

The effect of compassion-focused imagery on paranoia, and trust-based cooperative
decision-making in the general population

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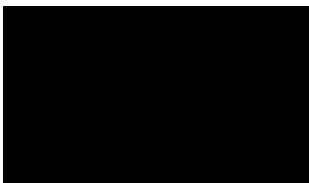
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Thesis declaration form

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Overview

The thesis examines compassion-focused imagery and paranoia, and is presented in three parts.

Part one presents a conceptual introduction of existing research in the field of compassion-focused imagery and paranoia, in the clinical and the non-clinical (general) populations. A review of the literature found promising results for compassion-focused imagery in reducing paranoia and improving positive and negative affect. Furthermore, the review suggests that game theory paradigms, in particular the Prisoner's Dilemma Game, provide useful and objective behavioural measures for paranoia. These paradigms present participants with a 'real life' interpersonal situation where they have to choose whether to cooperate or compete with the other player, providing key data regarding trust, paranoia, intentions and motivations. However, existing research investigating the impact compassion-focused imagery has on paranoia has not yet used game theory paradigms to measure paranoia.

Part two presents an empirical paper investigating the effects of compassion-focused imagery on paranoia, affect, and trust-based cooperative decision-making on the Prisoner's Dilemma Game in the general population, in comparison to relaxation imagery. Results suggest that compassion-focused imagery reduces paranoia and negative affect, with no impact on positive affect, or trust-based decision-making on the Prisoner's Dilemma Game (participants choosing to cooperate with another player). Relaxation imagery was found to be comparable with compassion-focused imagery in reducing paranoia and negative affect. This could suggest that either type of mental imagery is beneficial in reducing paranoia and negative affect, although further work would be needed to establish equivalent effectiveness.

Part three presents a critical appraisal reflecting upon the process and challenges of conducting doctoral research, with consideration given to the design, and the online nature of the study.

Impact Statement

Paranoia lies on a continuum, extending from an attenuated form in the general (i.e. non-clinical) population, to being a symptom within clinical psychopathology. Furthermore, paranoia is a risk factor for developing psychosis, as well as being associated with significant distress, impacting upon social functioning and disruption to individual's lives. Under current National Institute for Health and Care Excellence (NICE) guidelines, individuals experiencing psychosis are recommended: medication, however adherence is poor; and psychological therapies: Cognitive Behavioural Therapy (CBT) and/or Family Intervention, also have limitations of poor engagement and high financial costs. Alternative interventions are in development, with compassion-focused therapy (one fundamental aspect being compassion-focused imagery - CFI), showing promising results both for individuals with psychosis and individuals experiencing paranoia in the general population.

This thesis investigated the effects of a single session of brief, guided CFI, in comparison to relaxation imagery, on paranoia and affect, with the aim of establishing whether this form of CFI is effective in reducing non-clinical paranoia and to better understand the mechanism behind this. The findings suggest that CFI does reduce paranoia and negative affect in the general population, and this was comparable to relaxation imagery. Therefore, this thesis suggests that regardless of the type of mental imagery (compassion-focused or relaxation), paranoia and negative affect are significantly reduced. The mechanism behind how this works, and whether the same mechanism is involved in both CFI and relaxation imagery needs further research, and would benefit from researchers evaluating additional interventions (including a control). The finding that the mental imagery tested (CFI and relaxation imagery) had comparable effects (no difference was found between the groups) on paranoia and negative affect adds to a body of ongoing research

investigating alternative treatments for psychosis. If replicated in a clinical population, these findings may have implications for treatments offered.

Self-report measures are open to a range of limitations such as social desirability bias and subjective interpretations. However, recent research has begun to investigate paranoia using game theory and socioeconomic games such as the Prisoner's Dilemma Game, which this thesis used. The Prisoner's Dilemma Game provides a 'real life' interpersonal interaction where individuals are forced to make judgements about the other player, allowing researchers to interpret their levels of paranoia, intentions, motivations, and their perceptions regarding the other players motivations. Further research should continue to use the Prisoner's Dilemma Game as a behavioural measure of paranoia, just as this thesis did. This will enable further development of how this game paradigm can be used to examine paranoia in online studies, by generating 'real life' interpersonal situations which participants can respond to. Consequently, further understanding will then be developed as to treatments for individuals with high levels of paranoia and at risk of developing psychosis, and individuals with psychosis.

The encouraging findings regarding mental imagery (CFI and relaxation imagery) reducing paranoia and negative affect, and the use of a game paradigm to measure paranoia in the general population has clinical implications (in terms of treatment) and academic implications (in terms of methodology), as outlined above. Knowledge of these findings can be shared with the wider clinical and academic community through direct communications to clinical teams, and academic publications targeting academic researchers.

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Part 1: Literature Review

A conceptual introduction of compassion-focused imagery and paranoia

Abstract

This conceptual introduction examines existing literature and research on compassion-focused therapy (of which compassion-focused imagery is key), and paranoia. There are four sections within the conceptual introduction: key concepts, game theory paradigms that examine paranoia, review of existing literature (including compassion-focused imagery and paranoia in both the clinical and non-clinical populations), and rationale for empirical research.

Promising results can be seen for compassion-focused imagery providing an interpersonally sensitive approach to psychosis (in terms of being interpersonal in nature, and providing a kind and compassionate stance), and reducing paranoia. Furthermore, compassion-focused imagery is heavily intrapersonal, promoting individuals to relate compassionately to themselves. The Prisoner's Dilemma Game is shown to have promising results as an objective measure of paranoia, particularly interpersonal trust. However, the conceptual introduction concludes that research investigating the impact compassion-focused imagery has on paranoia has not yet used these formal game theory paradigms to measure paranoia. This is important as these game theory paradigms could help better understand paranoia, in terms of interpersonal trust, and provide an objective means of evaluating interventions.

Introduction

This study aimed to investigate the immediate effect that compassion-focused imagery (in comparison to a control – relaxation imagery) had on paranoia. This, in turn, anticipated to provide further insight into how compassion-focused imagery works therapeutically, in terms of reducing paranoia, or impacting upon affect. Paranoia is associated with an exaggerated sense of personalised threat, causing significant distress and disruption to individual's lives. Paranoia (delusion), is a main symptom experienced by people with psychosis, and is also a risk factor for developing psychosis (Garety et al., 2017; Gumley, Braehler, Laithwaite, MacBeth, & Gilbert, 2010). Under current NICE guidelines, individuals experiencing psychosis are recommended antipsychotic medication, however adherence is poor, with partial or minimal effects reported for 40% of cases (Connick Jamison & Kane, 1996; NICE, 2014). Recommendations for psychological treatment for those who are at risk of developing psychosis and those who are experiencing psychosis are CBT for psychosis (CBTp) and Family Interventions, however these also have limitations (NICE, 2014). High financial costs for training and delivery, and limited engagement is leading to developments within these interventions, in the hope of more effective and desirable outcomes (Garety et al., 2017). Alternative interventions are also in development, with research suggesting that compassion-focused therapy, with one fundamental aspect being compassion-focused imagery (CFI), provides a developmentally and interpersonally sensitive approach to recovery for psychosis (Gumley et al., 2010).

There have been some promising studies using non-clinical paranoia in the general population to investigate the effectiveness of CFI, however, research is limited, and the mechanism by which CFI works remains unclear (Lincoln, Hohenhaus, & Hartmann, 2013). Therefore, once this mechanism is clearer, CFI as a treatment option for paranoid thinking, will gain greater understanding,

consequently enabling it to be adapted and standardised across clinicians, so it more specifically targets the key mechanism. Furthermore, CFI could be used to treat existing paranoia in patients with psychosis, then could potentially be a preventative intervention for those with high levels of paranoia who are at risk of developing psychosis.

The project intended to advance the existing research with two main aims. First, to investigate the effects of paranoia on trust-based decision-making. Second, to determine the effects of CFI on paranoia, affect and trust-based decision-making. Participants completed a variant of the Prisoner's Dilemma Game, administered online, and participants had to decide whether they competed (distrusted) or cooperated (trusted) with their partner. Participants were led to believe they were playing against another person rather than a computer, as previous research suggests paranoia is interpersonal in nature, and effects are only present when participants believe they are playing against another person (Ellett, Allen-Crooks, Stevens, Wildschut, & Chadwick, 2013). A guided imagery intervention (either CFI or relaxation imagery) was administered prior to one round of the task. Participants completed online questionnaires, including state and trait measures of paranoia, as well as positive and negative affect which were collected pre and post intervention. This study aimed to find out whether participants in the CFI group showed a larger reduction in state paranoia, as well as higher rates of cooperation (trust), compared to the relaxation imagery group.

The aim of this literature review is therefore to investigate existing research on paranoia and compassion-focused interventions in order to provide a rationale for the project. Key concepts, and theoretical underpinnings motivating this study will be outlined, with existing research in the field analysed, resulting in a clear justification for the methodology used in the empirical paper.

Key concepts

Paranoia

The term 'paranoia' has evolved throughout the years, bringing with it a number of advancing definitions. A recent definition is suggested to encompass two co-occurring elements; first that individuals have false beliefs that they will be harmed, and second, that harm is intended by others (Raihani & Bell, 2017). From this definition, it is clear that paranoia is interpersonal, and involves the idea of an exaggerated sense of personalised threat. However, after investigating paranoia, Raihani and Bell (2017) consequently challenged this definition to an extent, arguing that paranoia involves more than just a sense of personalised threat in an interpersonal situation. They argued that it involves a negative social representation of others.

Psychosis is a mental health condition common in schizophrenia spectrum disorders, and present but less common in bipolar and other affective disorders. These symptoms include unusual beliefs (delusions and paranoia), unusual experiences (hallucinations), and deficits in threat processing and emotional regulation (Braehler, Harper, & Gilbert, 2012; Freeman & Garety, 2003). The latest version of the DSM (DSM-5, 2012), has moved to a dimensional understanding of psychotic symptoms, rather than the previous categorical approach. The most prominent symptoms are considered, instead of grouping individuals into specific nonoverlapping categories. The dimensions used to describe the construct of psychosis include positive and negative symptoms, affective symptoms and also disorganisation (Potuzak, Ravichandran, Lewandowski, Ongu & Cohen, 2012). People with psychosis can show impairments in social functioning, and exhibit high levels of distrust in others (Fett et al., 2012). Individuals experiencing these already distressing symptoms, frequently also experience feelings of shame, self-criticism, low self-esteem, stigma, loss and intrusive traumatic memories (Braehler et al.,

2012). Consequently, many individuals avoid social connection, which increases isolation and social anxiety (MacDonald, Sauer, Howie, & Albiston, 2005). Several studies have found a link between individuals who experience higher levels of anxiety reporting significantly more paranoid thoughts (relative to a neutral control), and bias towards paranoid interpretations of facial expressions (Lincoln, Lange, Burau, Exner, & Moritz, 2010; Westermann & Lincoln, 2010). The ability to emotionally regulate effectively is suggested to be impaired in individuals experiencing high levels of paranoia (Lincoln et al., 2013). Therefore, paranoia is seen as highly debilitating, and additionally, it may also prevent individuals from trusting or seeking help or support, as threat is perceived from and within others.

Paranoia is widely recognised to lie on a continuum, extending from an attenuated form in the general (i.e. non-clinical) population, to being a symptom within clinical psychopathology (Allen-Crooks & Ellett, 2014; Freeman, 2010). Numerous studies have investigated paranoia in the general population, concluding that paranoia is a common human experience illustrated through day-to-day behaviour, such as: negative thoughts about self and others, interpersonal and social anxiety and sensitivity, suspiciousness, and assumptions of hostility or harm intended from others (Ellett et al., 2013; Ellett, Lopes, & Chadwick, 2003; Raihani & Bell, 2017). Furthermore, paranoia has been argued to serve an adaptive function, beneficial for human survival. Originating from evolutionary research, Lincoln et al. (2013) suggest that the 'better safe than sorry' principle translates to individuals remaining vigilant once a threat has been identified.

Paranoia and distrust

Evidence suggests, as expected, that the ability to trust others is impaired in people with higher levels of paranoia (Fett et al., 2012; Ellett et al., 2013). Paranoia tends to be somewhat global and a state of mind, whereas trust relates to a live interaction which is why paranoia is often investigated through trust-based

interactions (Ellett et al., 2013). One study found that people with psychosis and their healthy relatives had higher levels of distrust in others in comparison to healthy controls (Fett et al., 2012). Furthermore, people with psychosis did not evidence taking on board behavioural information which indicated that their partner could be trusted, and they were not able to adapt their social functioning in response to these social cues. Relatives of people with psychosis, who are at a genetically higher risk of the illness, were able to adapt their social functioning in response to this feedback, exhibiting higher levels of trust, however trust was still impaired in comparison to healthy controls (Fett et al., 2012).

