcomed to the lab and then directed to a private booth. Following this, participants were then randomly assigned to recall and to write about one of three conditions via the Qualtrics randomiser; Ostracism, Inclusion or Physical Pain. Participants were instructed to write (up to 150 words) about a personal experience that fit their assigned condition.

In the ostracism condition, participants actively recalled and wrote about an experience of being ignored or excluded, drawing from personal instances such as receiving the 'silent treatment' or being left out by friends. In the inclusion condition required participants to remember and describe times when they felt a deep connection to others, like a cherished moment with family or a friend. For the physical pain condition, participants recalled a non-social but negatively valanced experience (e.g., a painful injury, migraine). No individual accounts were read through or retained.

Manipulation Check

Following the recall task, participants were then asked to state what memory they were asked to recall. Participants were then asked two questions as part of a manipulation check. 1) “how excluded did you feel during the recall?” & 2) “how excluded do you feel right now?” Participants were given a 5-point scale to answer these. The scale ranged went from ‘Very excluded to Very included’.

Game Of Dice Task (GDT)

Following this, participants were then automatically directed to PsychoPy (V 2023.1.2) to complete the Game of Dice Task (GDT) (Brand et al., 2005). See Figure 4.1 below for a full depiction of the task sequence.

Figure 4.1: Game of Dice Task (GDT) instructions. Participants are told that their main aim is to win as much money, and to lose as little money as they can. Following this, they are presented with a series of on-screen instructions. There are 18 total rounds. During the game participants are able to select one of four possible options. There are two risky options, and two safer options. Participants start with a balance of $1000. The highest risk option has a 1/6 chance of winning. A dice outcome in this option would allow the participant to either win or lose $1000. The second riskiest choice has a 1/3 chance of winning. A dice outcome in this option would allow the participant to either win or lose $500. The safer options have a ½ and 2/3 chance of winning, with participants either winning or losing $200 or $100 respectively.

Results

All data were analysed using R (R Core Team, 2013). For the manipulation check, I conducted a one-way ANOVA to assess differences in exclusion ratings across the Ostracism, Inclusion, and Physical Pain conditions. Post-hoc Tukey's HSD tests were then used to identify specific differences between conditions. Additionally, I calculated the correlation between participants' ratings of exclusion during and after the recall.

To analyse risk-taking, I computed the proportion of risky choices made by each participant in the Game of Dice Task (GDT). These proportions were compared across recall

conditions (Ostracism, Inclusion, Physical Pain) using a one-way ANOVA, followed by Tukey HSD post hoc tests to examine pairwise differences. To analyse risk persistence, I tested trials in which participants had already chosen a risky option on the previous round. A generalized linear mixed model (GLMM) was then fitted with recall condition (Ostracism, Inclusion, Physical Pain) and prior feedback (win or loss) as fixed effects, and participant as a random intercept. This allowed me to test whether recalling ostracism altered the likelihood of repeating a risky choice after different feedback outcomes. The final monetary results of the outcomes of both tasks are included in the Appendix material (4A - for GDT, and 4G for IGT).

Manipulation Check

I asked participants two questions on a five-point likert scale: 1) "How excluded did you feel during the memory recall?", and "How excluded do you feel right now?" The scale went from (1 - Very excluded, to 5 - Very included). I then averaged the two scores together, and ran post-hoc Tukey's HSD tests to compare the intra-condition effects. To clarify scoring, lower scores on the manipulation check items indicate greater feelings of exclusion, while higher scores indicate greater feelings of inclusion.

There was a significant positive correlation between participants' responses to how excluded they felt during the memory, and how excluded they felt in the moment, *rs = 0.31, p < .001, 95% CI [0.14, 0.46].* A one-way ANOVA confirmed a significant effect of differences between the recall conditions, $F(2,119) = 57.6, p < .001, \eta^2 = 0.49$, confirming a large effect. Participants in the Ostracism condition reported the lowest levels of inclusion (M = 2.20, SD = 1.32), followed by the Physical Pain condition (M = 2.94, SD = 1.34), and the Inclusion condition (M = 4.24, SD = 1.46). Post-hoc tests showed significant differences between each condition: *Ostracism vs. Inclusion, p < .001; Ostracism vs. Physical Pain, p < .001; and Inclusion vs. Physical Pain, p < .001*, confirming that the recall tasks elicited varying levels of perceived ostracism across conditions.

Risk-Taking

I next examined whether recalling different conditions (Ostracism, Inclusion, or Physical Pain) influenced risk-taking on the Game of Dice Task (GDT). Participants' choices were categorised as risky (Gamble Choices 3 and 4) or safe (Gamble Choices 1 and 2), and I calculated the proportion of risky choices made by each participant. A one-way ANOVA

revealed a significant effect of condition, *F(2, 116) = 6.79, p = .0016, η² = .10,* indicating that risk-taking varied across recall conditions. Participants in the ostracism condition showed a higher proportion of risky choices *(M = .48, SD = .32, 95% CI [.38, .58])* than those in the inclusion condition *(M = .29, SD = .24, 95% CI [.22, .36])* and the physical pain condition *(M = .27, SD = .25, 95% CI [.19, .34]).* Tukey post hoc comparisons confirmed that ostracism elicited significantly greater risky choice behaviour than inclusion, *M difference = 0.18, 95% CI [0.04, 0.33], p = .010,* and physical pain, *M difference = 0.20, 95% CI [0.06, 0.35], p = .003.* Inclusion and physical pain did not differ*, M difference = –0.02, 95% CI [–0.17, 0.13], p = .94.* These findings support the hypothesis that recalling ostracism increases risk-taking behaviour in the GDT.

Sensitivity to feedback

To examine whether recalling ostracism reduced sensitivity to feedback, I tested whether participants persisted in risky decisions after wins or losses. Here, I operationalized risk persistence as the tendency to repeat a risky choice on the subsequent trial. Therefore, analyses were restricted to trials in which participants had initially selected the risky option. Risk persistence was coded as 1 if participants repeated the risky choice and 0 if they switched to a safer option. I analysed these data using a generalized linear mixed model (GLMM) with recall condition (ostracism, inclusion, physical pain) and feedback outcome (win, loss) as fixed effects, and a random intercept for each participant. This model tested whether recalling ostracism increased persistence in risky choices relative to the other conditions, and whether this effect varied depending on feedback.

In line with my hypothesis, the model confirmed a significant main effect of recalled ostracism on the likelihood of staying with a risky decision *(β = 1.55, SE = 0.58, z = 2.69, p = 0.007, OR = 4.72, 95% CI [1.52, 14.6]).* Participants in the ostracism condition were significantly more likely to persist with risky decisions compared to those in the reference condition (Inclusion). In contrast, the effect of recalling physical pain was non-significant *(β = 0.59, SE = 0.61, z = 0.97, p = .333, OR = 1.80, 95% CI [0.55, 5.96]).* This finding supports the hypothesis that recalling ostracism increases risk-taking persistence, suggesting that participants are more inclined to maintain risky choices even after experiencing losses.

To compare conditions directly, I conducted post-hoc pairwise tests using estimated marginal means with Tukey-adjusted p-values (see Table 4.1 below). Ostracism differed significantly from inclusion, showing a higher likelihood of risk persistence. In contrast, physical pain did not differ significantly from either inclusion or ostracism. Model-predicted probabilities illustrated the size of these effects: after losses, ostracism participants persisted on 73% of trials (95% CI [58%, 85%]) compared with 37% for inclusion [19%, 59%]; after wins, ostracism participants persisted on 85% of trials [68%, 94%] compared with 36% for inclusion [16%, 64%]. Figure 4.2 shows these estimated probabilities of persistence across conditions and feedback. This suggests that ostracism reliably increased persistence compared to inclusion, but the distinction between ostracism and physical pain was not statistically supported.

Feedback	Contrast	Estimate (log-odds)	SE	z.ratio	p.value
Negative	Inclusion - Ostracism	-1.551	0.576	-2.691	0.0195*
Negative	Physical Pain - Inclusion	0.590	0.610	0.967	0.5977
Negative	Physical Pain - Ostracism	-0.961	0.541	-1.777	0.1772
Positive	Inclusion - Ostracism	-2.273	0.757	-3.002	0.0076*
Positive	Physical Pain - Inclusion	1.752	0.817	2.144	0.0812
Positive	Physical Pain - Ostracism	-0.521	0.758	-0.687	0.7709

Table 4.1: Post-hoc pairwise comparisons (Tukey-adjusted) for ostracism, physical pain, and inclusion on the log-odds of persisting with a risky decision after receiving negative (a loss) or positive (a win) feedback. Statistically significant effects ($p < .05$) are denoted with a *.

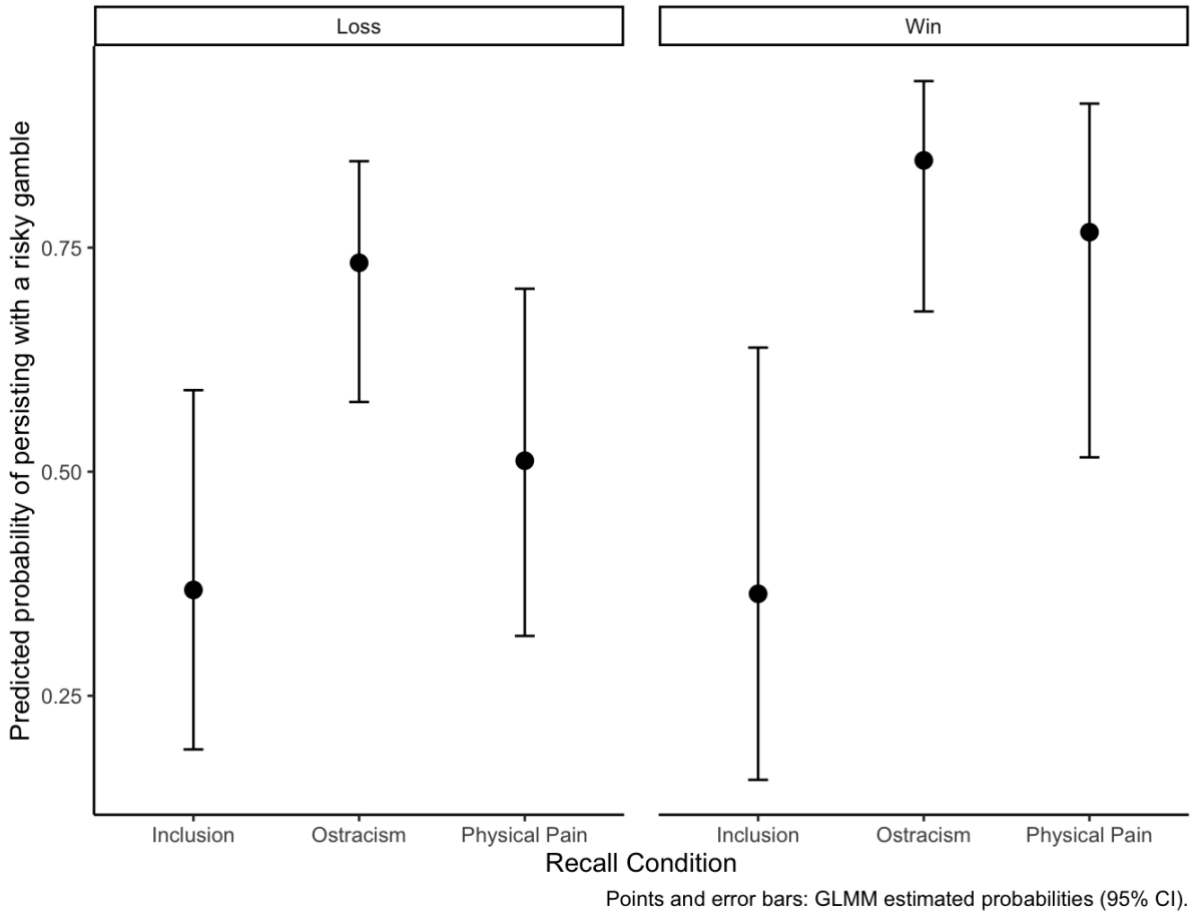


Figure 4.2: Predicted probability of persisting with a risky gamble as a function of recall condition (inclusion, ostracism, physical pain) and prior feedback (loss vs. win). Points represent model-predicted probabilities estimated from the generalized linear mixed model; error bars indicate 95% confidence intervals. Risk persistence was defined as repeating a risky choice following a risky choice on the previous trial.

Further, the effect of feedback outcome (win vs. loss) was non-significant *(β = -0.019, SE = 0.59, z = -0.032, p = 0.975, OR = 0.98, 95% CI [0.31, 3.10])*, indicating that receiving a win or a loss in the prior round did not independently affect the likelihood of persisting with a risky decision. The interaction between ostracism and feedback also was not significant *(β = 0.72, SE = 0.76, z = 0.96, p = 0.339, OR = 2.06, 95% CI [0.47, 9.05])*, suggesting that feedback did not further modulate the effect of ostracism on risk-taking persistence. Similarly, the interaction between physical pain and feedback was not significant *(β = 1.16, SE = 0.83, z = 1.40, p = 0.161, OR = 3.20, 95% CI [0.63, 16.3]),* indicating no significant combined effect of recalling physical pain and feedback on risk persistence. Descriptive

frequencies of participants' choices across recall conditions, gamble type, and feedback are reported in the Appendix (4C).

Overall, recalling ostracism significantly increased risk-taking persistence compared to inclusion, but did not statistically differ from physical pain in post-hoc tests. This pattern suggests that although ostracism exerts a particularly robust effect against positive social memories, however, its distinction from other negatively valanced experiences such as physical pain may be more nuanced. The full model outputs are provided in the Appendix (4B).