Ellett and colleagues (2013) investigated this same idea by using the Prisoner's Dilemma Game paradigm to explore levels of trust in the general population. People with higher levels of state paranoia were found to be more likely to compete (distrust) rather than cooperate (trust) with their opponent on a forced choice social interaction with the aim of maximising outcomes (points). This was found only to be significant when participants believed their opponent was another person rather than a computer, adding weight to the theoretical underpinning that paranoia is interpersonal in nature. Higher levels of trait paranoia were suggested to predispose participants to higher levels of state paranoia, which resulted in participants choosing to compete with their opponent because they did not trust them, rather than participants believing their opponent wanted to earn more than them (i.e. competing for greed).

In summary, these two studies outline a fundamental principle of higher levels of paranoia resulting in increased levels of distrust in others, whether individuals are more likely to, or have a diagnosis of psychosis or not.

Gilbert's 'Three System Affect Regulation Model'

Despite paranoia being arguably adaptive and an evolved defence to ensure safety, paranoia appears to focus solely on threat, which can become a problem.

Gumley et al. (2010) proposed an affect regulation model in which a threat-detection system performs a role, in conjunction with other regulatory systems.

This model proposes three main systems are at play: a threat-detection system, a self-soothing and self-compassion system, and a drive system (Gilbert, 2009). When the threat system is activated, (as is the case when someone presents with paranoia), feelings of anxiety, disgust or anger are experienced, stimulating action from the individual to minimise the threat (Gilbert, 2009). Additionally, from an evolutionary perspective, the threat system is designed to overrule the drive and soothing systems to ensure avoidance of danger and enable safety.

The threat system, alongside the soothing and drive systems, develop in early life. If an individual experiences adverse events in childhood, their affect regulation systems can be effected. Gilbert (2009) suggests that individuals with overstimulated threat systems in early life, develop safety strategies such as avoidance of interpersonal conflict, leading to negative development of their self-identity and increased levels of paranoia (including perceptions of themselves as inferior, powerless, and socially anxious). Additionally, these individuals fail to adequately develop their self-soothing system, not learning the value of soothing themselves or gaining this from others. This can potentially maintain these negative experiences, leading to social isolation and further, longer term experiences of paranoia.

Social Mentality Theory and Attachment

Another theory that may account for trust/paranoia is Social Mentality Theory. Individuals evaluate themselves and others through an internal system which processes information such as motivations, behaviours, cognitions and emotions. Therefore, the role that an individual has in any particular relationship (e.g. caregivers, friends, colleagues, sexual partners) not only will play out between them and the other, it will also be internalised (Gumley et al., 2010). Consequently,

early relationships are key in developing an individual's internal working model, and the quality of these relationships can determine whether individuals are more likely to be self-critical or self-compassionate towards themselves and others (Hermanto & Zuroff, 2016). A way to understand how people have developed these different social mentalities can be found in developmental theories such as attachment theory.

Experiences of attachment figures in childhood are internalised within the child, and remain into adulthood; Bowlby called this 'internal working models' (Bowlby, 1973). This is important as children who do not experience positive attachments, face a conflict between a desire to gain safety and soothing from their caregiver, but also the threat system triggering fear and an avoidance of that same caregiver in order to ensure safety (Braehler et al., 2012). This lack of clear attachment and 'fear without resolution' results in individual as adults experiencing an increase in feelings of threat, higher levels of paranoia, less well developed self-soothing skills, and they also may be less likely to perceive others as a source of safety or soothing (Braehler et al., 2012).

Compassion-focused therapy

As previously stated, there are three main systems within the affect regulation model, with threat only being one of them. The drive system and soothing system are crucial for affect regulation. The drive system motivates and guides individuals to desirable life goals and enables basic needs to be sought, consequently providing positive feelings, for example food, water, sex and relationships (Gilbert, 2009). The soothing system focuses on safety, wellbeing, contentment, feeling cared for, accepted and having a sense of belonging with others (Gilbert, 2009). Theoretically, individuals with higher levels of paranoia have reduced access to their soothing system, and heightened arousal for their threat system. This can reduce an overall sense of wellbeing, increase self-criticism and

shame, increase levels of depression, and potentially lead to psychopathology. However, evidence suggests that compassion-focused therapy can benefit people who experience paranoia by developing the self-soothing system and refocusing the mind away from the threat system, to activate the soothing system, through compassionate imagery (Gilbert & Procter, 2006). This has been linked to higher levels of positive affect, and lower levels of negative affect (Gilbert et al., 2008; Neely, Schallert, Mohammed, Roberts, & Chen, 2009).

Compassion-focused therapy was designed for individuals with high shame and self-criticism who experienced challenges in their early life. It is grounded within a few key theoretical principles: evolutionary psychology, neuroscience, social psychology, Buddhism, and linked to the neurophysiology and psychology of attachment and caring for others, and being cared for (Gilbert, 2009; Gilbert, 2014).

One particular element of compassion-focused therapy was named 'compassionate mind training', and refers to the exact techniques used to guide people to experience compassion for themselves, and in turn, others (Gilbert & Irons, 2004). These techniques include breathing exercises, psychoeducation of the human mind and its innate tendency to focus on negativity and threat, mindfulness exercises, emotional regulation and also encouraging supportive and helpful thinking (Matos et al., 2017). Research using these techniques are encouraging, and have been shown to have positive effects in comparison to a control group. These positive effects include significant increases in positive emotions related to feelings of relaxation, safety and contentment (Matos et al., 2017). In addition, compassion for the self, others and from others increased after two weeks of using the compassionate mind training techniques (Matos et al., 2017).

Compassion-focused imagery in psychosis

Furthermore, CFI also developed as a part of compassion-focused therapy and follows the theoretical underpinnings of attachment theory. The effectiveness of

CFI as a recovery intervention for people with psychosis has been evaluated (Laithwaite et al., 2009). After discussing psychosis and recovery, individuals were asked to create an 'ideal friend' through guided discovery and compassionate imagery techniques. The intention of this was for individuals to imagine 'somebody' who is compassionate, accepting, non-judgemental and who they can trust, with the hope that this would be internalised within each individual, and they would begin to develop these qualities and compassionate responses towards others and themselves (Laithwaite et al., 2009). This developed from the idea that emotional regulation systems are more accessible via imagery than rational explanation or understanding (Gilbert & Irons, 2010).

Game paradigms to examine paranoia

Research investigating the impact CFI has on paranoia have predominantly used self-report measures (Ascone, Sundag, Schlier, & Lincoln, 2017). However, given the interpersonal nature of paranoia, and the fundamental impact paranoia has on trust, recent research has begun to use game theory and socioeconomic games to investigate paranoia, as they present ambiguous social tasks to participants (Ellett et al., 2013; Raihani & Bell, 2018; Raihani & Bell, 2017). Participants are asked to make choices on these games, and these choices allow researchers to interpret participants intentions (trust or distrust/desire to harm their opponent or not), which can also be referred to as their motivations behind their choices. Furthermore, in some game paradigms, participants have to determine how they perceive their opponent and interpret their opponents intentions in order to make a decision. These 'real life' tasks create a more authentic experience for participants, which consequently provides researchers with more accurate and reliable data related to paranoia. Given these benefits, more and more research is beginning to use game theoretical models as opposed to questionnaires (Chan & Chen, 2011). When completing game paradigm tasks, it would be expected that

participants with higher levels of paranoia would show reduced cooperation (Fett et al., 2012). Gromann and colleagues (2013) investigated this idea by comparing 20 patients with psychosis to 20 healthy controls. Using functional magnetic resonance imaging, researchers measured participants brain activity while they were completing game tasks and found that the participants with psychosis showed reduced baseline trust compared to peers.

Game theory is still a relatively new concept in paranoia research, however three key game paradigms have emerged. These will be briefly outlined below, before this review goes on to analyse current research in the field.

Dictator Game

Two players are involved in the Dictator Game, the 'dictator' and the 'receiver'. The dictator receives a financial gift/bonus and is asked to choose how much of it they are willing to send to the receiver. The dictator is informed that the receiver has to accept any offer that is proposed, therefore the Dictator Game is not seen as a strategic game as the receivers intention/behaviour is irrelevant, unlike the Ultimatum Game. The amount that the dictator offers provides researchers with an indication into the players cooperative tendency. The idea is that the higher the levels of paranoia the dictator has, the more likely they are to be intentionally punitive to the other player (receiver) and offer a low amount (Raihani & Bell, 2018). However, the intention behind the dictators offer remains open to interpretation as it could be argued the dictator is acting in self-interest (greed) rather than out of distrust of the receiver, unless the dictator is directly asked about their intentions. In one version of the Dictator Game, the receiver is given a small amount of money as well (\$0.05 in comparison to the dictator receiving \$0.55). The receiver is asked to indicate whether they would give their \$0.05 in order to reduce the other player's financial gift by \$0.15 (Raihani & Bell, 2018). In contrast to the original game, this version allows researchers to understand the intention of both the dictator and the

receiver. However, the receivers option for a punitive response is limited to a forced prescribed choice, unlike the dictators self-selected choice. While this allows researchers to infer paranoia from their intention, it does not permit for the level of the receivers paranoia to be assessed due to the limitation of the forced prescribed choice.

Ultimatum Game

Two players are allocated as either the 'proposer' or 'responder' in the strategic Ultimatum Game. The proposer is given a financial gift/bonus and asked to share any amount of it with the other player. The responder is given the choice whether to accept or reject the offer that is proposed. Both the proposer and the responder are aware of the rules that if the responder accepts the offer then both players can keep the amount that was shared, whereas if the responder rejects the offer then both players will be left with nothing (Güth, Schmittberger & Schwarze, 1982). A key strategy within this game is for the proposer to make a judgement on what amount is acceptable for the responder to accept, this means that the proposer has to consider the responders intentions when making their decision.

A key question researchers ask when using the Ultimatum Game as an experimental paradigm is whether participants who reject an offer (do not cooperate with the proposer) do so because they are either acting in distrust or self-interest. Furthermore, the cost of the responder rejecting an 'unfair' offer (proposer keeping most of the money, and offering a small amount to the responder) carries a greater cost to the proposer as they will lose more money. Although it's important to keep in mind that the definition of an 'unfair' offer is of course subjective and may vary due to a players paranoid ideation. Raihani and Bell (2017) found that participants who scored higher on levels of paranoia were found to make larger offers to the responder as they perceived that the responder would intentionally want to harm them, and therefore attempted to minimise this as much as possible.

It could be argued that the design of the Ultimatum Game does not necessarily emulate the experiences that individuals with paranoia have; i.e. they are more often than not on the receiving end of a believed threatening situation. However, some experimental designs that use the Ultimatum Game do gain additional information from participants, by asking participants to indicate whether they would accept or reject a range of offers, providing the research team with participants' minimal acceptable offers (Raihani & Bell, 2018). This is important in terms of better understanding paranoia, as people with higher levels of paranoia may be more likely to reject offers because they may feel they are being unfairly treated, or alternatively, they may be more likely to accept them because of low social rank. However, despite finding out participants' minimal acceptable offers, the Ultimatum Game does not ask participants for reasons as to why they reject or accept offers which limits understanding in this regard.

Prisoner's Dilemma Game

The Prisoner's Dilemma Game (Dresher, 1961; Flood, 1952), is a paradigm that has been used by Ellett and colleagues (2013) to examine paranoia in the general population. They state that the Prisoner's Dilemma Game (PDG) captures fundamental aspects of paranoia; it is interpersonal in nature, it concerns threat, it considers the perception of others' intentions towards the self, and it's ambiguous, which has been shown to be a trigger for paranoia (Ellett et al., 2013).

Two players choose either to compete or cooperate with each other for maximum outcomes. The dilemma emerges when players are presented with a choice matrix, indicating how many points they will score if they choose to either cooperate or compete with the other player, and whether the other player chooses to cooperate or compete with them. Maximum outcomes can be accomplished by choosing to compete, when the other player chooses to cooperate. However, when both players choose to compete, they will each only earn a much lower number of

points than if they both cooperated, as such, this provides an objective measure of trust/distrust.

Reasons for participant's competitive choices have also been investigated using the Prisoner's Dilemma Game. Participants decide whether they have competed for either reasons of greed (i.e. anticipating that the opposition will cooperate, and then responding exploitatively to this possibility), or distrust (i.e. anticipating that the opposition will compete, and responding defensively to this possibility). Decisions made by participants on the Prisoner's Dilemma Game are associated with self-report measures of paranoia (Ellett et al., 2013). This allows researchers to determine whether choice to compete is associated with levels of trust and paranoia. Choice on the Prisoner's Dilemma Game could therefore be considered as a behavioural mechanism for paranoia in the nonclinical population. Furthermore, the PDG has the opportunity to not only ask participants for their intentions and motivations for their choice, but it also allows participants to be asked for their expectations of the other players choice, and their perceived reasons why they predict this. These appraisals of the other player, asked from the participants, allow researchers to infer the psychological processes behind choices and trust/paranoia.

Summary

All three experimental paradigms allow for paranoia to be tested in a more authentic situation ('real life' interaction), as opposed to relying on self-report measures which can be open to social desirability bias. The flexibility to administer these games online is invaluable, especially when the desire to recruit large sample sizes is paramount. Furthermore, the paradigms allow for an objective measure of participant's desire to either cooperate (trust) or compete (distrust) with another player. The Prisoner's Dilemma Game, unlike the other two paradigms, allows for further information to be gained by directly asking participants: expectations of the

others choice, participant's own motives and intentions, and their perception of the other's intentions. This allows researchers to interpret choice, intentions and expectations, and gain a greater understanding as to the motives behind a decision with another person in a social interaction.

Review of literature

Literature search

This literature search aimed to identify and summarise relevant papers in order to provide a comprehensive overview of the literature on compassion-focused imagery and paranoia. PsychoINFO (Ovid interface) and PubMed were searched on 14th February 2019; search terms focused on identifying studies that applied economic game theory inspired approaches to paranoia, as this is the focus of the present thesis. The following search terms were used: (psychosis OR psychotic OR paranoia OR paranoid OR non clinical paranoia OR general population) AND (compassion focused therapy OR CFT OR compassion focused model OR compassion focused imagery OR compassionate imagery OR compassion focused intervention). An additional search was then run to ensure that relevant papers were included which focused on paradigms to measure paranoia: (psychosis OR psychotic OR paranoia OR paranoid OR schizophrenia) AND game theory. These two searches returned 147 papers. Duplicates and irrelevant papers were then removed. Studies were included if the focus of their research was on compassion-focused imagery and paranoia in adults, both in the clinical and non-clinical population. Studies were excluded if they were a review paper, undergraduate paper, manual or case study. This left 20 relevant papers. Further literature was reviewed from citations in these papers, which identified another nine papers.

Studies of paranoia in the general population

A number of recent studies have focused on paranoia in the general population, and investigated factors that affect and increase paranoia, as well as

exploring participant's expectations and perceived intentions of the other (Ellett et al., 2013; Saalfeld, Ramadan, Bell, & Raihani, 2018). A novel approach to investigate paranoia is through social decision-making tasks such as the Prisoner's Dilemma Game and related variants. The Prisoner's Dilemma Game asks participants to decide whether to cooperate (trust) the other, or compete against the other (not trust), providing insight into constructs relevant to paranoia, such as trust, without relying on self-report measures (Van de Mortel, 2005). Furthermore, these tasks can be used to infer participants' perceptions of another player, because the motives and intentions of the other player are ambiguous. For example, their intentions could either be perceived as malicious (threatening) or acting in self-interest (greed), or acting altruistically.

Ellett and colleagues (2013) investigated paranoia in the general population using the Prisoner's Dilemma Game. They began with one experiment asking the question of whether there is an association between participant's choice (to compete or cooperate with the other player) and the severity of paranoia, then built upon this in two further experiments. State paranoia was found to significantly correlate with competitive (distrust) choice on the PDG, and therefore this paradigm appears to be an effective way to measure state paranoia in the general population. However, this result only remained significant when participants believed they were playing against another person, rather than a computer, indicating the importance of ensuring that participants believe they are engaged in an interpersonal context if researchers are to effectively study paranoia (Ellett et al., 2013). Finally, participants were asked to specify reasons for the choice they made (whether to cooperate or compete). The intentions behind the choices were coded as either greed-based competition (competing for self-interest), or distrust-based competition (competing to defend themselves against the other, or not trusting the other to cooperate with them). Results showed that state paranoia was associated with participants choosing to

compete based on reasons of distrust, and not greed, adding further weight to the PDG being a competent way to measure paranoia (Ellett et al., 2013).

Furthermore, not only does paranoia appear to predict people's intentions of harm on the other person, participants with pre-existing levels of paranoia positively predicted their tendency to interpret the intentions of the other's behaviour as being harmful, rather than the other acting in their own self-interest (Raihani & Bell, 2017). This perception of intention remained the same for 'dictators' who were both seen to be 'fair' and 'unfair' (in the decisions they made). This indicates that participants with higher levels of paranoia had higher levels of distrust in the other, and participants believed the intention of the other was to harm them. Due to participants with high levels of paranoia perceiving dictators to be equally as harmful in their intentions when participants were in both the observer and the receiver role, paranoia cannot just be a sense of personalised threat, it also has to incorporate the idea that high levels of paranoia result in a negative social representation of others (Raihani & Bell, 2017).

A similar study found slightly differing results contradicting the findings that higher levels of paranoia appear to show higher levels of perceived distrust in the other. Researchers aimed to investigate: firstly, whether paranoia predicts maladaptive social behaviour (examining whether participants displayed cooperative or punitive behaviour to the other player); secondly, whether participants were less likely to cooperate in these tasks, because participants did not trust the other person (Raihani & Bell, 2018). Participants with higher levels of paranoia proposed to give their opponent lower offers than participants with lower levels of paranoia on both the Dictator Game and the Ultimatum Game. This suggests that the higher the level of paranoia, the more punitive response they gave the other (Raihani & Bell, 2017). These results indicate that lower rates of cooperation suggest distrust in the other; however, Raihani and Bell (2018) suggest an alternate explanation for punitive responses, such as acting in one's own self-interest may pertain.

Building on developmental and attachment theories (Braehler et al., 2012; Gumley et al., 2010), people with higher levels of paranoia, may be more likely to focus on threat in a given situation, and see others as threatening towards them. Consequently, they may be more sensitive to power and status of others, particularly when the other person's social rank is perceived as higher than theirs (Saalfeld et al., 2018). A large online study found that when participants played against a 'dictator' who participants were informed was from a higher social status than the social status that they had indicated, or from an out-group, participants were more likely to attribute a harmful intention to the other player, in comparison to when they interacted with 'dictators' from their in-group, or from an equal social status (Saalfeld et al., 2018). I.e. when participants perceived the other player as more similar to them, they acted in less harmful ways towards them. Moreover, participants with pre-existing paranoia engaged in more harmful intention attributions than those without pre-existing paranoia. However, the severity of paranoia did not predict the level of harm, in fact, their response to social threat matched those participants who were less paranoid. Saalfeld and colleagues (2018) concluded that people with higher levels of paranoia are less able to detect social threat, rather than having an impairment in responding to it. An important factor that this study highlights is that paranoia seems to be associated with a perceived similarity to the other player (in terms of social rank).

Studies of compassion-focused therapy in people with psychosis

Compassion-focused therapy was designed specifically for people with high levels of shame and self-criticism, which makes it an intuitive intervention for people with psychosis. Several studies have investigated compassion-focused therapy for people with psychosis and schizophrenia and found high levels of acceptability, as well as improvements in depression, self-esteem and self-compassion (Ascone et al., 2017; Braehler et al., 2012; Laithwaite et al., 2009).

Ascone et al. (2017) guided psychotic patients with paranoid ideation through either a brief compassion-focused imagery, or a control imagery exercise. Participants were then asked to remember a negative emotionally distressing situation (threat-based image). The CFI group scored significantly higher on happiness and self-reassurance (positive ways of relating to themselves), than the control group. In addition, paranoia levels dropped significantly and negative affect levels dropped substantially, however this was the case in both the CFI and the control group. This indicates that time lapse or distraction from the negatively induced image was enough to reduce paranoia rather than the content of the imagery being significant. The investigators argued that the brevity of the intervention meant that self-criticism and the chronicity of paranoia was challenging to shift, however, the intervention gained positive feedback from the majority of participants.

Alternatively, a longer and more substantial intervention for people with schizophrenia-spectrum disorders found that after sixteen sessions of a compassion-focused therapy group, participants had significantly greater clinical improvement and significantly higher levels of compassion than the control group (treatment as usual), which was strongly associated with decreases in scores of depression (Braehler et al., 2012). Despite this study finding improvements in compassion and depression, paranoia and other key affect/mood ratings were not monitored.

Similarly regarding the length and group context of the treatment, a twenty-session recovery group for people with psychosis residing in a high security forensic setting, found significant improvements in depression, self-esteem, ratings of self in comparison to others, reductions in feelings of shame, and reductions in general psychopathology (Laithwaite et al., 2009). These changes continued at the six-week follow up, however, no significant changes were found on levels of self-compassion at any stage during the intervention. This could be, arguably, due to the chronicity of

psychosis, but also discussion between the participants revealed that self-forgiveness remained challenging as some feared it could be understood by others as a lack of empathy for their victims (Laithwaite et al., 2009).

Considering all of the above research, longer interventions appear to have more promising results within this clinical group, showing significant improvements in compassion, depression, self-esteem, shame and ratings of self in comparison to others (Braehler et al., 2012; Laithwaite et al., 2009). In contrast, briefer interventions only found changes in happiness and self-reassurance levels (Ascone et al., 2017). All of the studies were face to face, either in a group context or individual which was possibly due to the participant population, and none of the interventions were online. Paranoia was only measured in two of the three studies and no significant changes were found. None of the studies investigated behavioural change/action pre or post intervention, and only included narratives and self-report measures.

Studies of compassion-focused therapy in the general population

Whilst compassion-focused therapy being developed for people with high levels of shame and self-criticism is more typical in clinical populations, studies exploring the mechanisms of compassion-focused therapy are also employed in people from the general population. Paranoia lies on a continuum (Raihani & Bell, 2018), and by exploring compassion-focused therapy's effects on non-clinical participants, it may provide insight into mechanisms as well as briefer versions and other variants of compassion-focused therapy.

Two particular studies have used compassion-focused therapy in the general population, one being a guided brief intervention after a negative memory exposure, and the other asking participants to practice compassionate mind exercises over two weeks (Lincoln et al., 2013; Matos et al., 2017). Lincoln and colleagues (2013) were especially interested in testing the impact of CFI on paranoia, and found that their

brief compassionate imagery exercise resulted in lower levels of state paranoia scores in comparison to the control imagery group. In addition, the brief CFI intervention resulted in significantly lower negative emotions and higher self-esteem. Paranoia was mediated by reductions in negative emotions, but not by increased self-esteem. These results are encouraging and provide evidence towards CFI being a preventative treatment for those at risk of developing psychosis, or those who experience delusions but do not meet the criteria for a diagnosis.

In contrast, compassionate mind exercises were used by different participants over a two-week period and the group showed significant increases in positive emotions, associated with feeling relaxed, safe and content, increases in self-compassion, compassion for others and compassion from others (Matos et al., 2017). Additionally, there were significant reductions in shame, self-criticism, fears of compassion and stress in the compassionate mind group compared to the control group. However, the compassionate mind group's scores of positive affect and activation did not significantly improve. This provides crucial information as it shows that using compassionate mind training is beneficial from a relaxation perspective, however, it does not activate, or potentially motivate individuals. This is key when developing these exercises for the general population, and finding out the purposes and benefits of these interventions.

Taking the above research into consideration, compassion-focused imagery appears to significantly reduce paranoid thoughts compared to a neutral control image (Lincoln et al., 2013). Furthermore, compassion-focused therapy interventions increased compassion which was significantly associated with reductions in perceived social marginalization, in comparison to a treatment as usual intervention (Braehler et al., 2013). This evidence further suggests significant implications for clinical practice, as noted above, as it suggests that interventions such as compassion-focused imagery may have the potential to prevent the

formation of paranoid beliefs in persons at risk of developing psychosis, and reduce delusions in persons with clinically relevant symptom levels (Lincoln et al., 2013).

Despite the benefits of compassion-focused therapy outlined by the literature thus far, some research has also questioned its efficacy. A study by Ascone et al., (2017) found that brief compassion-focused imagery did not improve paranoia, however did increase feelings of happiness and reassurance. A crucial point to note concerning Ascone et al., (2017), and Lincoln and colleagues (2013) studies are that they used only self-report measures to ascertain paranoia, and not a behavioural measure of paranoia such as the Prisoner's Dilemma Game, and therefore may be open to social desirability bias (King & Bruner, 2000). This use of self-report measures may therefore limit the conclusions that can be drawn and illustrates the need for further research in this area.

Despite the varying lengths of the interventions, the studies noted provide promising evidence for CFI being a preventative treatment for those at risk of developing psychosis. Furthermore, CFI exercises appear to support people in the general population, reducing levels of depression and negative emotions, reducing feelings of shame, paranoia, increasing self-esteem, and self-compassion (Lincoln et al., 2013; Matos et al., 2017). Results appear similar for participants that were guided in their brief CFI exercise, and participants who practiced independently in their own time, indicating that the compassion-focused therapy may elicit the same feelings/results despite the platform. Furthermore, this adds weight to the current popular platform of mindfulness mobile phone applications, with millions of people accessing mindful imagery exercises and techniques on a daily basis. Crucially, this existing research has begun to investigate the mechanisms for how CFI works, but further research would still be beneficial.