Experiment 1 Discussion

According to general process models, threats such as ostracism fundamentally violate individuals' meaning frameworks, activating immediate anxiety responses associated with the Behavioural Inhibition System (BIS) and subsequent compensatory approach-oriented behaviours associated with the Behavioural Activation System (BAS; Jonas et al., 2014; Williams, 2007). The results of Experiment 1 provide partial support for this account. Participants who recalled ostracism were significantly more likely to persist with risky decisions in the Game of Dice Task (GDT) than those who recalled inclusion, consistent with the prediction that ostracism promotes a general tendency toward risk persistence. However, the predicted interaction with feedback outcome was not observed, suggesting that ostracism did not specifically diminish sensitivity to losses.

The physical pain condition was intended as a control to isolate ostracism's unique threat to social needs and identity. However, the results suggest complexities in how participants recalled painful events. General process models emphasise that compensatory behaviours are primarily triggered by threats to core psychological needs or meaning frameworks (Jonas et al., 2014; Proulx et al., 2012). Whereas ostracism directly undermines belonging and self-esteem (Williams, 2009), some recalled pain experiences (e.g., accidents or injuries) may also have threatened safety or control, eliciting defensive responses similar to those evoked by ostracism. Unlike standardised pain manipulations used in prior research (e.g., predictable dental procedures in Terror Management Theory studies), these idiosyncratic recollections may have inadvertently engaged comparable threat–defence processes, thereby complicating the intended contrast.

Importantly, participants recalling physical pain did not differ significantly from those recalling inclusion. This reinforces the view that the motivational salience and need-violation inherent to ostracism uniquely drives persistent risk-taking. In the task, feedback in the form of wins or losses did not significantly influence risk persistence, and the interaction between ostracism and feedback was not significant. This highlights that ostracism increased persistence across trials, independent of feedback. This pattern is consistent with evidence that social pain compromises cognitive flexibility and promotes risk-taking (Baumeister et al., 2005; Buelow & Wirth, 2015; Duclos et al., 2013; Twenge, 2011) and with frameworks emphasising that social threats elicit defensive motivational strategies (Downey & Feldman, 1996; Jonas et al., 2014; Proulx et al., 2012).

The findings of experiment 1 show that relative to recalling inclusion, ostracism reliably increased persistence in risky decisions. However, several limitations should be acknowledged. The GDT contains only 18 trials and may not capture fine-grained behavioural patterns. One limitation is that risk persistence could only be analysed for participants who engaged in risky choices, which reduced the effective sample size. Moreover, individual differences in traits such as impulsivity or reward sensitivity were also not assessed, which restricted our ability to examine potential moderators. Addressing these limitations will help clarify the mechanisms through which social exclusion promotes maladaptive risk-taking.

Experiment 2

Experiment 1 supported the hypothesis that recalling ostracism increases persistence in risky choices. Participants in the ostracism condition were more likely to continue making risky decisions in the Game of Dice Task, and this effect was independent of whether the previous outcome was a win or a loss. Experiment 2 was designed to determine whether the increased risk taking observed after recalling ostracism results from ostracism actively lowering psychological wellbeing rather than from the beneficial effects of recalling inclusion. Prior research indicates that ostracism reduces need satisfaction and increases negative mood (Williams, 2009) and has been linked to higher levels of risk taking (Buelow & Wirth, 2017; Duclos et al., 2013). To isolate the specific impact of ostracism, I replaced the physical pain condition with a neutral task in which participants wrote a shopping list. By comparing outcomes from ostracism recall, inclusion recall, and the neutral condition, this

experiment tests whether the increased risk taking is driven by the unique negative impact on social meaning and self-worth that ostracism produces. A finding of significantly higher risk-taking in the ostracism condition compared to both inclusion and neutral conditions would provide strong evidence that ostracism undermines social meaning and self-worth and leads to compensatory behavior in decision making.

A second objective of Experiment 2 was to examine individual differences relevant to the General Process Model of Threat and Defense (Jonas et al., 2014). This model proposes that threats initially activate the Behavioural Inhibition System (BIS), heightening vigilance and avoidance tendencies, but may later prompt a shift toward compensatory approach behaviours associated with the Behavioural Activation System (BAS). The BIS/BAS scales (Carver & White, 1994) and the Sensitivity to Punishment and Reward Questionnaire (Torrubia et al., 2001) assess variation in these systems. In addition, impulsivity, measured by the Barratt Impulsivity Scale (Patton et al., 1995), reflects heightened reward-seeking and poor inhibitory control, which may amplify risk-taking in response to ostracism-induced distress. These measures allowed us to test whether trait differences moderate ostracism's impact on decision-making. This was an important part of Experiment 2, given that to-date, only limited empirical research has south to assess which individual differences amplify risk-taking behaviours specifically following ostracism, making this a significant objective of our investigation.

Finally, Experiment 2 used the Iowa Gambling Task (IGT) to provide a more sensitive assessment of feedback processing over an extended period. Whereas the GDT involves explicit probabilities and only 18 trials, the IGT features 100 trials in which probabilities and payoffs must be inferred through experience. This task captures decision-making under ambiguity, allowing us to examine how risk-taking evolves as participants learn from repeated outcomes. Using the IGT alongside the GDT enabled us to test whether ostracism disrupts adaptive feedback sensitivity across both explicit and implicit risk contexts.

Methods

Participants

For Experiment 2, a total of 170 undergraduate students were recruited from the Psychology Department at Cardiff University. 12 participants data was not saved due

to technical issues with the Iowa Gambling Task, meaning that they could not be included in the final data analysis. As such, the final sample consisted of 119 Females, 34 Males, 5 Non-Binary. M*age* = 19.98, SD*age* = 2.28. Of the 158 participants, 121 identified as White British. Participants were randomly assigned to write about an experience of either being ostracized (N = 53), socially included (N = 55), or as the control condition, some participants were randomly assigned to write out what they bought during their last food shop (N = 50).

To assess whether the sample sizes in Experiment 2 provided sufficient power to detect the hypothesized effects, I conducted sensitivity analyses using the Chi-squared test with an alpha level of 0.05 and a desired power of 0.80. The sensitivity analysis showed a minimum detectable effect size (Cramér's V) of 0.247. This threshold represents the smallest effect size that could be reliably detected with 80% power in this experiment. Like Experiment 1 these results suggest that both experiments have been sufficiently powered to identify moderate to large effects.

Materials & Procedure

Participants were welcomed to the lab, handed a piece of paper and a pen and then directed to a private booth. After entering basic demographic details, participants then completed three psychometrically validated scales to measure individual differences across three domains.

BISBAS Scale

To assess individual differences in behavioural inhibition and approach, participants completed the BIS/BAS scales (Carver & White, 1994).The BISBAS scale is a 24-item self-report measure which consists of four subscales: BAS Drive (α = 0.74) (4 items), which captures the persistent pursuit of goals (e.g., "When I want something, I usually go all-out to get it"); BAS Fun Seeking (α = 0.72) (4 items), assessing the desire for new and exciting experiences (e.g., "I'm always willing to try something new if I think it will be fun"); BAS Reward Responsiveness (α = 0.88) (5 items), which measures responsiveness to reward (e.g., "When I get something I want, I feel excited and energized"); and BIS (α = 0.41) (7 items), which assesses sensitivity to punishment and the tendency to avoid aversive outcomes (e.g., "I worry about making mistakes"). Participants responded to items on a 4-point Likert scale ranging from 1 ("very true for me") to 4 ("very false for me"). Scores for each subscale were

calculated by summing the relevant items, with higher scores indicating greater sensitivity in the respective domain. Items other than 2 and 22 are reverse scored.

Sensitivity to Punishment and Reward Questionnaire (SPSRQ)

To measure sensitivity to punishment and reward, participants completed the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) (Torrubia et al., 2001). The SPSRQ consists of 48 dichotomous (yes/no) items, equally divided into two subscales: Sensitivity to Punishment (24 items) and Sensitivity to Reward (24 items). The Sensitivity to Punishment subscale assesses an individual's tendency to avoid punishment or negative consequences (e.g., "Do you often refrain from doing something because you are afraid of it being illegal?"), while the Sensitivity to Reward subscale measures the tendency to seek out rewarding situations (e.g., "Does the possibility of social advancement motivate you to action, even if this involves not playing fair?"). Each subscale score is calculated by summing the number of "yes" responses, with higher scores indicating greater sensitivity to punishment or reward.

Barratt Impulsivity Scale (BIS-11)

To measure impulsivity, participants completed the Barratt Impulsivity Scale (α = 0.52) (BIS-11) (Patton et al., 1995). This 30-item self-report questionnaire assesses impulsivity, and measures participants on dimensions such as; attentional Impulsiveness (8 items), which evaluates an individual's ability to focus and cognitive stability (e.g., "I am restless at lectures or talks"); Motor Impulsiveness (11 items), which captures a tendency to act without thinking (e.g., "I do things without thinking"); and Non-Planning Impulsiveness (11 items), which assesses a lack of future planning and foresight (e.g., "I am more interested in the present than the future"). Participants respond to each item on a 4-point Likert scale ranging from 1 ("Rarely/Never") to 4("Almost always/Always"). Some items are reverse-scored, and higher overall scores reflect greater impulsivity.

Manipulation

Participants were randomly assigned via the Qualtrics randomiser to write about one of three writing tasks: a time they had been ostracised, a time they had been socially included, or listing their grocery shopping for the upcoming week. This design was intended

to clarify whether the recollection of ostracism was significantly impacting individuals' cognition, or whether inclusion was having a self-esteem enhancing effect, and were making individuals more sensitive to risk persistence.

Participants were instructed to write (up to 150 words) about a memory that fitted the description as clearly and accurately as possible. Participants were asked to only recall memories that they were safe to do so. In the ostracism condition, like Experiment 1, participants actively recalled and wrote about an experience of being ignored or excluded, drawing from personal instances such as receiving the 'silent treatment' or being left out by friends. In contrast, the inclusion condition required participants to remember and describe times when they felt a deep connection to others, like a cherished moment with family or a friend. Whilst in the control condition, participants were asked to write about what is on their shopping list for the upcoming week. This task was chosen to minimize both emotional engagement and the potential for recalling experiences that could be aversive or threatening, ensuring a neutral baseline for comparison.

This methodological approach was chosen as it had been previously used in similar research as a method to generate feelings of ostracism and inclusion in risk research (Duclos et al., 2013). After the experiment had finished, participants shredded their paper in a paper shredder. No individual accounts were read through or retained.

Manipulation Check

Following the recall task, participants were then asked to state what memory they were asked to recall. Participants were then asked two questions as part of a manipulation check. 1) "how excluded did you feel during the recall?" & 2) "how excluded do you feel right now?" Participants were given a 5-point scale to answer these. The scale range went from 'Very excluded to Very included'. Similar to Experiment 1, lower scores implied feeling more excluded, with higher scores implying greater levels of inclusion.

Iowa Gambling Task (IGT)

Following this, participants were then automatically directed to PsychoPy v2022.2.4 to complete the Iowa Gambling Task (IGT) (Bechara et al., 1994). See Figure 4.3 below for a full depiction of the task sequence.

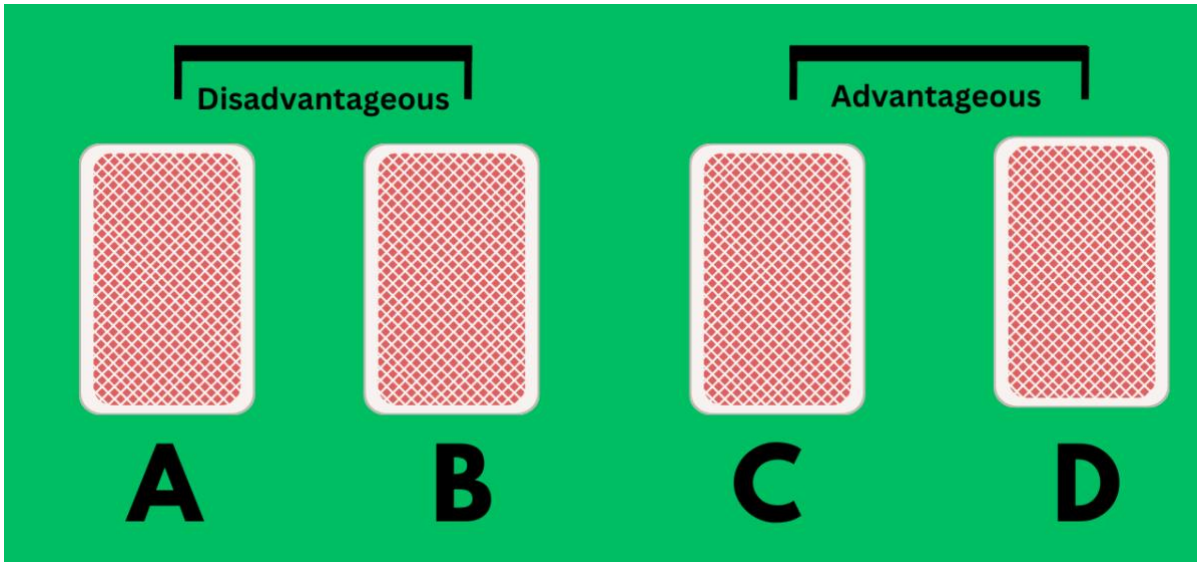


Figure 4.3: Iowa Gambling Task (IGT) instructions. Participants are instructed to maximize their earnings while minimizing their losses. They are presented with four decks of cards (A, B, C, D) and can draw cards from any deck. The task consists of a series of rounds where participants select one card per round, over 100 trials. Decks A and B are considered "risky" and disadvantageous as they offer larger rewards but also higher penalties, while decks C and D are considered "safer" and advantageous, as they provide smaller rewards and lower penalties. Participants begin with a virtual bankroll of $2000. Participants are told that they can freely alternate between decks. Participants receive instant feedback on their wins and losses after each selection, in the form of either adding money to their winnings or having it withdrawn from the total. The task aims to assess decision-making and the ability to learn from the outcomes.