Rationale for empirical research

Theoretical rationale

Attachment theory and Social Mentality Theory provide a theoretical rationale for the empirical study. CFI activates the soothing system, reducing the strength of the threat system, which theoretically could demonstrate a reduction in negative affect scores and increase positive affect scores. Furthermore, there could be a reduction of state paranoia, consequently enabling participants to be more likely to trust and therefore cooperate with the other player. One particular CFI script asks participants to create an image that conveys compassion for them, that wants the participant to feel good, be without worry, is deeply committed to them, completely accepting, caring, warm and never judges them (Lincoln et al., 2013). Attachment theory and Social Mentality Theory would lead to the conclusion that through imagining this image, participants will internalise this compassion, acceptance, love etc., which consequently will activate the soothing system more so than the threat system. Furthermore, by activating the soothing system, it could be argued that this will develop individual's emotional regulation abilities, producing a reduction in anxiety (which has been shown to predict paranoia), consequently preventing/reducing paranoia (Lincoln et al., 2013).

Compassion-focused imagery

Several studies have shown that CFI leads to changes in mood and behaviour. Completing a compassion-focused imagery condition, in comparison to a neutral control condition, significantly reduced levels of negative emotion, reduced self-reported paranoid thoughts (Lincoln et al., 2013), and significantly increased levels of happiness and self-reassurance (Ascone et al., 2017). The neutral control used in these studies asked participants to imagine a chair, and spend time thinking about the physical properties of it. However, the results found, albeit promising for compassion-focused imagery, provided limited information into the mechanisms of

CFI, and why it is effective. The results only demonstrate that CFI is beneficial in comparison to a neutral control. In order to really understand the mechanisms of CFI, it is important to compare it to another mental imagery that is only slightly different in nature to CFI. Only then will clear conclusions be able to be drawn from any differences found. For example, relaxation imagery (RI) is similar to CFI regarding the intended outcome (to refocus the mind and imagine a positive, rather than neutral, experience), however it does not encompass the same elements that CFI does (a focus on compassion). Some CFI scripts can be interpersonal in nature, and ask participants to generate a being who is 'perfect', compassionate towards them, and everything they could hope for in another being. Whereas, relaxation imagery generally focuses on creating a relaxing and soothing place where participants are encouraged to feel peaceful and safe, but with no interpersonal or compassionate component. What is not known is whether the relaxation component is sufficient to impact mood and paranoia, or whether the interpersonal, compassionate component is a necessary aspect to effect these changes (and closely associated behaviours, such as trust in others).

Furthermore, research suggests that compassion-focused therapy was designed for individuals with high self-criticism and shame, and it incorporates affect regulation strategies. However, it remains unclear whether compassion-focused imagery targets these processes directly, or whether it works by increasing positive affect, reducing negative affect, decreasing paranoia, or decreasing anxiety or depression scores (Gumley et al., 2010). Studies that compare the effects of CFI and RI on interpersonal decision-making do not exist, limiting an understanding of the mechanism by which CFI brings about benefits on paranoia.

Summary

Paranoia is characterised by issues around interpersonal distrust, an exaggerated sense of personalised threat intended by others, and heightened

anxiety (Raihani & Bell, 2017). These key aspects of paranoia are still being researched in order to be better understood, generating an evolution of advancing definitions. Current interventions targeting paranoia show limited effectiveness, creating a drive for further research to find more effective psychological treatments. Furthermore, objective measures to test such an interpersonal phenomenon are lacking, and currently the focus of developing research within this field.

The Prisoner's Dilemma Game has been shown to be an effective behavioural measure of paranoia, eliciting an ambiguous interpersonal social situation in which participants are given a choice whether to cooperate (trust) or compete (distrust) with the other person they're playing with. It allows researchers to explore participant's motives behind their choice, as well as their expectations of the other players choice, and their perceptions of the motives for this. The Prisoner's Dilemma Game has been used to investigate paranoia in the general population, however has never been used to investigate the impact mental imagery has on paranoia (Ellett et al., 2013).

CFI is a promising intervention but its role in the effect it has on paranoia still remains unclear, especially given that only self-report measures have previously been used to test it. Game theory approaches are well placed to test whether it works through interpersonal trust, as they provide a 'real life' interaction within these paradigms.

The empirical research (Chapter 2) builds upon the key ideas reviewed here, and aims to address the gaps identified in this field of research. Specifically, this research project aims to investigate the effect of compassion-focused imagery (in comparison to relaxation imagery) on paranoia and interpersonal trust-based decision-making using the Prisoner's Dilemma Game as well as other self-report measures.

References

- Allen-Crooks, R., & Ellett, L. (2014). Naturalistic Change in Nonclinical Paranoid Experiences. *Behavioural and Cognitive Psychotherapy*, 42(05), 634–639.
<https://doi.org/10.1017/S1352465813001148>
- Ascone, L., Sundag, J., Schlier, B., & Lincoln, T. M. (2017). Feasibility and Effects of a Brief Compassion-Focused Imagery Intervention in Psychotic Patients with Paranoid Ideation: A Randomized Experimental Pilot Study. *Clinical Psychology & Psychotherapy*, 24(2), 348–358.
<https://doi.org/10.1002/cpp.2003>
- Bowlby, J. (1973). PEP Web - Attachment and Loss: Volume II: Separation, Anxiety and Anger. Retrieved 28 February 2019, from <https://www-pep-web-org.libproxy.ucl.ac.uk/document.php?id=IPL.095.0001A>
- Braehler, C., Gumley, A., Harper, J., Wallace, S., Norrie, J., & Gilbert, P. (2013). Exploring change processes in compassion focused therapy in psychosis: Results of a feasibility randomized controlled trial. *British Journal of Clinical Psychology*, 52(2), 199–214. <https://doi.org/10.1111/bjc.12009>
- Braehler, C., Harper, J., & Gilbert, P. (2012). Compassion Focused Group Therapy for Recovery after Psychosis. In C. Steel (Ed.), *CBT for Schizophrenia* (pp. 235–266). <https://doi.org/10.1002/9781118330029.ch12>
- Chan, K. K., & Chen, E. Y. (2011). Theory of mind and paranoia in schizophrenia: a game theoretical investigation framework. *Cognitive neuropsychiatry*, 16(6), 505-529.
- Dresher, M. (2012). *The mathematics of games of strategy*. Courier Corporation.
- Ellett, L., Allen-Crooks, R., Stevens, A., Wildschut, T., & Chadwick, P. (2013). A paradigm for the study of paranoia in the general population: The Prisoner's Dilemma Game. *Cognition & Emotion*, 27(1), 53–62.
<https://doi.org/10.1080/02699931.2012.689757>

- Ellett, L., Lopes, B., & Chadwick, P. (2003). Paranoia in a nonclinical population of college students. *The Journal of Nervous and Mental Disease*, 191(7), 425.
<https://doi.org/10.1097/01.NMD.0000081646.33030.EF>
- Fett, A.-K. J., Shergill, S. S., Joyce, D. W., Riedl, A., Strobel, M., Gromann, P. M., & Krabbendam, L. (2012). To trust or not to trust: The dynamics of social interaction in psychosis. *Brain*, 135(3), 976–984.
<https://doi.org/10.1093/brain/awr359>
- Flood, M. M. (1958). Some experimental games. *Management Science*, 5(1), 5-26.
- Freeman, D. (2010). Testing the continuum of delusional beliefs: An experimental study using virtual reality. <https://doi.org/10.1037/a0017514>
- Freeman, D., & Garety, P. A. (2003). Connecting neurosis and psychosis: The direct influence of emotion on delusions and hallucinations. *Behaviour Research and Therapy*, 41(8), 923–947. [https://doi.org/10.1016/S0005-7967\(02\)00104-3](https://doi.org/10.1016/S0005-7967(02)00104-3)
- Garety, P. A., Ward, T., Freeman, D., Fowler, D., Emsley, R., Dunn, G., ... Hardy, A. (2017). SlowMo, a digital therapy targeting reasoning in paranoia, versus treatment as usual in the treatment of people who fear harm from others: Study protocol for a randomised controlled trial. *Trials*, 18(1), 510.
<https://doi.org/10.1186/s13063-017-2242-7>
- Gilbert, P., McEwan, K., Mitra, R., Franks, L., Richter, A., & Rockliff, H. (2008). Feeling safe and content: A specific affect regulation system? Relationship to depression, anxiety, stress, and self-criticism. *The Journal of Positive Psychology*, 3(3), 182–191. <https://doi.org/10.1080/17439760801999461>
- Gilbert, P. (2009). Introducing compassion-focused therapy. *Advances in Psychiatric Treatment*, 15(3), 199–208. <https://doi.org/10.1192/apt.bp.107.005264>
- Gilbert, P. (2014). The origins and nature of compassion focused therapy. *British Journal of Clinical Psychology*, 53(1), 6–41. <https://doi.org/10.1111/bjc.12043>

- Gilbert, P., & Irons, C. (2004). A pilot exploration of the use of compassionate images in a group of self-critical people. *Memory*, 12(4), 507–516.
<https://doi.org/10.1080/09658210444000115>
- Gilbert, P., & Procter, S. (2006). Compassionate mind training for people with high shame and self-criticism: Overview and pilot study of a group therapy approach. *Clinical Psychology & Psychotherapy*, 13(6), 353–379.
<https://doi.org/10.1002/cpp.507>
- Gumley, A., Braehler, C., Laithwaite, H., MacBeth, A., & Gilbert, P. (2010). A Compassion Focused Model of Recovery after Psychosis. *International Journal of Cognitive Therapy*, 3(2), 186–201.
<https://doi.org/10.1521/ijct.2010.3.2.186>
- Güth, W., Schmittberger, R., & Schwarze, B. (1982). An experimental analysis of ultimatum bargaining. *Journal of economic behavior & organization*, 3(4), 367-388.
- Gromann, P. M., Heslenfeld, D. J., Fett, A. K., Joyce, D. W., Shergill, S. S., & Krabbendam, L. (2013). Trust versus paranoia: abnormal response to social reward in psychotic illness. *Brain*, 136(6), 1968-1975.
- Hermanto, N., & Zuroff, D. C. (2016). The social mentality theory of self-compassion and self-reassurance: The interactive effect of care-seeking and caregiving. *The Journal of Social Psychology*, 156(5), 523–535.
<https://doi.org/10.1080/00224545.2015.1135779>
- Jamison, S., & Kane, C. F. (1996). Object relations and nursing care of persons experiencing psychosis. *Archives of Psychiatric Nursing*, 10(3), 129–135.
[https://doi.org/10.1016/S0883-9417\(96\)80013-6](https://doi.org/10.1016/S0883-9417(96)80013-6)
- King, M. F., & Bruner, G. C. (2000). Social desirability bias: A neglected aspect of validity testing. *Psychology and Marketing*, 17(2), 79–103.
[https://doi.org/10.1002/\(SICI\)1520-6793\(200002\)17:2<79::AID-MAR2>3.0.CO;2-0](https://doi.org/10.1002/(SICI)1520-6793(200002)17:2<79::AID-MAR2>3.0.CO;2-0)

- Laithwaite, H., O'Hanlon, M., Collins, P., Doyle, P., Abraham, L., Porter, S., & Gumley, A. (2009). Recovery After Psychosis (RAP): A Compassion Focused Programme for Individuals Residing in High Security Settings. *Behavioural and Cognitive Psychotherapy*, 37(05), 511.
<https://doi.org/10.1017/S1352465809990233>
- Lincoln, T. M., Hohenhaus, F., & Hartmann, M. (2013). Can Paranoid Thoughts be Reduced by Targeting Negative Emotions and Self-Esteem? An Experimental Investigation of a Brief Compassion-Focused Intervention. *Cognitive Therapy and Research; New York*, 37(2), 390–402.
<http://dx.doi.org.libproxy.ucl.ac.uk/10.1007/s10608-012-9470-7>
- Lincoln, T. M., Lange, J., Burau, J., Exner, C., & Moritz, S. (2010). The Effect of State Anxiety on Paranoid Ideation and Jumping to Conclusions. An Experimental Investigation. *Schizophrenia Bulletin*, 36(6), 1140–1148.
<https://doi.org/10.1093/schbul/sbp029>
- MacDonald, E., Sauer, K., Howie, L., & Albiston, D. (2005). What happens to social relationships in early psychosis? A phenomenological study of young people's experiences. *Journal of Mental Health*, 14(2), 129–143.
<https://doi.org/10.1080/09638230500060052>
- Matos, M., Duarte, C., Duarte, J., Pinto-Gouveia, J., Petrocchi, N., Basran, J., & Gilbert, P. (2017). Psychological and physiological effects of compassionate mind training: A pilot randomised controlled study. *Mindfulness*, 8(6), 1699–1712. <https://doi.org/10.1007/s12671-017-0745-7>
- National Institute for Health and Care Excellence. (2014). *Psychosis and schizophrenia in adults: prevention and management* (NICE Quality Standard No. 39). Retrieved from <https://www.nice.org.uk/guidance/cg178>
- Neely, M. E., Schallert, D. L., Mohammed, S. S., Roberts, R. M., & Chen, Y. J. (2009). Self-kindness when facing stress: The role of self-compassion, goal