Results

Data Analysis

For Experiment 2, all data were analysed using R (R Core Team, 2013). First, a Spearmans rho correlation analysis was used to assess the consistency between exclusion ratings during and after memory recall. Then, for the manipulation check, a one-way ANOVA was conducted to examine differences in exclusion ratings across the Ostracism, Inclusion, and the Shopping condition. I followed this up with Post-hoc Tukey's HSD to compare each

condition pair, ensuring the manipulation elicited varying levels of perceived exclusion. Additionally

To analyse risk-taking behavior, choices in the Iowa Gambling Task (IGT) were categorised as "risky" for decks 1 and 2 or "safe" for decks 3 and 4. A Chi-square test was conducted to examine associations between recall condition and choice type. To analyse differences in feedback sensitivity, I used a generalized linear mixed model (GLMM) with the condition (ostracism, inclusion or shopping list) and feedback outcome (win or loss) as fixed effects, and the participant as a random effect, to test if recalling ostracism affected participants' tendency to persist with risky choices after feedback. Our dependant variable was whether participants persisted with a risky decision after a win or loss on the previous trial (coded as 1 for sticking with the decision, and 0 for switching).

In addition, to explore the influence of individual differences, I conducted correlation analyses between risk-taking persistence and individual traits, including Behavioral Inhibition and Activation System (BISBAS) scores, impulsivity, and sensitivity to reward and punishment. This analysis aimed to determine how individual differences in personality traits might moderate risk-taking and feedback sensitivity across conditions.

Manipulation Check

I asked participants two questions on a five-point Likert scale: (1) "How excluded did you feel during the memory recall?" and (2) "How excluded do you feel right now?" (1 - Very excluded, 5 - Very included). The two scores were averaged and were found to be significantly correlated, *(r = 0.22, p < . 001, (95% CI [0.10, 0.34])),* indicating consistency in participants' reported feelings of exclusion. Post-hoc Tukey's HSD tests were conducted to compare effects within conditions. A one-way ANOVA confirmed a significant effect of differences between conditions, $F(2,168) = 91.45$, $p < .001$, $\eta^2 = 0.52$ (95% CI [0.44, 1.00]), with exclusion ratings varying differentially across conditions. Participants in the Ostracism condition reported feeling the most excluded (M = 2.43, 95% CI [2.20, 2.66]), followed by the Shopping condition (M = 3.50, 95% CI [3.29, 3.71]), and the Inclusion condition (M = 4.29, 95% CI [4.14, 4.44]). Post-hoc tests indicated significant differences between each condition: Ostracism vs. Inclusion *(M difference = -1.86, SE = 0.14, 95% CI [-2.13, -1.59], p < .001);* Ostracism vs. Shopping *(M difference = -0.79, SE = 0.14, 95% CI [-1.06, -0.52], p < .001);* and

Shopping vs. Inclusion *(M difference = 1.07, SE = 0.14, 95% CI [0.80, 1.34], p < .001),* confirming that the recall tasks effectively elicited distinct levels of perceived exclusion.

Risk-Taking

I then investigated whether recalling ostracism would lead to greater risk-taking on the Iowa Gambling Task (IGT) compared to inclusion and a control shopping condition. Participants' choices were categorized as either risky (Decks 1 and 2) or safe (Decks 3 and 4). I examined differences in choice behaviour between the conditions. A Chi-square test revealed a significant association between condition and choice type *(χ^2, 2, N = 15,580) =165.65, p < .001, Cramér's V (0.103, 95% CI [0.087, 0.119])* confirming that participants' risk-taking behaviour differed depending on the condition. Participants that recalled ostracism showed a higher proportion of risky choices *(54.8%, 95% CI [54.8%, 57.5%])* compared to those that recalled inclusion *(47.0%, 95% CI [46.9%, 49.7%])* and those that wrote about their shopping list *(43.5%, 95% CI [42.5%, 45.2%*]). These results support my hypothesis, demonstrating that recalling ostracism led to greater risk-taking behaviour.

Feedback Sensitivity

To test whether ostracised participants were less sensitive to feedback, I used a generalized linear mixed model (GLMM) to test whether the likelihood of persisting with risky decisions (as opposed to switching to safe decisions) was influenced by the experimental condition (Ostracism, Inclusion, or Shopping) and the outcome of the previous trial (win or loss). The model included a random intercept for participants to account for individual differences in decision-making behaviour over repeated trials. In addition, I then ran post-hoc testing adjusted by the Tukey method to compare contrasts for each condition's likelihood of sticking with a risky decision dependent upon the type of feedback that they received (e.g., winning or losing a trial). The results of this are presented below in Table 4.2.

The analysis revealed several significant effects. Across conditions, participants were less likely to persist with risky choices on the trial following a loss compared with a trial following a win *(β = -1.25, SE = 0.15, z = -8.26, p < 0.001, OR = 0.29 (95% CI: [0.21, 0.38]))*. In addition, experiencing a win on the previous trial significantly increased the likelihood of participants persisting with a risky decision in the following trial, (*β = 0.54, SE = 0.08, z =*

6.58, p < 0.001, OR = 1.72 (95% CI: [1.46, 2.03])), indicating that participants were more likely to continue with a risky decision after a win compared to a loss.

In line with my hypothesis, participants in the Ostracism condition were significantly more likely to persist with risky decisions compared to those in the Inclusion condition *(β = 0.50, SE = 0.21, z = 2.41, p = 0.016, OR = 1.65 (95% CI: [1.10, 2.48*])). This confirms that participants recalling an experience of ostracism were more likely to persist with risky choices than those in the Inclusion condition. There was no significant difference between the Shopping and Inclusion conditions with respect to persistence with risky decisions, *(β = 0.03, SE = 0.21, z = 0.14, p = 0.889, OR = 1.03 (95% CI: [0.68, 1.56]).* Further, the interaction between Condition (Ostracism) and Feedback (Win) was not significant*, (β = -0.14, SE = 0.11, z = -1.30, p = 0.194, OR = 0.87 (95% CI: [0.69, 1.08])).* This suggests that the tendency for ostracized participants to persist with risky decisions did not significantly differ depending on whether they experienced a win or a loss. The full model output is available in the Appendix (4D). Figure 4.4 below displays the model-predicted probabilities of persisting with risky decisions by recall condition and prior feedback.

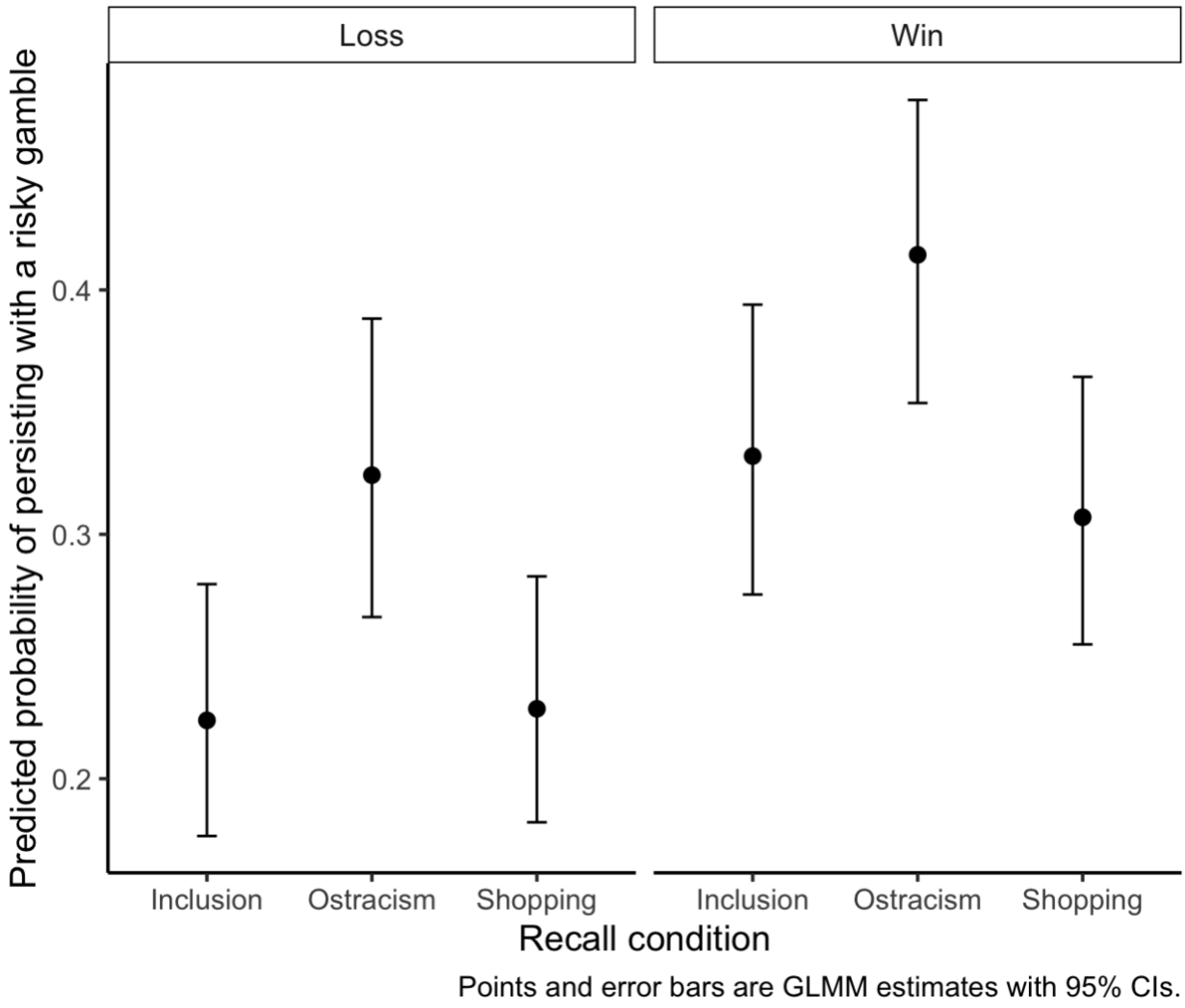


Figure 4.4. Predicted probability of persisting with a risky decision on the Iowa Gambling Task as a function of recall condition (ostracism, inclusion, shopping) and prior feedback (loss vs. win). Probabilities were estimated from the generalized linear mixed model; error bars represent 95% confidence intervals.

Feedback	Contrast	Estimate (log-odds)	SE	z.ratio	p.value
Negative	Inclusion - Ostracism	-0.5010	0.208	-2.406	0.0426*
Negative	Inclusion - Shopping	-0.0294	0.210	-0.140	0.9892
Negative	Ostracism - Shopping	0.4715	0.204	2.312	0.0541

Feedback	Contrast	Estimate (log-odds)	SE	z.ratio	p.value
Positive	Inclusion - Ostracism	-0.3560	0.190	-1.877	0.1453
Positive	Inclusion - Shopping	0.1168	0.190	0.614	0.8123
Positive	Ostracism - Shopping	0.4728	0.186	2.545	0.0294*

Table 4.2: Post-hoc pairwise comparisons (Tukey-adjusted) for ostracism, shopping list and inclusion on the log-odds of persisting with a risky decision after receiving negative (a loss) or positive (a win) feedback. Statistically significant effects ($p < .05$) are denoted with a *.

Individual Differences

I next examined whether trait-level factors moderated persistence in risky choices. Six candidate traits were tested in separate logistic mixed-effects models: Behavioural Inhibition System (BIS), Behavioural Activation System components (Drive, Reward Responsiveness, Fun Seeking), Impulsivity, and Sensitivity to Punishment. Due to sample size constraints, each trait was modelled individually alongside Condition (Ostracism, Inclusion, Shopping), Feedback (Win vs. Loss), and their interactions, with a random intercept for participants. Correlations between traits and risk persistence are reported in Appendix (4F). Below we highlight results for Impulsivity and Sensitivity to Punishment, which showed significant moderation effects.

Impulsivity. Impulsivity did not show a significant main effect on risk persistence *(β = 0.0166, SE = 0.0246, z = 0.676, p = .499, (OR = 1.01, 95% CI [0.97, 1.06]).* **T**here was a significant main effect of Positive Feedback (winning the previous round) on risk persistence (β = 2.937, SE = 0.964, z = 3.046, p = .0023, (OR = 18.86, 95% CI [2.85, 124.77]), confirming that participants who had won on the previous trial were more likely to remain with a risky option overall. Critically, there was a three-way interaction between recalling ostracism, winning the previous round, and trait impulsiveness on risk persistence *(β = 0.0355, SE = 0.0177, z = 2.007, p = .0448, (OR ≈ 1.04, 95% CI [1.00, 1.07]).* This indicates that among those who recalled ostracism, higher levels of Impulsivity were associated with an increased likelihood of persisting with risky choices following positive feedback. Similarly, there was another significant three-way interaction between the Shopping (neutral recall) condition,

Positive Feedback and *Impulsivity*, *(β = 0.0569, SE = 0.0201, z = 2.830, p = .0047 (OR ≈ 1.06, 95% CI [1.02, 1.10]).* This suggests that impulsive participants under a neutral recall context similarly exhibited a heightened tendency to persist with risky decisions following positive feedback.

Sensitivity to Punishment. Sensitivity to punishment did not show a main effect on persistence *(β = -0.0567, SE = 0.0308, z = -1.840, p = .0657, (OR = 0.95, 95% CI [0.89, 1.00]).* However, there was a significant main effect of Positive Feedback (winning the previous round) *(β = 0.7315, SE = 0.2278, z = 3.211, p = .0013, (OR = 2.07, 95% CI [1.33, 3.25]),* confirming that participants who had won on the previous trial were more likely to persist with a risky option overall. Importantly, sensitivity to punishment moderated the effect of ostracism on risk persistence, *(β = 0.0967, SE = 0.0455, z = 2.127, p = .0334, OR = 1.10, 95% CI [1.01, 1.21]),* indicating greater risk persistence at higher levels of punishment sensitivity in the ostracism condition on average across feedback. In contrast, no significant interactions were observed for the Shopping (neutral recall) condition *(β = 0.0265, SE = 0.0473, z = 0.560, p = .5753, (OR = 1.02, 95% CI [0.95, 1.13]).* Additionally, none of the three-way interactions involving Condition, Feedback, and Punishment were significant (all p > .05).

Experiment 2 Discussion

The findings from Experiment 2 provide further evidence that recalling ostracism, relative to social inclusion or a control condition, is associated with increased risk-taking and risk persistence in the Iowa Gambling Task (IGT). Participants that recalled ostracism selected riskier choices more frequently on the Iowa IGT, suggesting that the cognitive and emotional effects of recalling ostracism influence decision-making patterns by motivating participants towards riskier decision-making. This aligns with prior evidence that ostracism impairs executive functions and fosters impulsive decision-making (Buelow et al., 2015; Duclos et al., 2013; Svetieva et al., 2016). Importantly, I found that the tendency to persist with risky choices was more pronounced in the ostracism condition, irrespective of win/loss feedback from previous rounds. Participants in every condition adjusted choices after feedback, staying risky more often after wins and switching more often after losses. Interestingly, there was no evidence that ostracism reduced feedback sensitivity. Instead, recalling ostracism

increased the overall likelihood of persisting with risky choices. This pattern fits accounts in which exclusion threatens core needs and promotes approach-oriented responding (Jonas et al., 2014; Williams, 2009). This persistence supports theories suggesting that ostracism acts as a coping response aimed at regaining a sense of control or agency (Duclos et al., 2013). The effect is therefore best described as an additive shift toward risk persistence under ostracism rather than a deficit in feedback sensitivity. Conversely, inclusion and the neutral task (shopping list) produced comparable behaviour, consistent with the view that inclusion stabilises self-regulation rather than enhancing it (Bernstein & Claypool, 2012).

A significant development of Experiment 2 was the role of individual differences, particularly impulsivity and sensitivity to punishment, in shaping risk persistence. Higher levels of impulsivity were associated with an increased likelihood of persisting with risky choices in the ostracism condition, especially following positive feedback. This suggests that impulsive individuals may be particularly vulnerable to the effects of ostracism, as the emotional arousal induced by exclusion reduces sensitivity to losses and reinforces a preference for short-term gains over adaptive feedback responses (Heatherton & Wagner, 2011). However, and a similar pattern appeared in the neutral shopping condition, which suggests that positive feedback can unlock risk persistence among more impulsive participants in both contexts. Further, higher punishment sensitivity predicted more risk persistence when participants recalled ostracism. This held after wins and after losses, which points to a general elevation in risk persistence rather than a change in how wins and losses were used. Exclusion appears to couple with threat sensitivity to keep people on a riskier course on average while the normal reduction in risk after losses remains (Gray, 1994). These findings underscore that ostracism and inclusion elicit distinct patterns of risk-taking and risk persistence influenced by personality traits, highlighting the interplay between social experiences and individual predispositions (Gray, 1994). These findings show that the impact of ostracism on risk-taking and risk persistence varies with personality, particularly impulsivity and sensitivity to punishment, whereas there was no evidence of comparable moderation in the inclusion or neutral conditions. This pattern highlights the interplay between social context and individual predispositions and extends prior work by demonstrating that ostracism-related risk behaviour is trait-contingent. Future research

should test whether other traits (for example reward sensitivity) also moderate these effects.

General Discussion

It has been conceptualized that human decision-making in risk-reward contexts hinges on feedback learning, where adaptive behaviours are reinforced by decision-making that primarily avoids losses and maximises rewards (Schunk, 2003). Ostracism has been shown to impair emotional regulation and cognitive flexibility, potentially leading to maladaptive risk-taking (Baumeister et al., 2001; Buelow & Wirth, 2015; Lustenberger and Jagacinski, 2010). Here, I sought to address two critical questions: a) does recalling ostracism lead individuals to persist with risky gambling choices following a loss, and additionally, b) to what extent do key individual differences (such as impulsivity and sensitivity to punishment) moderate these effects. Using an autobiographical recall paradigm, I compared ostracism with inclusion and two distinct control conditions: physical pain (Experiment 1), and a shopping list (Experiment 2). This refinement aimed to disentangle whether the effects of ostracism stem from a meaning-based threat response or general distress, and allowed us to examine the impact of ostracism from general negative experiences.

The current research extends existing evidence that ostracism impairs important cognitive functions (Buhs et al., 2006; Parker & Asher, 1987; Wentzel & Caldwell, 1997; Zhu et al., 2024), as well as enhances risk-taking behaviour (Buelow et al., 2017; Duclos et al., 2013; Svetieva et al., 2016; Twenge et al., 2002), by showing that recalling ostracism enhances risk-taking, and promotes greater risk persistence. Furthermore, I highlight crucial individual differences that influence these processes, showing that risk persistence is not uniform but varies with traits such as impulsivity and sensitivity to punishment. These findings open avenues for further research, emphasizing the need to consider both environmental and personal contexts when addressing ostracism's effects on decision-making. Across both experiments, participants who recalled ostracism engaged in riskier choices compared to those recalling inclusion or performing a neutral task. These results align with General Process Models of Threat-Defense which argue that ostracism disrupts core psychological needs such as belonging and control, motivating compensatory behaviours aimed at restoring these threatened need (Jonas et al., 2014; Proulx et al., 2012).

Indeed, these models propose that self-related threats first activate anxiety-based avoidance (BIS), followed by approach-oriented responses (BAS) designed to alleviate distress. According to this perspective, threats to fundamental psychological structures (e.g., belonging, agency, self-worth) elicit compensatory behaviours aimed at re-establishing equilibrium. Although prior work links ostracism to reductions in executive function relevant to adaptive decision making (Buhs et al., 2006; Chen et al., 2025; Parker & Asher, 1987; Wentzel & Caldwell, 1997; Zhu et al., 2024), the present two experiments offer a different perspective. Recalling ostracism increased the overall likelihood of persisting with risky choices, but it did not weaken learning from feedback. Participants in all conditions persisted more after wins and switched more after losses to a similar extent. The effect of ostracism is therefore best described as an additive shift toward risk persistence rather than a deficit in feedback processing.

Interestingly, Experiment 1 showed little separation between ostracism and physical pain in post-hoc tests. Ostracism increased risk persistence relative to inclusion, while physical pain did not differ from inclusion, and ostracism did not differ from physical pain. One plausible reason is that both recollections engaged a common threat system. Prior work suggests partial overlap between social and physical pain in the dorsal anterior cingulate and anterior insula, regions implicated in affective distress and control monitoring (Eisenberger et al., 2003; MacDonald & Leary, 2005; Riva et al., 2011). More broadly, risk taking after aversive recall may reflect general mechanisms such as heightened arousal, transient reductions in cognitive control, or threats to meaning and agency that bias behavior toward approach, rather than social pain alone. Future work should use standardized nociceptive controls and tighter recall prompts to sharpen the contrast between social and non-social threat.

A key finding in Experiment 2 was a moderation analysis testing the role of individual differences in shaping risk persistence. As little is known about what individual differences moderate the effects of ostracism on risky decision-making, I investigated key traits that have been significant predictors of risky behaviour previously (Carver & White, 1994; Corr, 2004; Moeller et al., 2001; Smillie et al., 2006; Whiteside & Lynam, 2001). Two patterns stood out. First, impulsivity did not show a main effect, but it strengthened risk persistence after wins in the ostracism condition, as shown by a significant three-way interaction among

ostracism, feedback wins (winning a trial), and impulsivity. The same win-contingent pattern also appeared in the neutral shopping condition. This is consistent with accounts that link impulsivity to stronger approach after reward and a tilt toward immediate gains (Carver & White, 1994; Moeller et al., 2001; Whiteside & Lynam, 2001; Smillie et al., 2006; Heatherton & Wagner, 2011). These findings also align with theories that social exclusion heightens motivational salience, leading to paradoxical behaviours, such as engaging in risk as a means to regain control or mitigate distress (Gray, 1994; Downey et al., 1996). Second, sensitivity to punishment did not show a main effect, but it moderated the effect of ostracism on risk persistence when averaged across feedback. Higher punishment sensitivity predicted greater persistence in the ostracism condition, and there was no reliable three-way with feedback. This fits BIS/BAS models in which trait sensitivities tune approach - avoidance balance and can bias choice under threat of exclusion (Gray, 1994; Carver & White, 1994). Taken together, the trait findings suggest that ostracism shifts baseline toward risk persistence, and this shift is amplified in those higher in impulsivity and in sensitivity to punishment. These findings further contribute to the broader literature on social pain by illustrating how trait-level factors, such as impulsivity and punishment sensitivity, modulate responses to exclusionary experiences.

Limitations and future research

While these findings provide insight into the relationship between ostracism, risk-taking and feedback sensitivity in gambling tasks, several limitations should be noted. Firstly, the experimental context may not fully capture the complexities of real-life risky decision-making. While the IGT has been informative in understanding cognitive and emotional processes involved in risk and reward sensitivity, it has received several criticisms such as what specific psychological mechanisms the task that targets (Stocco et al., 2009), as well as concerns about repetition effects (Buelow & Suhr, 2013), and questions of whether the task correlates to real life decision-making. Additionally, although the recall task shifted mood and behaviour, it lacks standardization as participants draw on idiosyncratic memories that vary in recency, intensity, and context, which introduces measurement noise and potential demand. While this task holds ecological validity, other standardized tools like Cyberball (Williams & Jarvis, 2006) may provide tighter experimental controls and clearer causal inferences. Further, there was a non-significant contrast test in risk persistence between

ostracism and physical pain conditions. This overlap in behavioural outcomes highlights the challenge of disentangling the specific effects of ostracism from the general distress associated with aversive experiences. While ostracism is theorised to uniquely threaten core needs such as belonging and control (Williams, 2009), the shared activation of neural regions involved in processing social and physical pain (e.g., the Dorsal Anterior Cingulate Cortex) may explain some convergence in their behavioural effects (MacDonald & Leary, 2005). Future research should explore whether the intensity, context, or immediacy of the threat (e.g., using real-time paradigms) influences this overlap, as well as investigate individual differences in sensitivity to these experiences.

Conclusion

Across two experiments, recalling ostracism increased risk persistence relative to inclusion, a neutral task, and an aversive physical pain control. Crucially, there was no evidence that ostracism impaired feedback sensitivity. In all conditions participants stayed risky after wins and switched after losses. Ostracism simply raised the baseline likelihood of persisting with risk at both win and loss. The effect was clearest relative to the neutral task and inclusion, with some overlap with physical pain in Experiment 1. Impulsivity magnified risk persistence after wins, and sensitivity to punishment did so on average. Together these findings show that a common social threat can bias sequential choice toward continued risk and point to interventions that restore belonging and control. Across two experiments, I provide further evidence for how recalling ostracism tilts choices toward continued risk, advancing accounts of exclusion and decision making.

5. General Discussion

The research presented in this thesis contributes to a large body of research suggesting that ostracism is a potent social threat that uniquely threatens psychological needs such as belonging, control and self-esteem (Williams, 2007). While much is known about the effect of ostracism on psychological health, the aim of this thesis was to investigate whether ostracism leads to changes in risky decision-making, and to further test what key individual differences are implicated in this process. The work presented in this thesis contributes to an emerging literature demonstrating that both recalling and experimentally inducing ostracism disrupts cognitive-emotional processes involved in risky decision-making, susceptibility to peer influence and adaptive decision-making. In addition, the work presented here identifies several key individual differences that moderate the effects of ostracism on risky decision-making.

In this chapter, I first summarise the findings from the experiments that were presented in this thesis and offer an overview of how these findings can be considered in the context of the specific limitations from the methodologies that were used. I then review how these findings challenge, consolidate and extend existing theories on the topic. Finally, I offer suggestions and considerations of how these findings have implications for future research, psychological interventions, as well as speculating on the broader implications in health and educational areas.

5.1. Summary of findings

Traditional research on ostracism has largely examined its emotional and behavioural impacts, such as psychological distress, prosocial behaviour, aggression, and social withdrawal, yet relatively little is known about how ostracism might spur risk-taking, especially in social contexts. Williams' (2009) Temporal Need Threat Model **(TNTM) (see 1.2.3.),** suggests that ostracism disrupts four fundamental needs; belonging, control, self-esteem, and meaningful existence, driving individuals to seek rapid ways of restoring these needs. Recently, Chen et al. (2025) extended this framework by highlighting how self-regulation failure, affective dysregulation, and cognitive alterations underpin various negative outcomes, including aggression, extremism, workplace disengagement, and academic withdrawal. This expanded perspective incorporates individual moderators and

contextual factors (e.g., cultural norms), highlighting that the path from ostracism to maladaptive behaviour is rarely linear, and that there is significant heterogeneity amongst responses depending upon the individual, the social context, and whether the path to re-inclusion exists. Moving beyond the TNTM, the General Process Model of Threat and Defence (Jonas et al., 2014; Proulx et al., 2012) offers a broader explanation **(see 1.2.2)**, suggesting that fundamental threats trigger approach-oriented compensatory responses, potentially leading to heightened risk-taking. Social homeostasis theories (Matthews & Tye, 2019) **(see 1.2.1)** similarly describe how a disruption to social homeostasis drives a renewed urgency to reconnect and promotes a hypersensitivity to social rewards. Other theories, such as Compensatory Control Theory (Landau et al., 2015) underscore how a threat such as ostracism, undermines a sense of control, prompting some individuals to take risks in domains outside of the area that the threat occurred in to regain autonomy or project confidence. Likewise, mood repair processes (Twenge et al., 2002) suggest that negative affect arising from ostracism propels individuals toward high-reward behaviours that offer immediate emotional relief, even if that behaviour occurs with a cost (e.g., unhealthy eating). While the field is yet to converge on a unifying theory as to why, when and for whom ostracism leads to risk-taking, taken together, these theories suggest that ostracism can heighten risk-taking through multiple, interacting pathways, shaped by individual vulnerabilities and social contexts, while underscoring the importance of understanding these mechanisms to mitigate potentially harmful outcomes.