- regulation, and support in college students' well-being. *Motivation and Emotion*, 33(1), 88–97. <https://doi.org/10.1007/s11031-008-9119-8>
- Potuzak, M., Ravichandran, C., Lewandowski, K. E., Ongür, D., & Cohen, B. M. (2012). Categorical vs dimensional classifications of psychotic disorders. *Comprehensive psychiatry*, 53(8), 1118-1129.
- Raihani, N. J., & Bell, V. (2017). Paranoia and the social representation of others: A large-scale game theory approach. *Scientific Reports*, 7(1), 4544. <https://doi.org/10.1038/s41598-017-04805-3>
- Raihani, N. J., & Bell, V. (2018). Conflict and cooperation in paranoia: A large-scale behavioural experiment. *Psychological Medicine*, 48(9), 1523–1531. <https://doi.org/10.1017/S0033291717003075>
- Saalfeld, V., Ramadan, Z., Bell, V., & Raihani, N. J. (2018). Experimentally induced social threat increases paranoid thinking. *Royal Society Open Science*, 5(8), 180569. <https://doi.org/10.1098/rsos.180569>
- Van de Mortel, T. F. (2005). *Faking it: social desirability response bias in self-report research*. 25(4), 10.
- Westermann, S., & Lincoln, T. M. (2010). Using signal detection theory to test the impact of negative emotion on sub-clinical paranoia. *Journal of Behavior Therapy and Experimental Psychiatry*, 41(2), 96–101. <https://doi.org/10.1016/j.jbtep.2009.10.007>

Part 2: Empirical Paper

The effect of compassion-focused imagery on paranoia, and trust-based cooperative decision-making on the Prisoner's Dilemma Game in the general population

Abstract

Aims

Compassion-focused imagery has shown promising results in reducing paranoia as well as other negative symptoms, however the mechanism is poorly understood. Paranoia is associated with distrust within an interpersonal context, which impacts social functioning. The Prisoner's Dilemma Game has recently been shown to be an objective measure of trust-based decision-making. This study investigates 1) the effects of compassion-focused imagery on paranoia, affect, and trust-based (cooperative) decision-making, in comparison to relaxation imagery, and 2) the effects of paranoia on trust-based decision-making.

Method

One-hundred and seventy participants, from the general population, completed a variant of the Prisoner's Dilemma Game, administered online. Participants decide whether to compete or cooperate (trust) with a virtual partner. Unbeknown to participants, they only play a single round, and the other "player" is a computer that always elects to compete. Prior to the task, participants underwent soothing rhythmic breathing and a guided imagery intervention (either compassion-focused imagery or relaxation imagery). Participants were randomised to one of the two guided imagery interventions. State measures of paranoia as well as positive and negative affect were collected pre and post intervention.

Results

Analyses confirmed a reduction in paranoia and negative affect, but no change in positive affect, following the compassion-focused intervention. There were no differences in trust-based decision-making between the intervention groups. In addition, levels of paranoia did not have an impact on trust-based decision-making, but did impact appraisals of the other player's intentions. Participants who chose to

compete were found to have higher expectations that the other player would also compete.

Conclusions

Receiving a mental imagery intervention did reduce participant's paranoia, and negative affect, however no differences were found between the type of imagery (compassion-focused imagery and relaxation imagery). Further research is needed to determine the mechanism behind this reduction, for example by including an additional control group not receiving any intervention. Overall, this study has found that mental imagery appears to be effective in reducing paranoia and negative affect in the general population.

Introduction

Paranoia is interpersonal in nature, involves an exaggerated sense of personalised threat, and is a risk factor for developing psychosis (Gumley, Braehler, Laithwaite, MacBeth, & Gilbert, 2010; Raihani & Bell, 2018). Research suggests that the ability to trust others is impaired in people with high levels of paranoia (Ellett, Allen-Crooks, Stevens, Wildschut, & Chadwick, 2013; Fett et al., 2012). Paranoia has been investigated using game theory approaches which target fundamental aspects of paranoia, by asking participants to make social decisions on ambiguous interpersonal tasks (Ellett et al., 2013; Raihani & Bell, 2018; Raihani & Bell, 2017). Compassion-focused imagery has been shown to provide an interpersonally sensitive approach to recovery for psychosis, with studies publishing promising results for those with a clinical level of paranoia, as well as those with non-clinical paranoia (Gumley et al., 2010; Lincoln, Hohenhaus, & Hartmann, 2013). However, studies investigating interventions for paranoia, have not used these experimental paradigms to investigate paranoia. Furthermore, there remains a limited understanding as to how these interventions impact paranoia, and what particular aspects of paranoia they target. By investigating compassion-focused imagery using an experimental paradigm, this study hopes to develop upon previous research that shows compassion-focused imagery may reduce paranoia. Additionally, this study seeks to answer how this comes about, and whether it can be captured objectively in a trust-based decision-making task. This chapter will briefly summarise existing research outlined in chapter one and rationale for the current study.

Background

Compassion-focused imagery has been investigated in several studies, both in the clinical and the general population. Overall, research presents promising findings across both groups of individuals. Compassion-focused imagery (in comparison to control groups) has been shown to have: significant positive effects

on happiness, self-reassurance (positive ways of individuals relating to themselves), self-esteem, significantly greater clinical improvements for people with schizophrenia-spectrum disorders, and significantly higher levels of compassion, and positive affect (Ascone, Sundag, Schlier, & Lincoln, 2017; Braehler, Harper, & Gilbert, 2012; Matos et al., 2017). Furthermore, significant improvements in depression and negative affect, and reductions in feelings of shame and lower levels of state paranoia were also found in compassionate imagery groups in comparison to control groups (Braehler et al., 2012; Laithwaite et al., 2009; Lincoln et al., 2013).

Additionally, in one study, paranoia levels significantly reduced in both the compassionate imagery group and the control group (imagining a chair), suggesting that regardless of the type of mental imagery, paranoia scores will reduce (Ascone et al., 2017). However, given this study induced participants with a distressing image initially, either mental imagery condition could have acted as a distraction or time lapse which allowed for paranoia levels to shift, therefore clear conclusions regarding the role of compassionate imagery cannot be drawn from this.

All of the studies using compassionate imagery were face to face (individually or within a group setting), with only one of them using audio files that participants could practice at home with independently. Similar overall results were found despite the platform the imagery took, giving promise for online mental imagery applications. Popularity for online meditation and mental imagery has increased recently, with evidence suggesting numerous mental health benefits for regular users, for example, improvements in depressive symptoms, resilience and mindfulness (Flett, Hayne, Riordan, Thompson, & Conner, 2019). Furthermore, practicing compassionate imagery online, without clinicians support, has been found to be acceptable, and have positive effects including reductions in depression, anxiety and stress, and increases in self-compassion and self-reassurance (McEwan & Gilbert, 2016).

In summary, studies using compassionate imagery have shown promising results for improving positive and negative affect, as well as a range of other symptoms. Additionally, evidence suggests that mental imagery can be used on an online platform, which is highly beneficial from a research perspective in terms of gaining a larger sample, economic benefits and the ability to access a range of diversity in participants.

Investigating paranoia using socioeconomic games

The aforementioned compassionate imagery research used only self-report measures to examine levels of participant's paranoia, which can bring a range of limitations such as social desirability bias and subjective interpretations. However, recent research has begun to investigate paranoia using game theory and socioeconomic games (Ellett et al., 2013; Raihani & Bell, 2018; Raihani & Bell, 2017). The Prisoner's Dilemma Game allows for paranoia to be measured by a behavioural mechanism rather than relying on self-report, providing a 'real life' interpersonal interaction where individuals are forced to make judgements about the other player regarding whether they trust (cooperate with) them. It is important however to acknowledge the potential demand characteristics that may be at play even for a more 'real life' interaction within an experiment.

State paranoia has been found to significantly correlate with the competitive choice (distrust) participants make on the game (Ellett et al., 2013). Furthermore, paranoia appeared to predict participant's intentions of harm on the other, i.e. state paranoia was found to be associated with participants choosing to compete because they did not trust the other player rather than acting in self-interest (greed) (Ellett et al., 2013). Compassionate imagery is hoped to target this. Participant's perceptions of the other players intentions can also be investigated, providing rich information for the researchers. Ellett and colleagues (2013) found that participants with higher levels of paranoia believed their opponent intended to harm them through their choice on the game.

Summary of existing research

Research using compassion-focused imagery has shown promising results in reducing paranoia as well as other negative symptoms. Furthermore, the Prisoner's Dilemma Game has been shown to be an effective behavioural measure of paranoia, additionally providing the opportunity for researchers to investigate expectations and motives behind social decision-making. However, there are not currently any existing studies that investigate how compassion-focused imagery (CFI) impacts paranoia by using the Prisoner's Dilemma Game as a behavioural measure of paranoia rather than solely self-report measures. Also, the expectations of whether the participant believes the other player will compete or cooperate, and the participant's beliefs about the other players intentions has not been investigated. Furthermore, existing compassion-focused imagery studies have tended to be compared to a neutral control, rather than to other active interventions (Acone et al., 2017; Lincoln et al., 2013). This limits the conclusions that can be drawn from any differences found, as it is not known whether CFI works by targeting a specific element (for example trust and paranoia), or whether it just brings down overall arousal in the same way as relaxation-based interventions. Consequently, the present study compares compassion-focused imagery with relaxation imagery (RI), using the Prisoner's Dilemma Game as a behavioural measure for paranoia, alongside additional self-report measures. Intentions behind choice will be asked, and perceptions of why the other player chose to compete will also be asked to determine whether participants choose to compete because they were responding defensively (distrust), or to maximise their pay-out (greed) (Ellett et al., 2013). This information will allow for further evaluation as to the potential mechanism behind CFI.

Study aims and Hypotheses

The present study aims to quantify the effect that a brief compassion-focused imagery intervention has on paranoia and on a single round of trust-based decision-making, in a non-clinical population.

Hypothesis one: Effects of intervention on paranoia and affect

- a. State paranoia will significantly decrease for participants in the compassion-focused imagery group post intervention, in comparison to participants in the relaxation imagery group.
- b. Self-reported negative affect will significantly decrease, and positive affect will significantly increase in the compassion-focused imagery group post intervention, in comparison to participants in the relaxation imagery group.

Hypothesis two: Effects of intervention on distrust-based (competitive) decision-making

- a. Participants in the compassion-focused imagery group will be more likely to cooperate in the Prisoner's Dilemma Game (less likely to compete), relative to the relaxation imagery group.
- b. Participants in the compassion-focused imagery group will have higher expectations that the other player will cooperate, in comparison to the relaxation imagery group.

Hypothesis three: Effects of paranoia on trust-based decision-making

- a. Participants with higher rates of paranoia will choose to compete rather than cooperate, independent of the intervention received. State (pre and post intervention) and trait (baseline) paranoia will be tested for separately.
- b. Participants who choose to compete will have higher expectations that their opponent will also compete, than those participants choosing to cooperate.
- c. Participants with higher levels of paranoia (state and trait) will report higher distrust-based motives for competing (as opposed to greed-based motives

for competing). I.e. Participants with higher levels of paranoia will choose to compete because they do not trust the other player, more so than wanting to compete for their own self-interest.

- d. Furthermore, participants with higher levels of paranoia (state and trait), will perceive that their opponent has competed because of hostile motives (the other wanted to reduce participant's earnings), more so than greed-based motives (the other wanted to earn more for themselves).

Method

Pilot

A pilot study, which consisted of seven participants (mean age = 36.43 years, range = 25-59; $SD = 15.53$, with 85.7% being female), was conducted before the main study to ascertain the feasibility of the online design and the accessibility and engagement of the mental imagery audio. Additionally, participants were asked to comment on the believability they were playing against a human rather than a computer, whether any technical issues arose, their awareness throughout of the true aim of the study, and finally the clarity of the instructions.

Participants

The main study recruited 170 participants from the general population using UCL's internal research recruitment system. Participation was voluntary, with a prize draw available in which they could win one of five vouchers worth £50 each. Informed consent was obtained from all participants before they took part, participants also had the opportunity to withdraw their data once the true aim of the study was revealed at the end. Inclusion criteria included participants being over 18 years old, they had to understand verbal and written English language, and not currently, or previously, have received professional help for a mental health problem (determined by self-report). Participants were excluded if they did not meet this criteria.

Design

The study used an experimental randomised design with two intervention groups. All participants completed all questionnaires, received the same instructions, practice rounds and completed one experimental round of the Prisoner's Dilemma Game online using Gorilla software. The intervention groups differed only in the type of mental imagery they were given. Participants in group one (CFI group) were given compassion-focused mental imagery, and group two (RI group) were given relaxation-focused mental imagery. Both intervention groups listened to an identical three minute script of soothing rhythmic breathing before their mental imagery condition.

Both intervention groups completed measures on trait paranoia (GPTS) and anxiety and depression (DASS). The PANAS (pre and post intervention) was used to measure the immediate effect of both intervention conditions on positive and negative affect. State paranoia (SPS) was investigated pre and post intervention, in the context of the Prisoner's Dilemma Game. Participants were asked for their choice on the Prisoner's Dilemma Game, their intentions behind their choice, and their expectations and perceived intentions of the other's choice (to determine if they were making a decision based on greed or distrust) (See Figure 1 for choice options). Participants 'opponent' (named player #44 to increase the believability the opponent was human) on the Prisoner's Dilemma Game was a computer, and was pre-programmed to compete with every participant.

		Other player	
		Cooperate	Compete
Participant	Cooperate	75 75	100 25
	Compete	25 100	50 50

Figure 1. Prisoner's Dilemma Game choice matrix

Imagery Scripts

Introduction to mental imagery and soothing rhythmic breathing exercise

All participants were asked to listen to a three minute audio recording of an introduction into mental imagery, followed by a brief soothing rhythmic breathing exercise (See Appendix J for script). This audio also outlined that the study is interested in stimulating the positive emotional systems of the brain. The soothing rhythmic breathing script aimed to prepare participants for the intervention scripts (CFI versus RI), by asking participants to compose the mind and body; for the body to be relaxed, but for the mind to be alert and aware. Participants were then randomly split into one of two conditions (CFI or RI).

Compassion-focused imagery

The compassion-focused imagery script was 12 minutes in length, and asked participants to create an image in which they imagine themselves to be the focus of a compassionate being. This compassionate being was explained to have superhuman, complete and perfect compassionate qualities, which included having a deep commitment to participants, as well as warmth, acceptance, kindness, strength and dependability. (See Appendix J for script).

Relaxation imagery

The relaxation imagery script was 10 minutes in length, and asked participants to imagine themselves in a relaxing, peaceful and soothing place. The script asked participants to think about the sounds, smells, temperature and details, like colour and shapes they could see. (See Appendix J for script).

Measures

Demographic details

Participants were asked to provide demographic information, including: their sex (female, male, rather not say, other – please specify), age, occupational status (student, employed, unemployed, other – please specify), ethnicity, and country of residence.

Paranoia

Trait paranoia was measured using Green et al (2008)'s Paranoid Thought Scales (GPTS). This 32-item self-report scale reflects a hierarchy of paranoid ideas measuring trait paranoia, in relation to social reference (16 items, e.g. 'I was certain that people have followed me'), and persecution (16 items, e.g. 'people have intended me harm') over the last month. Participants rated each of the 32 statements on a 5-point Likert scale, with 1 representing 'not at all', and 5 representing 'totally'. Scores range from 16-80 for each set of 16 items, and both social reference and persecution scores can be added to equal a total trait paranoia score. Higher scores reflect higher levels of trait paranoia. Specifically, individuals in the non-clinical population were found to have higher social reference scores than persecution scores. The GPTS shows good validity, being highly correlated with Fenigstein and Vanable's (1992) Paranoia Scale. Good internal consistency was shown for a non-clinical sample: social reference (Cronbach's alpha = .90); persecution (Cronbach's alpha = .92); total GPTS (Cronbach's alpha = .95) (Green et al., 2008). Furthermore, good test-retest reliability was also found with highly

significant intra-class coefficients: social reference (Cronbach's alpha = .88); persecution (Cronbach's alpha = .81) and total GPTS (Cronbach's alpha = .87).

State paranoia was measured using Ellett et al (2013)'s State Paranoia Scale (SPS). Participants rated how they perceived another person ('opponent') by marking responses on a 7-point Likert scale anchored with two contrasting statements. The four paranoia items consist of: 1) 'is friendly towards me' versus 'is hostile towards me', 2) 'wants to please me' versus 'wants to upset me', 3) 'wants to help me' versus 'wants to harm me', and 4) 'respects me' versus 'has it in for me'. Scores range from 4-28, with higher scores indicating higher levels of state paranoia. The measure shows good internal consistency (Cronbach's alpha = .92), and good validity, being significantly correlated with Fenigstein and Varabian's (1992) Paranoia Scale. Participants were asked to complete this on two occasions, pre and post intervention (CFI versus RI), both before starting the game with the opponent.

Affect

The DASS-21 is a 21-item self-report measure consisting of 3 subscales measuring states of anxiety, depression and stress, each containing 7 items (Lovibond & Lovibond, 1995). This study used two of the subscales: anxiety (e.g. 'I felt I was close to panic'), and depression (e.g. 'I felt downhearted and blue'), with stress not being measured. Participants were asked to rate how each of the 14 statements applied to them over the past week, using a 4-point scale: 'did not apply to me at all' (0), to 'applied to me very much, or most of the time' (3). Scores are calculated by multiplying each subscale by two, with scores ranging from 0-42 for each subscale. Reliability was found to be good for both subscales in the non-clinical population: anxiety (Cronbach's alpha = .90), and depression (Cronbach's alpha = .82) (Henry & Crawford, 2005).

The Positive and Negative Affect Schedule (PANAS) was used to measure self-reported positive (e.g. 'excited') and negative (e.g. 'hostile') affect in the present moment (Watson, Clark, & Tellegen, 1988). Participants rated how they felt in the present moment on 20 items on a 5-point Likert scale (10 positive affect and 10 negative affect), from 'very slightly or not at all' to 'extremely'. Scores range between 10-50 for each of the two scales, with higher scores representing higher levels of affect. The measure shows good internal consistency reliability for both positive affect (Cronbach's alpha = .89), and negative affect (Cronbach's alpha = .85). Participants were asked to complete both affect scales on two occasions, pre and post intervention (CFI versus RI), before starting the game with the opponent.

Motives and distress

Reasons for choice on the Prisoner's Dilemma Game were asked if participants chose to compete. For example, 'please rate each item indicating why you chose to compete' on a Likert scale from 1 (not at all) to 7 (very much). Responses included: 'I chose to compete because': (1) 'I wanted to defend myself against the actions of the other person' (distrust); (2) 'I did not trust the other person' (distrust); (3) 'I wanted to earn more than the other person' (greed); (4) 'I wanted to maximise the difference between both persons in my favour' (greed). Statements a) and b) were coded for distrust, and statements c) and d) were coded for greed, as seen in the study by Ellett and colleagues (2013).

Participants were asked their expectations of their opponent's choice on the Prisoner's Dilemma Game: 'please indicate, using the sliding scale (0-100), your expectation of the probability that the other player will compete'.

Participants were asked why they believed their opponent competed, with two intentions outlined on a 7-point Likert scale from 1 (not at all) to 7 (very much). 'Person #44 wanted to reduce my earnings' (hostile-based competition); 'Person #44 wanted to earn more for themselves' (greed-based competition).

Additionally, distress was measured, asking participants to rate on a 10-point scale from 0 (not at all) to 10 (very much) 'how much are you bothered by player #44's choice?'

Experimental checks

Participants were asked to rate their engagement (attention/concentration) on a 10-point visual analogue scale once they completed listening to the full script (CFI or RI); 0 = not engaged at all, low concentration and attention, 10 = completely engaged, high concentration and attention. This allowed for interpretation of acceptability of the scripts, as well as interpretation of any difficulties with the audio (e.g. scoring zero may suggest technical or other issues with the audio, or that participants did not listen to the script and could arguably be excluded from the data set).

At the end of the study, participants were asked to 'rate how certain they were that person #44, who you played against online, was human' on a 10-point Likert scale from 0 (certain they were not) to 10 (certain they were). Participants were asked to rate this based on 'at the time they were interacting with player #44 (then)', and 'now'.

Single trial of Prisoner's Dilemma Game

This study used Ellett et al (2013)'s design of the Prisoner's Dilemma Game paradigm to examine paranoia in the general population. Participants were asked to either compete or cooperate with the other player online. The dilemma emerges when participants are presented with Figure 1. Maximum outcomes can be accomplished by choosing to compete when the other player chooses to cooperate. However, when both players choose to compete, they will each only earn a much lower number of points than if they both cooperated.

Participants were given clear instructions outlining the possible choice combinations and their points. Players were told they would be playing between one and six trials of the game, however every player would only play one trial of the game. Participants had to complete two practice rounds to ensure understanding, and could only move on once they had correctly answered at least one of the two questions.

Summary of findings from Pilot testing

Seven pilot participants completed the study providing feedback on the following topics: clarity of the instructions throughout, audio (length, accessibility, engagement), any issues during the study (technical or otherwise), opinions on questionnaires (length, number, engagement), believability opponent was human rather than a computer (any suggestions on how to enhance this perception), awareness of the true aim of the study (any suggested improvements) and any general feedback. Participants responded that the instructions and questionnaires were clear, easy to understand and the right length. Furthermore, the audio was accessible and easy to engage with and concentrate on, with most participants feeling it was a good length, and calming to listen to. Most participants also commented that they were not aware of the true aim of the study.

Two issues arose from the pilot which participants commented on, and were actioned before the main study commenced. First, there were technical issues with the audio, sometimes due to the particular browser used and other times due to the device used (mobile phones had an issue switching to landscape mode). The audio for others played, however sound remained quiet due to their volume being on low. The mechanism to access the audio file was amended so that participants could press 'play' when they were ready to begin. In addition, a screen was set up to precede the audio reminding participants: 'the audio cannot be paused so try your best to ensure you will not be distracted or interrupted for the next 10-15 minutes'.

Second, participants mostly did not believe they were playing against a human opponent. Ellett and colleagues (2013) previously found a correlation between state paranoia and behavioural choice (compete or cooperate) only when participants believed they were playing against a person rather than a computer. Therefore, as this element is crucial for the study, a number of amendments were made to increase the believability. Further screens were set up throughout the study explaining that the study is searching for another player to connect with, additionally, the message 'searching for another player...' appeared on most pages. Further amendments included: naming the other player as 'player #44', and naming the participant 'player #42'; 'player #44' was referred to in many questions to increase the interpersonal nature of the online relationship; on-screen messages informing participant #42 that player #44 knows they are connected to them and knows them by the ID #42; stating that both the participant and player #44 will be listening to the audio script at the same time; and finally, the word 'person' was used more frequently than 'player'.

The pilot study took on average 29.9 minutes to complete (range = 23-37; SD = 6.23). There appeared to be good engagement with the mental imagery scripts (engagement ratings: average = 6.86, range = 4-9, SD = 1.77). There was no significant difference on engagement between the two scripts $t(5)=-1.134$, $p=.308$.

Procedure

The study was conducted online, using Gorilla software, and could be accessed using a link found on UCL's internal recruitment website. Participants were able to access the link anytime, from anywhere, and any device (mobile, tablet, laptop, computer) provided they had internet access. Participants were first provided with an information page explaining they were taking part in a study which was exploring social expectations and behaviour in ambiguous social situations. Later in the study, participants were shown the choice matrix (Figure 1) and asked two

practice questions about how many points they would earn if they chose to cooperate/compete and the other player chose to cooperate/compete. Results appeared instantly on the screen showing whether they got the answer right or wrong. Participants had to get at least one of the two questions right in order to move forward with the study, those who answered incorrectly on both occasions were given the opportunity to read the instructions and practice again. Please see Figure 2 for an overview of the study's design.

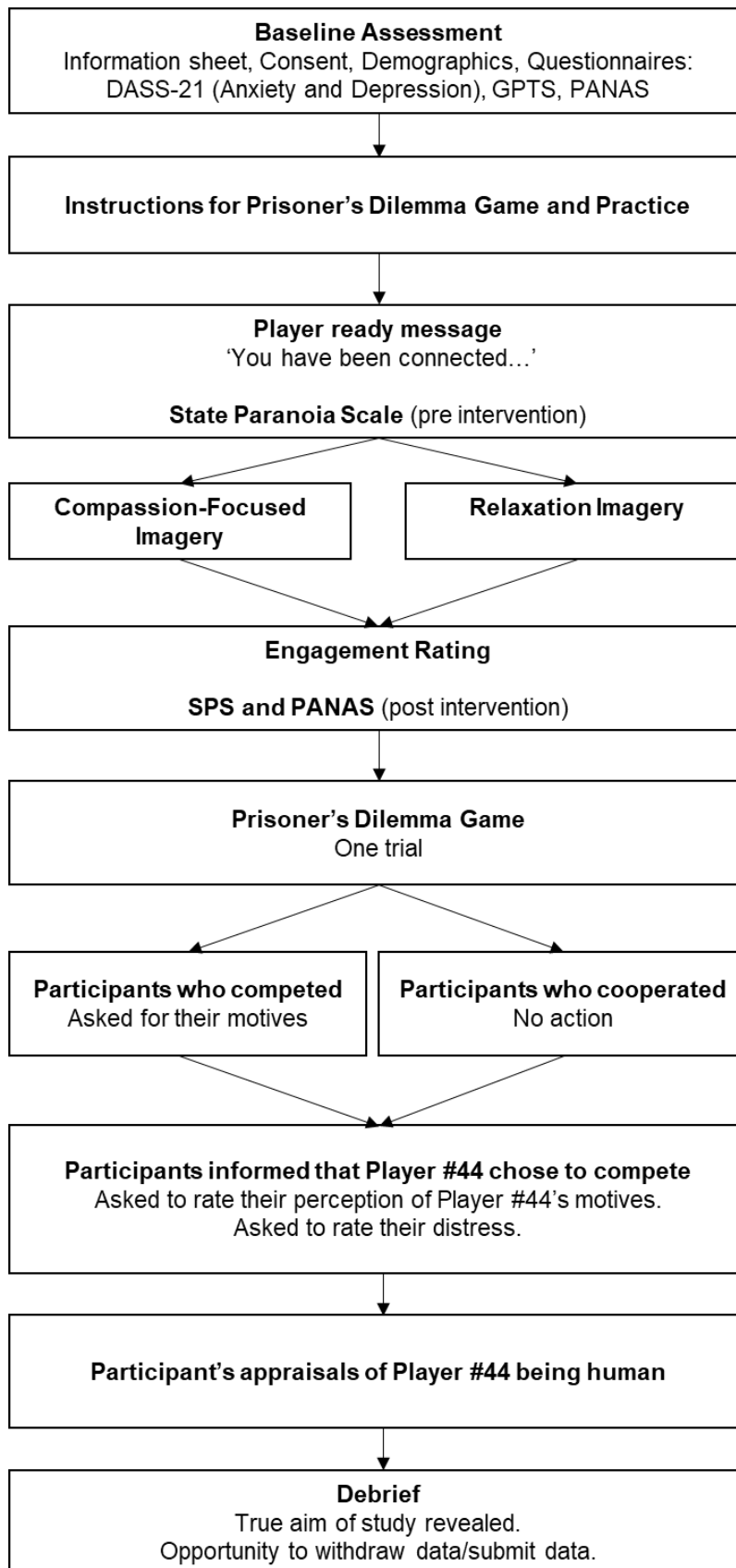


Figure 2. Overview of study procedures.