As such, in the first experiment presented in **Chapter 2** I tested how recalling an experience of ostracism relative to inclusion influenced health risk perceptions and susceptibility to peer-provided risk ratings, examining whether the presence of peer influence and the direction of the peer ratings (more or less risky than the participants initial rating) influenced subsequent ratings. The results highlighted that participants who recalled being ostracised exhibited lower risk perception than those who recalled inclusion, supporting the hypothesis that ostracism leads to lower risk perception. In line with the TNTM model **(see 1.2.3),** ostracized individuals demonstrated heightened conformity to peer risk ratings, suggesting a heightened conformity to peer influence. Broadly, this in line with other research examining the effects of ostracism on susceptibility to peer influence (Carter-Sowell et al., 2008; Riva et al., 2014). Here, I extend previous findings in two ways. Firstly, I found that ostracized

participants conformed more to risk-averse peers than to risky peer judgements. Suggesting that while the social context can be a proponent for risk-taking, risk averse peers may also be a buffer for ostracised peers against risk-taking, offering a potential route for intervention. I further extended this finding by showing that baseline individual differences in risk-taking, specifically how much negative consequences that an individual perceives will arise from engaging in the risk provided to be a significant moderating factor for ostracism-induced risk-taking, while identifying that the amount of risk that an individual had previously engaged in was another significant predictor of risk-taking.

In the follow-up experiment in **Chapter 2,** I furthered this with another experiment that aimed to investigate three changes from Experiment 1. Firstly, I changed the task from risk perception to risk behaviour in the Social Balloon Analogue Risk Task (SBART; Tomova & Pessoa, 2018). Secondly, I changed the method of inducing ostracism from a recall-based method to experimentally induced ostracism via Cyberball (Willaims & Jarvis, 2006). Lastly, I aimed to test whether any effects in risk-taking or susceptibility to peer influence were driven by individual differences in rejection sensitivity. I did this, as theoretical frameworks suggest that rejection sensitivity is a key factor in shaping behavioural responses to social exclusion, particularly in contexts involving decision-making under uncertainty. For example, the Rejection Sensitivity Model (Downey & Feldman, 1996) states that individuals high in rejection sensitivity exhibit heightened vigilance towards social exclusion, which triggers affective and cognitive responses aimed at mitigating the perceived threat. As such, these individuals are more likely to engage in behaviours that restore social connection or alleviate distress, which can manifest as increased risk-taking when influenced by social rewards (Romero-Canyas & Downey, 2013).

The results of this experiment confirmed that experimentally induced ostracism leads to risk-taking behaviour, a heightened sensitivity to peer influence, and that the effects of ostracism on risk-taking and susceptibility to peer influence were contingent on individual differences in rejection sensitivity. Interestingly, in comparison to Experiment 1, here I found that in a rewards-based task, ostracized participants conformed more to neutral risk peers than to risk-averse judgements, suggesting that the presence of rewards moderate the preference for social context. The findings of this experiment confirm that ostracism is a potent social threat, that drives changes in risky decision-making and susceptibility to peer influence.

Consistent with models explaining how ostracism leads to behavioural changes (Chen et al., 2025; Williams, 2009), I confirm these theoretical models by demonstrating that ostracism leads to significant behavioural alterations, altering how risk is perceived, as well as leading to changes in susceptibility to the immediate social context. In addition, I found that rejection sensitivity moderated the effect of ostracism and peer influence. This is consistent with past literature that has stated that in rejection-sensitive individuals, ostracism activates a defensive motivational system (Downey et al., 2004), leading them to prioritise immediate social reinforcement over long-term consequences, making them more susceptible to peer influence. This aligns with findings that socially excluded individuals exhibit increased sensitivity to reward cues and a diminished capacity for loss aversion (Baumeister & Leary, 2017; Twenge et al., 2007). The findings of **Chapter 2** show that this individual difference elaborates into risk-related contexts. This provides further empirical support for the hypothesis that risk-taking in social contexts is not only shaped by the immediate experience of exclusion but also by individual differences in sensitivity to social threat and reward contingencies.

The findings of **Chapter 2** suggest that both recalling ostracism, and ostracism via Cyberball (Williams & Jarvis, 2006) lead to decreased health risk perception, and increased risk-behaviour in a rewards-based risk-taking task, increasing susceptibility to social influence. However, this a general limitation given that both results were based in experimental lab-based tasks which limit the ecology of the research, given that the magnitude of the effect that experimentally induced peer influence would have, as well as there are likely significant differences between how an individual would take risks in real-life situations. This offers wider promise for future research to exist in naturalistic settings using longitudinal and network-based analysis to test if these effects correlate to real life.

In Chapter 3 I investigated how a previously used behavioural task designed to manipulate affective and deliberate judgements in risk contexts (Finucane et al., 2000) influenced risk and benefit perception following participants recalling either ostracism or inclusion. This experiment was grounded in a domain-specific risk hypothesis, which suggests that risk-taking tendencies vary by context rather than occurring uniformly across all domains (Blais & Weber, 2006). Specifically, I tested a *bidirectional risk* hypothesis, suggesting that ostracism leads to lower risk perception in financial and health domains, where risk-taking may serve

as a compensatory strategy to regain control in financial domains (Duclos et al., 2013) or health risks as a result of pleasure seeking or lowered self-esteem (Twenge et al., 2002), while simultaneously increasing risk perception in social domains, where the threat of further exclusion would amplify social caution. This theory aligned with the Social Risk Hypothesis of Depression (Allen & Badcock, 2003), which proposes that depressed mood functions as a risk-averse adaptation in social contexts, minimizing behaviours that would lead to further exclusion. Given that ostracism is known to increase feelings of burdensomeness (Wirth et al., 2021), dehumanization (Bastian & Haslam, 2010), and lower psychological need satisfaction (Williams, 2007), it follows that ostracized individuals exhibit heightened social risk perception as a protective mechanism to avoid further rejection. Furthermore, in this experiment I examined whether any domain-specific changes were affect-driven or whether these changes persisted in deliberate decision-making settings by examining time-pressure as a moderating factor.

The results of **Chapter 3** confirmed my bi-directional hypothesis, by demonstrating that recalling ostracism led to heightened social risk perception, yet lower risk perception in financial and health domains. Comparatively, the results of this experiment revealed a dual-process effect: under time pressure, ostracized participants relied more heavily on affective processing, leading to exaggerated risk perceptions in social domains and reduced risk perceptions in financial and health domains. However, even in non-time-pressured conditions, the effect of ostracism on risk-taking persisted, suggesting that it is not solely driven by heightened affect but also reflects a broader cognitive restructuring of risk perception following social exclusion. This finding is significant as it suggests that ostracism-induced changes in risk perception are not transient emotional reactions but rather enduring cognitive biases, influencing decision-making even when individuals have time to engage in deliberative reasoning. This aligns with research on the lasting cognitive consequences of ostracism, suggesting that ostracism has significant effects on cognition, disrupt executive functioning, and alter risk-reward evaluation (Buelow & Wirth, 2017; Williams, 2007). By demonstrating that affective changes, driven by time pressure, amplifies, but does not entirely account for, the effects of ostracism on domain specific risk perception, I highlight both the immediate affective consequences and cognitive alterations that occur following ostracism, confirming the multiple process model of ostracism (Chen et al., 2025). These

results underscore the importance of considering both context-specific risk tendencies and situational pressures when assessing the psychological consequences of ostracism, particularly in applied settings where decision-making under stress or time constraints is common.

Finally, in **Chapter 4**, our primary aim was to determine whether recalling an experience of ostracism, as opposed to inclusion or a neutral/aversive control condition, would increase both the frequency of risky choices and persistence in those choices despite negative feedback. Building on theoretical models such as the Temporal Need-Threat Model (Williams, 2009) and the General Process Model of Threat and Defence (Jonas et al., 2014), I hypothesised that recalling ostracism disrupts fundamental psychological needs, such as belonging, control, self-esteem, thereby impairing feedback sensitivity processes to wins or losses that ordinarily promote caution following losses. To do this, I used the Game of Dice Task and the Iowa Gambling Task, both of which assess adaptive shifts in behaviour following trials (Bechara et al., 1994; Brand et al., 2005). I specifically tested whether recalling ostracism would uniquely dampen an individual's adaptive responses to losses, and promote a maladaptive focus on short-term gains. Importantly, I also considered how key individual differences (e.g., impulsivity; Moeller et al., 2001, and sensitivity to punishment; Gray, 1994) might moderate these effects. This was an important empirical aim given that little is known about how individual differences influence behavioural responses to ostracism.

Across studies, recalling ostracism increased the overall rate of risky choices and increased risk persistence relative to inclusion and the neutral control. Participants in every condition still adjusted after feedback, staying risky more often after wins and switching more often after losses, however, there was no evidence that the effect of feedback (winning or losing a trial) led to changes in risk persistence. As such, the ostracism effect on risk is best described as an additive upward shift in risk persistence rather than a reduction in feedback sensitivity. This pattern fits accounts in which exclusion threatens core needs and promotes approach-oriented responding (Jonas et al., 2014; Proulx et al., 2012; Williams, 2009). For individual differences, higher impulsivity predicted greater risk persistence after wins in the ostracism condition, with a similar pattern in the neutral condition. Higher sensitivity to punishment was associated with greater risk persistence in the ostracism condition on average across feedback. Together, these findings indicate that ostracism shifts

the baseline tendency to persist with risk, and that this shift is stronger for more impulsive participants and for those higher in punishment sensitivity, while basic sensitivity to wins and losses remains intact. These results converge with prior work linking exclusion to greater risk taking and compromised self-regulation (e.g., Baumeister et al., 2005; Buelow & Wirth, 2017; Duclos et al., 2013; Svetieva et al., 2016).

5.2. Methodological limitations & considerations

The findings of this thesis presented in **Chapters 2, 3, and 4** contribute to our understanding of how ostracism influences risky decision-making, and the contributing role of individual differences in this process. However, these findings must be interpreted within the context of several methodological limitations and considerations. While I discuss limitations in each Chapter of the experiments specifically, here I offer specific limitations that should be considered in relation to findings presented in this thesis.

Firstly, the reliance on university student samples across the experiments limits the generalisability of the findings. Broadly speaking, University students, often described as WEIRD (Western, Educated, Industrialised, Rich, and Democratic) samples (Henrich et al., 2010), represent a narrow demographic group in terms of age, socio-economic background, and educational performance. This demographic homogeneity may not fully capture the variability in responses to ostracism seen in broader populations. For instance, adolescents and older adults may exhibit different social motivations and vulnerabilities to ostracism due to developmental and relational differences (Blakemore & Mills, 2014). Consequently, relying predominantly on a WEIRD sample raises concerns regarding the cross-cultural and cross-demographic relevance of the findings, as social experiences and responses to ostracism may vary substantially across different cultural and economic contexts. Indeed, a recent review by Chen et al. (2025) highlighted the role of culture and economic contexts in moderating responses to ostracism. For example, across a series of studies Over and Uskul (2016) found that children from interdependent farming communities judged ostracism to be less distressing than children from more independent herding communities, suggesting that cultural frameworks shape both the perception and impact of exclusion. Similarly, Pfundmair et al. (2015) reported that individuals from collectivist cultures exhibited greater resilience to ostracism, likely due to stronger social networks that buffer against exclusion. These findings underscore the importance of broadening participant diversity beyond

WEIRD samples to better understand how sociocultural factors shape susceptibility to and recovery from ostracism. Beyond cultural influences, individual differences in socio-economic background may further moderate the impact of ostracism. For instance, Petsnik and Vorauer (2023) propose that individuals from lower socioeconomic backgrounds experience chronic relational devaluation, which reduces perceived control and heightens sensitivity to ostracism. Their Perceived Control-Relationally Devaluing Experiences Model suggests that this lack of control amplifies distress in response to ostracism, making individuals more likely to engage in compensatory behaviours, offering a significant avenue for future research to consider.

Across four of the experiments, the use of autobiographical recall as a method of inducing memories of ostracism introduces several considerations. While this method benefits from ecological validity by drawing on participants' real experiences, and as is the case in **Chapter 4**, allows for more precise control conditions, this methodology is also susceptible to variability in memory accuracy and differences in emotional potency of the memory recalled (Bernstein & Claypool, 2012), highlighting the need for this research to be replicated using other methods of ostracism. One limitation of this approach is that I did not measure effort-related variables such as time spent writing, subjective effort, or narrative engagement. Although prompts and word limits were matched across conditions, it remains possible that differences in recall effort could have influenced outcomes. Such effects would most likely introduce random noise rather than systematically bias one condition, yet future studies should preregister and record effort indices to examine their potential role more directly. Further, all participants accounts were shredded, and not read through, meaning that I never attained rich information about the task. A qualitative or mixed-methods approach (e.g., interviews or diary studies) could clarify how people interpret exclusion events, anticipate inclusion, and regulate behaviour in everyday settings, adding ecological nuance to the experimental findings. Moreover, emotional intensity and vividness of recalled events may differ between participants, potentially leading to heterogeneity in their responses. Moreover, the reliance on self-reported recall limits control over the specific features of the ostracism experience being studied, such as its duration, severity, or the context in which it occurred. This variability makes it difficult to isolate the specific effects of ostracism on subsequent risk-taking behaviours.

While this thesis does benefit from the addition that in **Chapter 2**, I found that inducing risk-taking via Cyberball also lead to significant effects in risk-taking, providing evidence that the effect does transfer across manipulations. Interestingly, given that there is not currently a non-social version of Cyberball, it makes it difficult to rule out whether observed effects reflect a specifically social mechanism or a more general expectancy violation. Converging neuroimaging evidence suggests that brain regions often labelled as the "pain network" may instead track discrepancies between expected and experienced inclusion, since they respond both to exclusion and over-inclusion (Cacioppo et al., 2013; Cheng et al., 2020; Dalgleish et al., 2017; Tomova et al., 2022; Vijayakumar et al., 2017). In this thesis, I did not isolate expectancy from social exclusion, which is therefore a limitation. Future work should include non-social omission controls (e.g., an algorithm withholding throws on a fixed schedule with no avatars), over-inclusion conditions, and preregistered ratings of expected inclusion to directly test expectancy-violation accounts alongside social exclusion effects.