Ethical considerations

Ethical approval was gained from University College London (UCL) Research Ethics Committee (project ID number: CEHP/2014/519).

Information sheets were presented to potential participants on the first screen of the study and they had the opportunity to ask questions via email or telephone if they wished. Participants were then asked for consent to participate and could not continue with the study until they had done so. Participants were informed that they could withdraw from the study at any point without explanation, including at the end of the study once the true aims of the study were revealed in the debrief. Only participants who clicked through to the very last webpage, after the debrief page, were believed to fully consent and submit their answers. Therefore no incomplete data was used.

The main ethical issue that arose within this study was of deception. Significant effort was made to generate the belief that participants would be playing against another person rather than a computer. I.e. participants were informed that they were 'player #42' and they were playing 'person #44'. The phrase 'searching for a player to connect you with' displays on the screen numerous times, as well as phrases such as 'waiting to connect'.

In addition to this, participants were told there would be between one and six trials of the game, however, for every participant there was only one trial of the game. This element of deception was necessary as evidence shows that when participants know they only have a single trial, it can strongly increase competition (Ellett et al., 2013; Pruitt & Kimmel, 1977).

Both elements of deception described above were explained in the debrief where participants had the opportunity to withdraw their data, alternatively the researchers contact details were provided for support if necessary.

Participants were informed that their data would be kept confidential and they would not be identifiable by the data kept. Participant's information was kept anonymous, with no names being kept on file, only participant codes.

Power analysis

The power analysis for this study was informed by Ellett and colleagues' (2013) study, which used the Prisoner's Dilemma Game to explore paranoia in a non-clinical population. A power calculation was carried out using G Power 3 (Faul, Erdfelder, Buchner, & Lang, 2009), with desired power at 80%, and an alpha level of 5%. The required sample size was estimated to be 102 (51 in each intervention group) to detect a small to medium effect size.

Data analysis

All data was assessed for normality, through visually checking the histograms, concurrently with the Kolomogorov-Smirnov tests. If the histogram indicated skew and the Kolomogorov-Smirnov test generated a significant result, then the skewness and kurtosis scores would be calculated. If the data showed a non-normal distribution transformation would be considered.

Planned analyses

Statistical Package for Social Sciences, version 24.0 (SPSS, version 24.0) was used to analyse the data. P-values are given to three decimal places, percentages are given to one decimal place, and all other statistics are given to two decimal places.

A between and within subjects two-way factorial ANOVA was run for Hypotheses 1a and 1b to determine the effects intervention had on paranoia and affect. Follow up Mann-Whitney U and ANCOVA analyses were run for Hypotheses 1a.

To investigate the effects of intervention on distrust-based (competitive) decision-making, Chi-Square and Mann-Whitney U analyses were run for 2a and 2b respectively. Additionally ANCOVA was run for Hypothesis 2b.

To determine the effects of paranoia (state and trait) on trust-based decision-making and motives behind the decisions made on the Prisoner's Dilemma Game (Hypothesis 3), Mann-Whitney U and Spearman correlations were run. State (pre and post intervention) and trait (baseline) paranoia were tested for separately for Hypothesis 3a, and state and trait paranoia post intervention, as well as change in state paranoia were tested for separately in Hypotheses 3c and 3d.

Given the multiple comparisons for Hypotheses 3c and 3d, Bonferroni corrections were applied for three comparisons (corrected p -value reduced to: $p=.017$).

Results

Analysis

The analysis included all 170 participants, with each intervention group (CFI versus RI) having 85 participants in. The average age of participants across the whole study was 23.1 years (range = 18-64, SD = 7.89), with 80.6% of participants being female. Majority of participants were of Asian ethnicity (40.6%), and 78.8% of participants reside in the UK. Most participants described themselves as students (80.0%). Mann-Whitney U analysis showed no differences between the CFI and RI groups regarding demographics. All participant demographics are illustrated in Table 1.

Table 1.

Participant demographics

	Total (CFI and RI)	CFI	RI	Test statistic
N (%)	170 (100)	85 (50)	85 (50)	
Age (M, SD)	23.10 (7.89)	23.40 (8.34)	22.80 (7.46)	<i>Mann Whitney</i> $U = 3535.50$ $z = -.24$ $p = .808$
Sex (N, %)				
Female	137 (80.6)	71 (83.5)	66 (77.6)	<i>Chi-Squared</i> $\chi^2(1) = .94$ $p = .332$
Male	33 (19.4)	14 (16.5)	19 (22.4)	
Occupation (N, %)				
Student	136 (80.0)	66 (77.6)	70 (82.4)	$\chi^2(6) = 4.68$ $p = .586$
Unemployed	5 (2.9)	3 (3.5)	2 (2.4)	
Employed	25 (14.7)	14 (16.5)	11 (12.9)	
Other	4 (2.4)	2 (2.4)	2 (2.4)	
Ethnicity (N, %)				
White	57 (33.5)	32 (37.6)	25 (29.4)	$\chi^2(4) = 2.76$ $p = .598$
Black	3 (1.8)	2 (2.4)	1 (1.2)	
Asian	69 (40.6)	32 (6)	37 (43.5)	
Mixed/Multiple	10 (5.9)	6 (7.1)	4 (4.7)	
Other	31 (18.2)	13 (15.3)	18 (21.2)	
Country of Residence				
UK	134 (78.8)	69 (81.2)	65 (76.5)	$\chi^2(20) = 17.60$ $p = .614$
Europe - Other	17 (10.0)	8 (9.4)	9 (10.6)	
Asia	16 (9.4)	7 (8.2)	9 (10.6)	
America	3 (1.8)	1 (1.2)	2 (2.4)	
Device				
Computer	150 (88.2)	79 (92.9)	71 (83.5)	$\chi^2(2) = 3.76$ $p = .153$
Mobile	12 (7.1)	4 (4.7)	8 (9.4)	
Tablet	8 (4.7)	2 (2.4)	6 (7.1)	

Outcome measures

No differences were found between the two intervention groups on baseline measures, using Mann-Whitney U analysis. Full descriptive statistics for baseline measures for both intervention groups (CFI and RI), and for all participants overall can be found in Table 2.

Table 2.

Baseline (pre-intervention) descriptive statistics and Mann-Whitney U analysis

Baseline Measures	Total (CFI and RI)		CFI		RI		Mann-Whitney U
	M (SD)	Range	M (SD)	Range	M (SD)	Range	
PANAS Negative Affect	7.49 (3.35)	5-23	7.71 (3.29)	5-18	7.27 (3.42)	5-23	$U = 3195.00$ $z = -1.34$ $p = .180$
PANAS Positive Affect	12.41 (4.04)	5-25	12.05 (3.98)	5-25	12.78 (4.09)	5-22	$U = 3244.50$ $z = -1.15$ $p = .250$
SPS	14.43 (3.75)	4-27	14.19 (3.66)	4-23	14.67 (3.84)	6-27	$U = 3482.50$ $z = -.42$ $p = .676$
Anxiety (DASS)	10.12 (7.69)	0-38	9.69 (6.49)	0-28	10.54 (8.74)	0-38	$U = 3604.00$ $z = -.03$ $p = .979$
Depression (DASS)	10.07 (9.76)	0-42	9.44 (8.63)	0-34	10.71 (10.8)	0-42	$U = 3610.00$ $z = -.01$ $p = .994$
GPTS Social Reference	28.75 (12.01)	16-68	28.68 (11.38)	16-68	28.81 (12.68)	16-67	$U = 3466.00$ $z = -.32$ $p = .750$
GPTS Persecution	21.55 (9.79)	16-80	21.12 (8.7)	16-70	21.98 (10.81)	16-80	$U = 3513.00$ $z = -.32$ $p = .750$
GPTS Total	50.29 (20.55)	32-144	49.8 (18.87)	32-133	50.79 (22.21)	32-144	$U = 3449.50$ $z = -.51$ $p = .611$

Skewness

Positive affect scores (pre and post) were not skewed. However, nine variables were skewed: DASS Anxiety ($p < .001$, skewness = 4.91, kurtosis = 1.42), DASS Depression ($p < .001$, skewness = 6.16, kurtosis = 1.66), PANAS negative affect pre intervention ($p < .001$, skewness = 10.25, kurtosis = 10.25), PANAS negative affect post intervention ($p < .001$, skewness = 16.45, kurtosis = 28.31), SPS pre intervention ($p < .001$, skewness = -3.77, kurtosis = 4.52), SPS post intervention ($p < .001$, skewness = -4.45, kurtosis = 0.16), GPTS social reference ($p < .001$, skewness = 6.79, kurtosis = 3.13), GPTS persecution ($p < .001$, skewness = 16.39, kurtosis = 31.32) and GPTS total ($p < .001$, skewness = 10.76, kurtosis = 12.39).

Due to the data not being normally distributed, transformation was considered. However, there are a number of issues with transforming data, for example interpreting a transformed construct would be different from what was originally measured. Furthermore, Field (2013, p.202) states that 'unless correcting for a lack of linearity, use robust [non-transformative] procedures, where possible, in preference to transforming the data'.

Therefore, given the issues with transformation, and the current studies large sample size ($N = 170$, power calculation estimated $N = 102$ for a small to medium effect size), non-parametric equivalent tests were used for t-tests, Chi-Square and correlations, rather than transforming the data. However, ANOVAs were used as these are more robust to violation of parametric assumptions (Field, 2013). Additionally, using ANOVAs allowed use of multi-factorial models and inclusion of covariates, therefore were well suited to this study's purposes.

Belief opponent was human

Participants rated their belief that their opponent was human out of 10: 'then' mean = 2.78, $SD = 2.80$; and 'now' mean = 1.98, $SD = 2.15$. A Spearman's rank-order correlation found a significant negative correlation between participant's belief

that their opponent was human (when they played the game: 'then'), and the choice they made on the Prisoner's Dilemma Game ($r_s(170) = -.156, p=.042$). However, no correlation was found between participant's belief that their opponent was human (at the time of responding to the question 'now') and their choice ($p=.103$).

A one sample t-test showed that participant's ratings that their opponent was human was significantly greater than zero, both 'then': 95% CI [2.34 to 3.20], $t(169) = 12.94, p < .001$; and 'now', 95% CI [1.65 to 2.30], $t(169) = 11.97, p < .001$. This confirms that on average, participants believed they were interacting with a real human-being rather than a computer.

Hypothesis Testing

Hypothesis one: Effects of intervention on paranoia and affect

1a. It was predicted that participants in the compassionate imagery group would have lower levels of state paranoia (SPS) in comparison to participants in the relaxation imagery group post intervention. There was a significant main effect for time, $F(1, 168) = 41.25, p < .001$, but no main effect for intervention ($p=.166$) or interaction effect for time-intervention ($p = .356$). Regardless of the type of intervention participants received, state paranoia scores decreased (Figure 3).