In terms of the experimental dependant measures, the results from this thesis must also be considered with broad limitations. Firstly, all experimental tasks used in this thesis were lab based under controlled conditions. This raises a broad limitation given that all experiments are devoid of either ostracism in real life, or the dependant measures are limited to hypothetical or simulated risk-taking behaviours rather than real-world decision-making contexts. While lab-based tasks offer high internal validity by controlling for extraneous variables, they may lack ecological validity, as real-life risk-taking is often influenced by dynamic social, emotional, and environmental factors that cannot be fully captured in experimental settings (Harrison & List, 2004). For example, decisions involving financial risk, social risk, or health risk in real-world contexts are subject to long-term consequences, personal stakes, and unpredictable social pressures, which may not be adequately reflected in controlled lab environments. Additionally, responses to ostracism in real life may be more complex and enduring, involving persistent rumination, social withdrawal, or compensatory behaviours that extend beyond the immediate experimental session (Williams, 2009). Future research should complement lab-based findings with naturalistic or longitudinal approaches, such as experience sampling methods or real-world behavioural tracking, to enhance the generalizability of these effects.

The results from **Chapter 2** also highlight limitations in the peer influence task design. Although peer influence was simulated through pre-programmed risk ratings, this approach may not fully replicate the complexities of real-world peer interactions. In real-life contexts, peer influence is multifaceted and often involves nuanced social dynamics that are difficult to capture in a laboratory setting (Chein et al., 2011). Additionally, the task's reliance on participants' perceptions of fictitious peer ratings could introduce a level of artificiality, potentially diminishing the ecological validity of the findings.

In **Chapter 3**, the development of a novel behavioural task to assess risk and benefit perception across different domains provides valuable insights into the heterogeneity of ostracisms effects on risk-perception in distinct domains (financial, health and social). However, a limitation of this task is that it measures risk and benefit perceptions through hypothetical scenarios rather than actual risk-taking behaviour. This reliance on hypothetical judgments may limit ecological validity, as real-world decisions often involve more complex and emotionally charged contexts that may not be fully captured by laboratory-based tasks. Additionally, the task's broad categorization of risk domains (financial, health, social) could overlook subtle, domain-specific factors such as individual familiarity with certain risks or cultural variations in risk assessment, potentially affecting the generalizability and depth of interpretations derived from the findings. One interesting effect to note in Chapter 3 was the interaction between risk domain and response times. This suggests that certain categories (e.g., financial or social) may inherently elicit slower or faster judgements. Such differences indicate that task demands may vary subtly across domains and should be considered when interpreting the findings.

The methodologies used in **Chapter 4** are also subject to several limitations. The gambling tasks designed to examine feedback sensitivity rely heavily on hypothetical scenarios and simulated environments, which may not fully capture the stakes and emotions associated with real-world decision-making, such as winning or losing money (Buelow & Suhr, 2013). Furthermore, while the inclusion of individual difference measures, such as impulsivity and sensitivity to reward and punishment, adds depth to the analysis, these constructs were assessed through self-report measures, which are inherently prone to biases such as social desirability or introspective limitations. Another key limitation lies in the relatively short

timeframe of the gambling tasks, which may not adequately represent the cumulative effects of ostracism on feedback sensitivity over extended periods.

In sum, while the studies presented in **Chapters 2, 3, and 4** offer valuable contributions to the literature on ostracism and risk-taking, these limitations underscore the need for cautious interpretation and for future research to address these methodological and sample-related constraints. By doing so, subsequent work can build upon these findings to provide a more comprehensive and generalisable understanding of the phenomena under investigation.

5.3. Implications for Theory, Research & Clinical Practice

5.3.1 Implications for Theory

This thesis makes a significant contribution to the growing literature on ostracism by demonstrating its role in risk-taking, susceptibility to peer influence, feedback sensitivity, and the moderating factors within this process. Prior research has primarily focused on how ostracism threatens fundamental psychological needs, such as belonging, self-esteem, control, and meaningful existence (Williams, 2009), prompting prosocial, antisocial, or avoidant behaviours. However, the findings presented in this thesis extend this framework by establishing risk-taking as a response to ostracism, influenced significantly by both individual differences and the broader social environment.

Across **Chapters 2–4**, I demonstrate that ostracism increases risk-taking in certain contexts, yet this effect is moderated by crucial factors including rejection sensitivity, baseline risk-taking tendencies, the presence of rewards, and the peer context. These findings resonate with contemporary theoretical models suggesting ostracism acts as a potent social threat, disrupting self-regulation, reward processing, and motivational systems (Chen et al., 2025; Jonas et al., 2014; Matthews & Tye, 2019).

Importantly, my findings support the General Process Model of Threat and Defence (Jonas et al., 2014), which proposes that threats like social exclusion initially trigger inhibitory responses characterised by anxiety and hypervigilance. Subsequently, individuals shift toward approach-oriented behaviours, such as risk-taking or peer conformity, as strategies to restore psychological equilibrium. My thesis highlights how risk-taking following ostracism

can serve dual adaptive functions: it may facilitate social reconnection through conformity to peer-endorsed risks, aligning with the social reconnection hypothesis (Maner et al., 2007), or serve as an autonomous compensatory control mechanism driven by efforts to reassert a threatened sense of control (Landau et al., 2015).

Moreover, the present findings offer refinements to our understanding of the Temporal Need-Threat Model (TNTM; Williams, 2009), by illustrating that post-ostracism risk-taking is not merely an impulsive or reactive phenomenon but is systematically shaped by reward contingencies and social contexts. **Chapter 2** underscores the significant role of peer influence, supporting the assertion that peer norms moderate behaviours during the reflective stage of TNTM. Additionally, these insights align with updated versions of the TNTM framework (Chen et al., 2025), emphasising cognitive alterations and affective dysregulation as central mechanisms underpinning behavioural responses to exclusion.

Finally, these findings reinforce the importance of broader theoretical perspectives, such as social homeostasis (Matthews & Tye, 2019) and mood repair mechanisms (Twenge et al., 2002), in understanding why individuals adopt risk-taking behaviours following social threats. Collectively, this thesis advocates for future theoretical models to more comprehensively incorporate individual variability and situational influences when predicting behavioural outcomes of ostracism.

5.3.2. Implications of research

This research demonstrates three key consequences of ostracism: (1) increased risk-taking, and decreased risk perception, (2) heightened susceptibility to peer influence, and (3) altered cognitive processes affecting adaptive decision-making. However, it is essential to note that while these findings offer valuable insights, their translation into practical interventions requires cautious interpretation and further validation through clinical and applied research.

Educational contexts represent a significant area for potential interventions, given the pronounced impact of peer dynamics during adolescence (Blakemore, 2018; Tomova et al., 2021). **Chapter 2** demonstrated that susceptibility to peer influence increases after ostracism, and I showed that this can be used as a proponent to take greater risks, and to make risk-averse decisions. This illustrates that the peer context can either be a proponent

for risk-taking or risk-aversion, dependent upon the context. In education settings, this underscores the importance of fostering inclusive school environments that proactively address social exclusion and offer support systems that can buffer against maladaptive decision-making. Preventive inclusion-based initiatives may therefore play a critical role in mitigating the escalation of risk behaviours among adolescents. For example, peer-led interventions, have previously been shown to be effective in reducing risk-related behaviours (Yeager et al., 2013), suggesting that they offer a promising avenue.

The findings presented in **Chapter 3** indicate that ostracism diminishes the perceived severity of health-risk statements, bolstering past research linking social disconnection to self-destructive behaviours such as substance misuse and unhealthy eating (Twenge et al., 2002; Ranganath et al., 2022). Because ostracised individuals may adopt such behaviours as a form of mood repair, public health campaigns should consider socially integrated messaging strategies that emphasise the protective role of peer support networks. In particular, social norm interventions suggest that people are more inclined to adopt health-promoting behaviours when convinced that their peers endorse them (Schultz et al., 2007). Therefore, policymakers and health organisations could consider campaigns featuring narratives of social belonging, highlighting, for instance, how group norms and community participation reinforce healthy habits. Peer-led messages might be delivered through school-based workshops, online forums, or community programmes, ensuring that individuals not only receive information but also experience direct social reinforcement for positive lifestyle choices.

Finally, **Chapters 2 and 4** demonstrate significant individual differences, such as *rejection sensitivity, impulsivity, and baseline risk-taking tendencies*, as moderators of ostracism's impact on risk behaviours. These findings suggest potential directions for personalised interventions. For example, individuals high in rejection sensitivity may benefit from approaches focusing on emotion regulation, while interventions targeting impulse control might suit highly impulsive individuals. These findings could be useful at informing personalised clinical interventions. Nonetheless, these suggestions are speculative and require validation through clinical research before implementation.

In summary, although this thesis contributes meaningfully to the understanding of ostracism and risk-taking, the proposed practical applications - particularly within clinical settings -

must be carefully evaluated through further systematic investigation and empirical validation.

5.4. Future Directions

Throughout this thesis, I have offered several suggestions for how research into ostracism could be advanced. Below, I offer suggestions for future research that are timely and offer considerable concern based upon the results from this thesis.

The multifaceted consequences of ostracism on psychological health, cognition, and behaviour provide fertile ground for future research, with several pressing questions that warrant further inquiry. While significant advancements have been made in understanding the outcomes of ostracism, several areas remain underexplored. This section highlights key gaps in the literature and proposes directions for future investigation.

First, as highlighted in **Chapter 3** the phenomenon of solitude-seeking as a behavioural response to ostracism (Ren et al., 2015) warrants greater attention. Indeed, evidence in this thesis presents converging evidence that one mechanism that drives this is by increasing an ostracized individual's perception of social risk-taking **(see Chapter 3)**, suggesting that ostracised individuals become more socially withdrawn and perceive additional costs of social rejection as higher. This is important given that a wealth of empirical evidence points to the negative effects of social isolation, such as increased mortality risk (for a meta-analysis, see Holt-Lunstad et al., 2010). As a self-perpetuating behaviour, solitude-seeking may have long-term implications for mental health and social reintegration, yet its underlying mechanisms and moderating factors remain poorly understood.

From a developmental perspective, research has indicated that ostracism impairs academic and cognitive performance, yet its broader effects on students' academic long-term successes remain underexplored and represents a critical developmental period during which social relationships take on heightened significance (Andrews, 2021; Blakemore et al., 2018; Tomova et al., 2021). As such, ostracism during this stage may disproportionately impact students' psychological well-being and academic functioning, given the unique sensitivity of adolescents to social feedback and inclusion. Importantly, adolescence is also marked by an increased propensity for risk-taking (Duell et al., 2018) and heightened susceptibility to peer influence which is known to be a significant precursor to risk-taking

(Steinberg, 2007). This is important given that the results of **Chapter 2** found that ostracism increased sensitivity to peer influence, suggesting that experiences of ostracism could amplify risky decision-making especially if the social context advocates for risk. Evidence further indicates that there may be age and gender related differences in the cognitive effects of ostracism. For instance, adolescent girls appear to be particularly vulnerable to the cognitive disruptions associated with ostracism, displaying greater impairments in working memory and executive function following exclusion compared to boys (Fuhrmann et al., 2019). These findings suggest a developmentally specific need for targeted and longitudinal research examining how these effects manifest over greater periods of time, and whether these findings maintain over a longer period.

Emerging technologies, particularly social media, present unique challenges for understanding ostracism. Social media has dramatically reshaped human communication, offering near-constant opportunities for online interaction (Vorderer et al., 2016). In the UK, 95% of adolescents aged 15 and older now actively use social media, while half of U.S. teenagers describe themselves as 'almost constantly online' (Orben et al., 2024). Although these platforms are central to everyday life, the implications for mental health and changes in cognition, particularly in the context of ostracism, remain understudied. Ostracism manifests in digital spaces through ignored messages, unanswered comments, or visible like counts (Schneider et al., 2017). However, unlike face-to-face exclusion, social media exclusion carries a lasting digital footprint, potentially amplifying its emotional impact (Vorderer et al., 2016). Adolescents, who are especially sensitive to peer feedback, may be disproportionately affected by these dynamics (Orben et al., 2024). As such further research is needed to clarify how social media ostracism intersects with adolescent developmental changes, such as heightened rejection sensitivity. Longitudinal studies would be especially valuable for assessing how these experiences evolve and influence mental health over time.

Finally, existing research on ostracism has generated compelling evidence of its influence on behavioural and psychological outcomes, but relatively few studies have explored effective clinical interventions to address these consequences. The findings in **Chapter 2** of this thesis illustrate one promising avenue for future interventions. It was found that the presence of *risk-averse* peers can reduce risk-taking judgements in individuals who have recalled ostracism. This highlights the dual role of the social context, which can either amplify or

mitigate risky behaviour following ostracism. Consequently, at an individual level, it is important for clinical interventions to incorporate a careful assessment of individual characteristics that might alter these effects. Two key factors that emerged from this thesis are an individual's own risk-taking patterns and their level of rejection sensitivity. By taking these differences into account, interventions can be more precisely tailored, ensuring that programmes designed to mitigate the effects of ostracism address the specific vulnerabilities and strengths of everyone.

5.5. Conclusion

In conclusion, this thesis provides evidence that ostracism is a significant predictor of risk-related decision-making, with effects that are moderated by peer influence and individual differences. By integrating insights from psychological, neurobiological, and social perspectives, this research advances our understanding of the complex interplay between social exclusion, risk-taking, and peer dynamics. The findings have important implications for theory, practice, and future research, offering a foundation for developing targeted interventions to mitigate the negative effects of ostracism on decision-making and well-being.

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Appendices

Chapter 2:

1A) Peer Influence Model 1 (included in-text):

Model: Rating Change ~ Condition * Signed Difference + (1 | Participant ID) + (1 | Scenarios)

Fixed Effects	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	1.468e-01	2.783e-02	2.296e+02	5.275	3.07e-07 ***
ConditionSocial INCLUSION	-3.152e-02	3.263e-02	1.730e+02	-0.966	0.335
SignedDifference	1.815e-01	3.339e-03	1.414e+04	54.362	< 2e-16 ***
ConditionSocial INCLUSION:SignedDifference	-3.521e-02	4.518e-03	1.476e+04	-7.793	6.96e-15 ***

REML criterion at convergence: 34978.9

Number of obs: 14850, groups: ParticipantID, 173; Scenarios, 90

1B) Peer Influence Model 2 modelling Direction of Influence and Magnitude of Influence as separate effects (Not included in-text)

Model: Rating Change ~ Condition * DirectionInfluence * MagnitudeInfluence +

(1 | ParticipantID) + (1 | Scenarios)

Fixed Effects	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	2.774e-01	3.525e-02	5.869e+02	7.871	1.71e-14 ***
ConditionSocial INCLUSION	7.734e-03	4.504e-02	6.435e+02	0.172	0.864
DirectionInfluenceLower	-3.034e-01	3.149e-02	1.466e+04	-9.636	< 2e-16 ***
MagnitudeInfluence	1.504e-01	8.700e-03	1.479e+04	17.287	< 2e-16 ***
ConditionSocial INCLUSION:DirectionInfluenceLower	1.741e-02	4.498e-02	1.466e+04	0.387	0.699
ConditionSocial INCLUSION:MagnitudeInfluence	-5.745e-02	1.301e-02	1.474e+04	-4.416	1.01e-05 ***
DirectionInfluenceLower:MagnitudeInfluence	-2.841e-01	1.107e-02	1.482e+04	-25.671	< 2e-16 ***
ConditionSocial INCLUSION:DirectionInfluenceLower:MagnitudeInfluence	7.371e-02	1.592e-02	1.473e+04	4.631	3.67e-06 ***

REML criterion at convergence: 34824.1

Number of obs: 14850, groups: ParticipantID, 173; Scenarios, 90

1C) Model on unconfounded data (not included in-text) (Testing to ensure that my hypothesis is not confounded by regression to the mean)

Model: Rating Change ~ Condition * SignedDifference +

(1 | ParticipantID) + (1 | Scenarios)

Fixed Effects	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-6.947e-03	3.580e-02	1.907e+02	-0.194	0.846364
ConditionSocial INCLUSION	8.195e-02	3.555e-02	1.723e+02	2.305	0.022352 *
SignedDifference	8.096e-02	5.582e-03	7.016e+03	14.505	< 2e-16 ***
ConditionSocial INCLUSION:SignedDifference	-2.879e-02	7.527e-03	6.944e+03	-3.825	0.000132 ***

REML criterion at convergence: 15916.6

Number of obs: 7027, groups: ParticipantID, 173; Scenarios, 90

1D) Individual Differences (Predicting Rating 1 with individual differences) (included in-text):

Model: Rating1 ~ PastInvolvement * Condition +

FutureExpectedInvolvement * Condition +

PositiveConsequences * Condition +

NegativeConsequences * Condition +

(1 | ParticipantID) + (1 | Scenarios)

Fixed Effects	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	5.776e+00	6.559e-01	1.760e+02	8.806	1.2e-15 ***
PastInvolvement	-4.904e-03	1.270e-03	1.621e+02	-3.860	0.000164 ***
ConditionSocial INCLUSION	-6.035e-01	9.428e-01	1.606e+02	-0.640	0.523044
FutureExpectedInvolvement	-4.793e-03	3.414e-03	1.627e+02	-1.404	0.162177
PositiveConsequences	-2.956e-02	7.350e-02	1.629e+02	-0.402	0.688062
NegativeConsequences	1.282e-01	1.043e-01	1.604e+02	1.229	0.220813
PastInvolvement:ConditionSocial INCLUSION	2.887e-03	2.284e-03	1.638e+02	1.264	0.207944
ConditionSocial INCLUSION:FutureExpectedInvolvement	-8.141e-04	5.513e-03	1.623e+02	-0.148	0.882802
ConditionSocial INCLUSION:PositiveConsequences	1.997e-01	1.066e-01	1.618e+02	1.872	0.062955 .
ConditionSocial INCLUSION:NegativeConsequences	2.999e-02	1.517e-01	1.607e+02	0.198	0.843526

REML criterion at convergence: 59166.8

Number of obs: 14700, groups: ParticipantID, 171; Scenarios, 90

1E) Peer Influence – Model 2 (Predicting Rating Change with individual differences)

Model: RatingChange ~ PastInvolvement * Condition +

FutureExpectedInvolvement * Condition +

PositiveConsequences * Condition +

NegativeConsequences * Condition +

(1 | ParticipantID) + (1 | Scenarios)

Fixed Effects	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	2.451e-01	2.023e-01	1.605e+02	1.212	0.2273
PastInvolvement	1.932e-03	4.018e-04	1.628e+02	4.808	3.45e-06 ***
ConditionSocial INCLUSION	-9.544e-02	2.972e-01	1.592e+02	-0.321	0.7485
FutureExpectedInvolvement	-6.962e-05	1.081e-03	1.633e+02	-0.064	0.9487
PositiveConsequences	-4.191e-03	2.328e-02	1.642e+02	-0.180	0.8574
NegativeConsequences	-6.840e-02	3.286e-02	1.589e+02	-2.081	0.0390 *
PastInvolvement:ConditionSocial INCLUSION	-1.824e-03	7.246e-04	1.656e+02	-2.518	0.0128 *
ConditionSocial INCLUSION:FutureExpectedInvolvement	-4.192e-04	1.744e-03	1.626e+02	-0.240	0.8104
ConditionSocial INCLUSION:PositiveConsequences	-1.100e-02	3.370e-02	1.618e+02	-0.326	0.7446
ConditionSocial INCLUSION:NegativeConsequences	4.947e-02	4.781e-02	1.593e+02	1.035	0.3023

REML criterion at convergence: 38231.5

Number of obs: 14700, groups: ParticipantID, 171; Scenarios, 90

Experiment 2 (SBART)

2A) Peer Influence Model – Predicting Rating Change With Condition and Trial Type (Influence)

Model: Rating Change ~ Condition * TrialType + (1 | ID)

ANOVA summary:

Effect	Sum Sq	Mean Sq	NumDF	DenDF	F value / Pr(>F)
Condition	2502	2502	1	155.0	3.7535 / 0.05452 .
TrialType	156794	78397	2	9179.2	117.6093 / < 2e-16 ***
Condition:TrialType	5594	2797	2	9179.2	4.1961 / 0.01508 *

LMM Summary (Fixed Effects Table):

Fixed Effects	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	0.9580	1.5790	194.8507	0.607	0.54475
ConditionInclusion	2.0220	2.2998	194.8156	0.879	0.38039
TrialType2	-11.7672	0.9004	9179.1267	-13.068	< 2e-16 ***
TrialType3	-6.4191	0.8997	9179.0221	-7.135	1.04e-12 ***
ConditionInclusion:TrialType2	3.4271	1.3113	9179.2113	2.614	0.00898 **
ConditionInclusion:TrialType3	3.1302	1.3105	9179.0572	2.389	0.01694 *

REML criterion at convergence: 87658.3

Number of obs: 9340, groups: ID, 157

2B) Peer Influence – Predicting Rating Change With Condition, Trial Type & Rejection Sensitivity (RS)

Model: Rating Change ~ Condition * TrialType * RS + (1 | ID)

ANOVA Full Model:

Effect	Sum Sq	Mean Sq	NumDF	DenDF	F value / Pr(>F)
Condition	144	144.5	1	152.0	0.2163 / 0.64256
TrialType	46957	23478.5	2	9124.4	35.1480 / 6.222e-16 ***
RS	1040	1040.0	1	151.9	1.5569 / 0.21405
Condition:TrialType	1918	958.9	2	9124.4	1.4355 / 0.23805
Condition:RS	63	63.5	1	151.9	0.0950 / 0.75833
TrialType:RS	5807	2903.4	2	9124.3	4.3465 / 0.01298 *
Condition:TrialType:RS	4229	2114.5	2	9124.3	3.1655 / 0.04224 *

Fixed Effects Model:

Fixed Effects	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	6.01952	4.01326	190.65826	1.500	0.135292
ConditionInclusion	4.02940	6.22547	190.79630	0.647	0.518252
TrialType2	-12.46833	2.28092	9124.05330	-5.466	4.71e-08 ***
TrialType3	-8.65145	2.27908	9123.99105	-3.796	0.000148 ***
RS	-0.51370	0.36887	190.52013	-1.393	0.165354
ConditionInclusion:TrialType2	-4.73016	3.54599	9124.46177	-1.334	0.182255
ConditionInclusion:TrialType3	0.84702	3.53759	9124.02311	0.239	0.810773
ConditionInclusion:RS	-0.16356	0.56420	190.66305	-0.290	0.772206
TrialType2:RS	0.06868	0.20951	9124.02307	0.328	0.743063
TrialType3:RS	0.22831	0.20926	9123.97408	1.091	0.275283
ConditionInclusion:TrialType2:RS	0.77947	0.32112	9124.34120	2.427	0.015230 *
ConditionInclusion:TrialType3:RS	0.20413	0.32036	9124.00836	0.637	0.524015

REML criterion at convergence: 87189.6

Number of obs: 9288, groups: ID, 156

2C) – Unconfounded Hypothesis Test Model: (RatingChange ~ Condition * TrialType + (1 | ID)

ANOVA Full Model:

Effect	Sum Sq	Mean Sq	NumDF	DenDF	F value / Pr(>F)
Condition	3408	3408	1	158.7	2.7827 / 0.09726 .
TrialType	347045	173523	2	3662.9	141.6777 / < 2e-16 ***
Condition:TrialType	10090	5045	2	3662.9	4.1190 / 0.01634 *

Fixed Effects Model:

Fixed Effects	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	4.587	2.602	220.076	1.763	0.0793 .
ConditionInclusion	1.233	3.760	215.940	0.328	0.7432
TrialType2	-25.998	1.856	3667.178	-14.009	< 2e-16 ***
TrialType3	-15.463	1.977	3657.202	-7.819	6.89e-15 ***
ConditionInclusion:TrialType2	6.248	2.720	3666.383	2.297	0.0217 *
ConditionInclusion:TrialType3	7.468	2.924	3659.968	2.554	0.0107 *

REML criterion at convergence: 37870.2

Number of obs: 3777, groups: ID, 154

2D)

Table 2.1. Means (SDs) of Rating Change by Condition and Peer Influence Type

Peer Influence Type	**Ostracism M (SD)**	**Social Inclusion M (SD)**
Low-risk peers	0.97 (33.6)	2.99 (31.3)
Neutral peers	-10.8 (29.0)	-5.25 (26.1)
High-risk peers	-5.46 (28.1)	-0.31 (24.0)

Chapter 3:

3A)

Social risk statements

Admitting that your tastes are very different from those of your friends

Defending an unpopular opinion that you believe in

Admitting that you listen to a singer or band that none of your friends like

Wearing clothes that are really different to your friends

Standing up for someone being mocked by your friends

Missing a popular friend's part that a lot of people are attending

Pro-Social statements

Helping a friend or colleague with a task

Sharing things that you have with your friends

Helping a stranger who is in need

Making your knowledge or opportunities available to those who need it

Helping others to avoid getting into trouble

Spending time with someone who feels lonely

Health risk statements

Riding a bicycle without a helmet

Picking up broken glass with your bare hands

Eating unhealthy (high fat/ sugar content) food

Taking an illegal drug at a social event

Spending an afternoon in the sun without any sun cream

Drinking tap water in a foreign country

Pro-Health Statements

Eating 5 or more servings of fruits and vegetables per week

Doing at least moderate exercise 3 or more times per week

Not smoking cigarettes

Getting enough sleep

Taking some time for relaxation

Reporting an unusual sign or symptom to a physician or Health professional

Financial Risk Statements

Investing in a high-risk stocks and shares portfolio

Betting a substantial amount of money at a casino

Gambling a week's wages on a bet that you think could win

Taking part in an illegal activity for a significant sum of money

Investing 10% of your money into a new business venture

Taking a job in which you get paid exclusively on a commission basis

Pro-Financial Statements

Completing a course that enhances employability

Attending a course on investing

Creating a monthly budget

Meeting with a financial advisor

Working hard to attain significant amount of material wealth

Working hard to attain a strong sense of financial security

3B)

Type III ANOVA results for the Risk Ratings model

Model examines the effects of time pressure (timed vs. non-timed), ostracism condition (ostracism vs. inclusion), and domain (financial risk, health risk, social risk, pro-financial behaviour, pro-health behaviour, prosocial behaviour) on *risk perception ratings*. Domain is treated as a within-subjects factor; time pressure and ostracism condition are between-subjects factors. Participant ID is included as a random intercept.

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
Time Pressure (Timed vs. Non-Timed)	13.9	13.95	1	233.5	14.02	<.001***
Experimental Manipulation (Ostracism vs. Inclusion)	3.8	3.80	1	233.5	3.82	.052
Domain	8135.0	1627.00	5	8310.6	1635.45	<.001***
Time Pressure * Experimental Manipulation	0.1	0.07	1	233.5	0.07	.787
Time Pressure * Domain	20.6	4.13	5	8310.6	4.15	<.001***
Experimental Manipulation * Domain	174.4	34.88	5	8310.6	35.06	<.001***
Time Pressure * Experimental Manipulation * Domain	13.4	2.69	5	8310.6	2.70	.019*

3C) Model is identical in structure to 3B, however, uses *benefit ratings* as the dependent variable. Domain is treated as a within-subjects factor; time pressure and ostracism condition are between-subjects factors. Participant ID is included as a random intercept.

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)
Time Pressure (Timed vs. Non-Timed)	3.9	3.93	1	232.6	4.12	.044*
Experimental Manipulation (Ostracism vs. Inclusion)	0.9	0.91	1	232.6	0.95	.330
Domain	9745.5	1949.11	5	8310.6	2043.62	<.001***
Time Pressure * Experimental Manipulation	0.0	0.00	1	232.6	0.001	.975
Time Pressure * Domain	12.8	2.56	5	8310.6	2.69	.020*
Experimental Manipulation * Domain	231.6	46.32	5	8310.6	48.57	<.001***
Time Pressure * Experimental Manipulation * Domain	5.0	1.00	5	8310.6	1.05	.387

3D) **Model examines the same predictors as 3B and 3C but combines *risk and benefit ratings* into a single variable, with rating type (risk vs. benefit) nested within the domain factor. This model tests whether the pattern of effects generalizes across both rating types simultaneously. Participant ID is included as a random intercept.**

	Sum Sq	Mean Sq	NumDF	DenDF	F value	Pr(>F)

Time Pressure (Timed vs. Non-Timed)	5.10	5.096	1	237.2	2.28	.132
Experimental Manipulation (Ostracism vs. Inclusion)	1.89	1.891	1	237.2	0.85	.358
Domain	673.29	134.658	5	16883.1	60.34	<.001***
Time Pressure * Experimental Manipulation	0.10	0.101	1	237.2	0.05	.832
Time Pressure * Domain	19.00	3.800	5	16883.1	1.70	.130
Experimental Manipulation * Domain	28.87	5.774	5	16883.1	2.59	.024*
Time Pressure * Experimental Manipulation * Domain	5.86	1.173	5	16883.1	0.53	.757

3E) Figure 3.2 Pairwise Comparisons: Ostracism vs Inclusion (Risk Ratings)

Asterisks denote significant pairwise differences between ostracism and inclusion within each time condition (timed or non-timed) (* = p < .05, ** = p < .01, *** = p < .001; Holm-adjusted).

	Time Condition	**Estimate**	**SE**	**df**	**t.ratio**	**p.value**
Financial Risk	Non-timed	-0.198	0.122	233	-1.629	0.3141

Financial Risk	Timed	-0.507	0.122	233	-4.159	0.0003***
Health Risk	Non-timed	-0.4029	0.132	233	-3.057	0.0100**
Health Risk	Timed	-0.4584	0.132	233	-3.475	0.0031**
Social Risk	Non-timed	0.328	0.154	233	2.133	0.1697
Social Risk	Timed	0.313	0.154	233	2.034	0.1724
Pro-financial	Non-timed	-0.4078	0.112	233	-3.653	0.0016**
Pro-financial	Timed	-0.1895	0.112	233	-1.697	0.2730
Pro-health	Non-timed	0.0924	0.0821	233	1.126	0.5229
Pro-health	Timed	0.1667	0.0822	233	2.029	0.1744
Pro-social	Non-timed	0.1229	0.102	233	1.200	0.6943
Pro-social	Timed	0.1135	0.103	233	1.107	0.6943

3F) Pairwise Comparisons: Ostracism vs Inclusion (Benefit Ratings)

Asterisks denote significant pairwise differences between ostracism and inclusion within each time condition (timed or non-timed) (* = p < .05, ** = p < .01, *** = p < .001; Holm-adjusted).

	Time Condition	**Estimate**	**SE**	**df**	**t.ratio**	**p.value**
Financial Risk	Non-timed	0.52	0.133	233	3.91	0.0005***

Financial Risk	Timed	0.572	0.133	233	4.305	0.0001***
Health Risk	Non-timed	0.1113	0.0862	233	1.292	1.0
Health Risk	Timed	0.0548	0.0862	233	0.635	1.0
Social Risk	Non-timed	-0.3635	0.143	233	-2.549	0.0343*
Social Risk	Timed	-0.4508	0.143	233	-3.159	0.0107**
Pro-financial	Non-timed	0.41	0.129	233	3.176	0.0085**
Pro-financial	Timed	0.298	0.129	233	2.304	0.0885
Pro-health	Non-timed	-0.1651	0.104	233	-1.583	0.5735
Pro-health	Timed	-0.1463	0.104	233	-1.402	0.6493
Pro-social	Non-timed	-0.2799	0.123	233	-2.269	0.145
Pro-social	Timed	-0.1081	0.123	233	-0.876	1.0

3F) Estimated marginal means (in seconds) for untimed vs. timed conditions across domains, with pairwise contrasts.

Domain	Not_Timed Means (SE)	Timed Means (SE)	Difference (Not Timed-Timed)	z.ratio	p.value (Holm)
Financial risk	1.291 (0.02)	1.041 (0.02)	0.25	8.879	<.001
Health risk	1.128 (0.02)	0.945 (0.02)	0.183	6.512	<.001
Social risk	1.318 (0.02)	1.088 (0.02)	0.231	8.185	<.001
Pro-financial	1.109 (0.02)	0.928 (0.02)	0.181	6.421	<.001
Pro-social	1.209 (0.02)	0.985 (0.02)	0.224	7.953	<.001
Pro-health	1.097 (0.02)	0.919 (0.02)	0.178	6.318	<.001

Chapter 4:

4A) Experiment 1: Final Balance on the GDT across the three experimental conditions:

Descriptive statistics of Final Balance by condition on the GDT:

Condition	**Average Final Balance**	**SD Final Balance**
Ostracism	- **$2250**	**$3363**

Physical Pain	- **$985**	**$2824**
Inclusion	- **$550**	**$2689**

Table 1. One-Way ANOVA on Final Balance by Inclusion Status

Source	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Inclusion Status	2	6.144e+07	30,718,319	3.468	0.0345*
Residuals	116	1.028e+09	8,857,812		

Signif. codes: 0 ‘ 0.001 ‘’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Table 2. Tukey's HSD Post Hoc Comparisons on final balance

Comparison	diff	lwr	upr	p adj
Ostracism - Inclusion	-1700.0000	-3300.6685	-99.33148	0.03459*

Comparison	diff	lwr	upr	p adj
PhysicalPain - Inclusion	-435.3659	-2026.4960	1155.76434	0.79295
PhysicalPain - Ostracism	1264.6341	-305.7159	2834.98423	0.13986

4B) Experiment 1: The effect of recalling specific memories (ostracism, inclusion, Physical Pain) on persisting with a risky decision on the Game of Dice Task

Predictor	(β)	SE	Z	P
(Intercept)	-0.540	0.463	-1.166	0.244
Condition (Ostracism)	1.551	0.576	2.691	0.007***
Condition (Physical Pain)	0.590	0.610	0.967	0.333
Feedback (Win)	-0.019	0.586	-0.032	0.975
Condition (Ostracism) * Feedback (Win)	0.722	0.755	0.956	0.339
Condition (Physical Pain) * Feedback (Win)	1.162	0.830	1.401	0.161

4C) Mean frequencies of participants' decisions to either stay with or switch from their previous choice

Inclusion Status	Previous Gamble	Previous Feedback	Next decision: Stay	Next decision: Switch

Ostracism	Risky	Lose	3.7 ± 0.46	1.43 ± 0.5
Ostracism	Risky	Win	3.54 ± 0.5	1.5 ± 0.53
Ostracism	Safe	Lose	1.5 ± 0.5	3.22 ± 0.43
Ostracism	Safe	Win	1.48 ± 0.5	3.36 ± 0.5
Inclusion	Risky	Lose	3.36 ± 0.49	1.36 ± 0.49
Inclusion	Risky	Win	3.27 ± 0.47	1.69 ± 0.48
Inclusion	Safe	Lose	1.32 ± 0.47	3.26 ± 0.45
Inclusion	Safe	Win	1.24 ± 0.43	3.16 ± 0.37
Physical Pain	Risky	Lose	3.67 ± 0.48	1.6 ± 0.5
Physical Pain	Risky	Win	3.43 ± 0.51	1.29 ± 0.49
Physical Pain	Safe	Lose	1.42 ± 0.5	3.56 ± 0.51
Physical Pain	Safe	Win	1.36 ± 0.48	3.36 ± 0.49

Table 4C: Values are presented as Mean ± Standard Deviation.

This table presents the mean frequencies of participants' decisions to either stay with or switch from their previous choice, following feedback (win or loss) broken down by inclusion status (Ostracism, Inclusion, or Physical Pain) and their previous gamble (Risky or Safe). A safe decision corresponds to choosing options 1 or 2 (more conservative choices), while a risky decision corresponds to choosing options 3 or 4 (more speculative choices). Positive feedback indicates the previous decision resulted in a win, while negative feedback indicates a loss. Next decision: Stay represents the likelihood of participants persisting with a risky or gamble, or switching to a more conservative choice. Conversely, Next decision: Switch represent how often participants switched from a risky to a safe decision or vice versa after their previous choice.

4D) Experiment 2: The effect of recalling specific memories (ostracism, inclusion, shopping) on persisting with a risky decision in the Iowa Gambling Task.

Risk Persistence ~ Condition * Feedback + (1 | ID)

Predictor	β	SE	z	p
Intercept	- 1.25	0.152	-8.26	<0.001 ***
Condition (Ostracism)	0.501	0.208	2.406	0.016 *
Condition (Shopping)	0.029	0.210	0.140	0.889
Feedback (Win)	0.544	0.083	6.579	<0.001 ***
Condition (Ostracism) * Feedback (Win)	-0.145	0.112	-1.299	0.194
Condition (Shopping) * Feedback (Win)	-0.146	0.115	-1.277	0.202

Table S.3: This table presents the results of a mixed-effects logistic regression analysis on the persistence in risky decisions as a function of experimental conditions (Condition: Ostracism, Shopping, Inclusion), feedback type (Feedback: Positive, Negative), and their interaction. The coefficients (β), standard errors (SE), z-values (z), and p-values (p) are reported. Significant effects were observed for the intercept and the feedback condition (positive), indicating a strong influence on the likelihood of persisting with risky choices.

4E) Mean frequencies of participants' decisions to either stay with or switch from their previous choice

Inclusion Status	Previous Gamble	Previous Feedback	Next Decision: Stay	Next Decision: Switch
Ostracism	Risky	Loss	1.69 ± 0.46	2.90 ± 1.00
Ostracism	Risky	Win	1.94 ± 0.24	2.99 ± 1.15
Ostracism	Safe	Loss	3.34 ± 0.48	2.38 ± 1.07
Ostracism	Safe	Win	3.86 ± 0.35	2.16 ± 0.86
Inclusion	Risky	Loss	1.61 ± 0.49	3.00 ± 0.97
Inclusion	Risky	Win	1.93 ± 0.25	3.08 ± 1.08
Inclusion	Safe	Loss	3.27 ± 0.45	2.55 ± 1.11
Inclusion	Safe	Win	3.86 ± 0.35	2.24 ± 0.89
Shopping	Risky	Loss	1.61 ± 0.49	2.99 ± 1.02
Shopping	Risky	Win	1.94 ± 0.25	3.07 ± 1.10
Shopping	Safe	Loss	3.39 ± 0.49	2.58 ± 1.11
Shopping	Safe	Win	3.87 ± 0.33	2.36 ± 0.97

Table 4E: Values are presented as Mean ± Standard Deviation.

This table presents the mean frequencies of participants' decisions to either stay with or switch from their previous choice, following feedback (win or loss) broken down by inclusion status (Ostracism, Inclusion, or Shopping List and their previous gamble (Risky or Safe). A safe decision corresponds to choosing options 3 or 4 (more conservative choices), while a risky decision corresponds to choosing options 1 or 2 (more speculative choices). Positive feedback indicates the previous decision resulted in a win, while negative feedback indicates a loss. Next decision: Stay represents the likelihood of participants persisting with a risky or gamble, or switching to a more conservative choice. Conversely, Next decision: Switch represent how often participants switched from a risky to a safe decision or vice versa after their previous choice.

4F) Correlations between specific individual differences and risk-persistence in the IGT, broken down condition.

Individual Difference	**Condition**	**Correlation (r)**	**p-value**
Impulsivity	Ostracism	0.30	0.026*
	Inclusion	-0.07	0.646
	Shopping	-0.15	0.279
Sensitivity To Punishment	Ostracism	0.18	0.182
	Inclusion	-0.40	0.004**
	Shopping	-0.16	0.265
Sensitivity To Reward	Ostracism	0.23	0.096
	Inclusion	0.00	0.998
	Shopping	-0.23	0.090
BIS	Ostracism	0.11	0.432
	Inclusion	-0.22	0.127
	Shopping	-0.06	0.688
BAS-Drive	Ostracism	0.04	0.771
	Inclusion	0.06	0.692
	Shopping	-0.16	0.263
BAS- Fun Seeking	Ostracism	0.06	0.645
	Inclusion	0.09	0.560

Individual Difference	Condition	Correlation (r)	p-value
	Shopping	0.01	0.915
BAS-Reward Responsiveness	Ostracism	0.03	0.816
	Inclusion	0.16	0.272
	Shopping	-0.07	0.638

Table S.4. *Correlations between personality traits and risk-taking persistence across experimental social conditions.* This table displays the Spearman correlation coefficients (*r*) and p-values for the relationships between individual differences in personality traits and risk-taking persistence in each experimental condition (Ostracism, Inclusion, and Shopping). Significant correlations are marked with $p < 0.05$ (*) and $p < 0.01$ (**), indicating condition-specific influences of Impulsivity and Sensitivity to Punishment on risk-taking behaviour.

4G) Final Balance of the Iowa Gambling Task by Condition

Descriptive Statistics of Final Total in Bank by Condition on the IGT

Condition	Mean Final Balance	SD Final Balance
Inclusion	300	2426.0
Ostracism	-709.0	2037.0
Shopping	519.0	1994.0

Table 2. One-Way ANOVA of Condition on the final balance on the IGT

1. **ANOVA on Total in Bank**

Source	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Condition	2	45180121	22590060	4.871	0.0089**
Residuals	152	704925000	4637664		

Signif. codes: 0 ‘’ ***0.001, 0.01 “****”, 0.05 ”*, 0.1 ‘.’, 1 ‘ ’

2. **Tukey’s HSD Post Hoc Comparisons**

Comparison	diff	lwr	upr	p adj
Ostracism - Inclusion	-1008.9623	-2019.1294	1.2049	0.0503480
Shopping - Inclusion	218.8679	-791.2992	1229.0351	0.8652179
Shopping - Ostracism	1227.8302	237.6683	2217.9921	0.0107004*