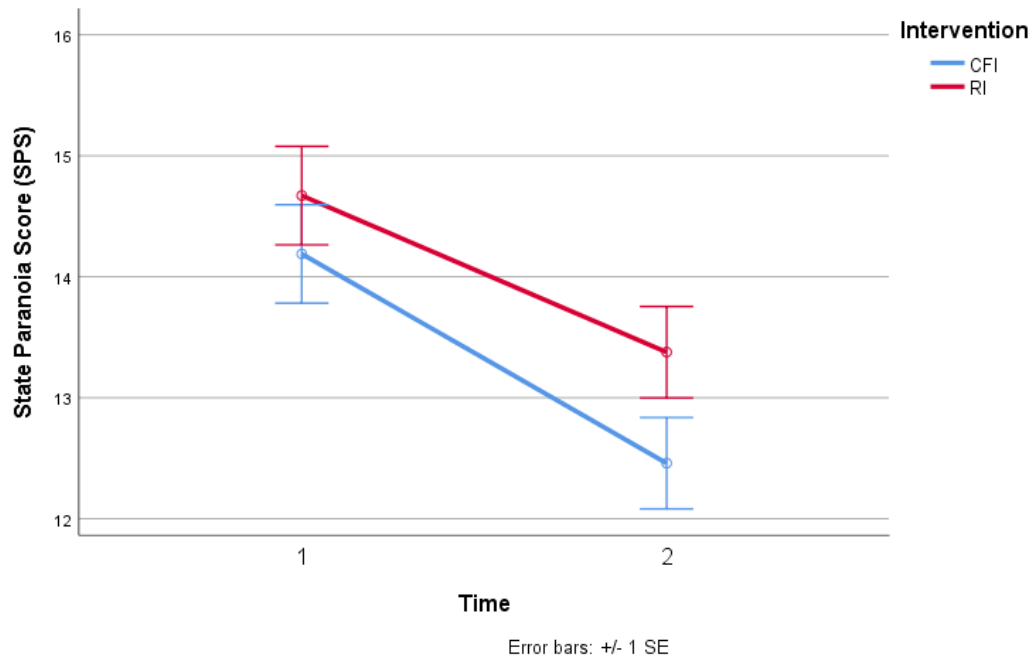


Figure 3. State paranoia before and after intervention. There is a reduction in state paranoia for both compassion-focused imagery and relaxation imagery. Error bars are standard error of the mean.

There remained no effect of intervention on change in state paranoia scores when controlling for: engagement ($p=.165$); sex ($p=.280$); anxiety ($p=.346$); depression ($p=.378$) and trait paranoia ($p=.340$).

1b. There was a significant main effect of time for negative affect, $F(1, 168) = 51.62$, $p < .001$, however not for positive affect ($p=.308$). There were no main effects of intervention or time-intervention interactions for either negative ($p=.701$; $p=.142$), or positive affect ($p=.175$; $p=.888$) respectively.

Regardless of the type of intervention participants received, negative affect scores decreased at time two, however there were no differences in positive affect scores (Figures 4 and 5).

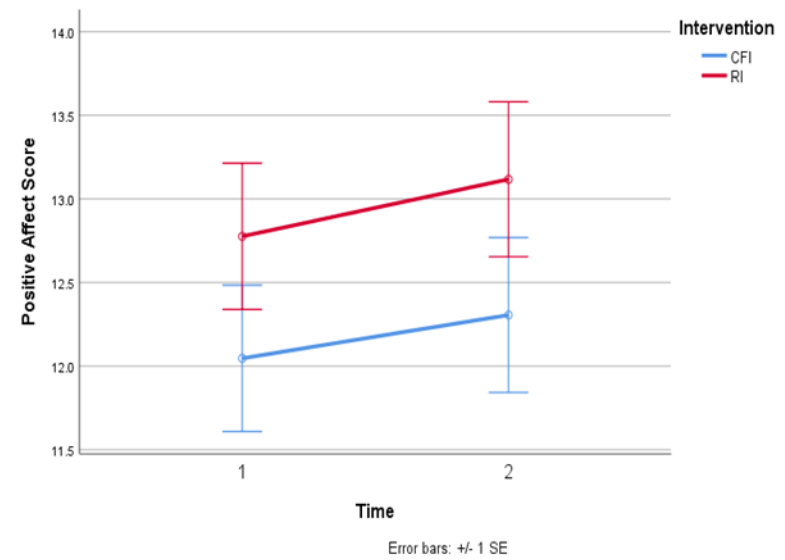
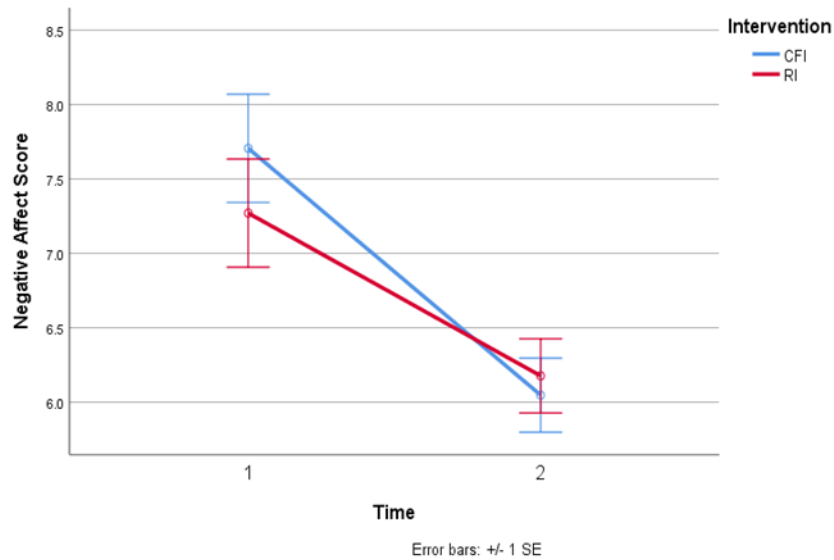


Figure 4 and Figure 5. State affect before and after intervention. There is a reduction in negative affect scores (left), and no difference in positive affect scores (right), following intervention, with no differences in these effects between interventions. Error bars are standard error of the mean.

Hypothesis two: Effects of intervention on distrust-based (competitive) decision-making

2a. Counter to predictions, there was no difference between the intervention groups in rates of cooperative choice $\chi^2(1)=.27$, $p=.602$.

Table 3.

Descriptive statistics of choice and intervention

	Cooperate % (n)	Compete % (n)	Total% (n)
CFI	37.6 (64)	12.4 (21)	50.0 (85)
RI	35.9 (61)	14.1 (24)	50.0 (85)
Total	73.5 (125)	26.5 (45)	100.0 (170)

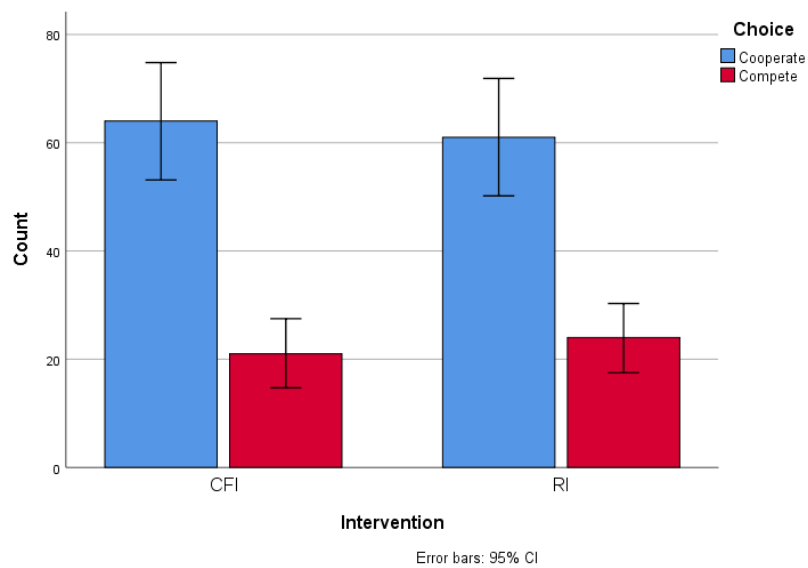


Figure 6. Bar chart showing frequency of choice in each intervention group (compassion-focused imagery versus relaxation imagery)

2b. Counter to predictions, expectation score was not statistically significantly different between CFI (*Mean Rank* = 80.99) and RI (*Mean Rank* = 90.01), $U = 3229.50$, $z = -1.20$, $p = .230$.

There remained no effect when controlling for total trait paranoia ($p=.416$), post-intervention state paranoia ($p=.716$) or engagement ($p=.341$).

Examining potential confounding factors

To ascertain whether level of engagement with the interventions played a role in the null effects reported above, self-reported engagement ratings were examined. Engagement was measured using a sliding self-rating scale asking participants to rate their engagement of the mental imagery audio, between 0 and 10 (Figure 7). The median score for engagement was 7, indicating overall good engagement with the breathing exercises and mental imagery audio (mean = 6.48, range = 0-10, SD = 2.41).

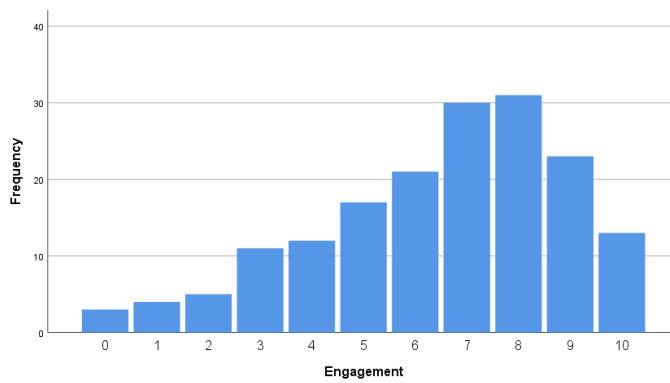


Figure 7. Participant's engagement scores

Leys et al. (2013) suggest exclusion criteria should be 2.5 standard deviations from the median. Accordingly, participants who scored 0 and 1 on engagement would fall into this exclusion criteria ($7.00 - 6.21 = 0.97$). This study therefore ran the key analyses for Hypotheses one and two again, after excluding the seven participants who scored 0 and 1 on engagement. No change in the significance of results was found for both hypotheses.

As no differences were found on Hypotheses one and two after excluding the participants who scored 0 and 1 on engagement, and given that Hypothesis three investigates the effects of paranoia, (rather than the effects of intervention), engagement with the mental imagery will not impact these results, therefore all participants have been included for the rest of the analyses.

Hypothesis three: Effects of paranoia on trust-based decision-making

3a. Participants with higher rates of paranoia were predicted to compete rather than cooperate on the Prisoner's Dilemma Game; state (pre and post intervention) and trait (baseline) paranoia were tested for separately. Contrary to predictions, no differences in paranoia scores were found between whether participants chose to compete (distrust), compared to those who chose to cooperate (trust) with the other player (See Table 4). Although there were trends in the direction expected (participants with higher rates of state paranoia chose to compete rather than cooperate), these did not reach significance ($p = .066$).

Table 4.

Mean paranoia scores for participants who chose to cooperate and compete, and Mann-Whitney U analysis

	Compete (n = 45)	Cooperate (n = 125)	Mann-Whitney U
SPS score (pre intervention)	M = 15.38 SD = 3.78	M = 14.09 SD = 3.69	$U = 2307.50$ $z = -1.84$ $p = .066$
SPS score (post intervention)	M = 13.69 SD = 3.57	M = 12.64 SD = 3.45	$U = 2320.00$ $z = -1.77$ $p = .076$
Change in SPS score	M = -1.69 SD = 3.47	M = -1.45 SD = 2.92	$U = 2770.00$ $z = -.15$ $p = .878$
Total trait paranoia score	M = 54.42 SD = 23.81	M = 48.81 SD = 19.14	$U = 2360.50$ $z = -1.60$ $p = .110$

3b. As predicted, participants who chose to compete had higher expectations that their opponent would also compete, than those participants choosing to cooperate. Expectation scores (that the other player would compete) for participants who competed ($Mdn = 60$) were significantly higher than for those who did not

compete ($Mdn = 50$), ($U = 1933$, $z = -3.12$, $p = .002$). This effect remained after adjusting for total trait paranoia scores, $F(1, 167) = 7.94$, $p = .005$, partial $\eta^2 = .045$.

3c. It was predicted that participants who chose to compete would report distrust-based motives more than greed-based motives for choosing to compete, if they had higher scores of paranoia (state and trait).

A significant positive correlation was found between state paranoia (post intervention), and participant's motivation for choosing to compete based on distrust, $p = .036$ (Table 5). However, after Bonferroni correction, this result no longer reached significance, (adjusted p -value cut-off for significance was $p = .017$). No correlation was found between trait paranoia and participant's motivation for choosing to compete based on distrust ($p = .071$).

As expected, no correlations were found between paranoia and greed-based motivations for competing ($p \geq .275$).

Table 5.

Spearman rank-order correlations between trait and state paranoia and participant's intentions and perceived intentions of the other. Significant results are underlined. P values are uncorrected for multiple comparisons.

	Participant's motivation for competing					Participant's perception of opponents intention to compete			
	Distrust		Greed			Hostility		Greed	
	N	r_s	p	r_s	p	r_s	p	r_s	p
Total Trait Paranoia (Baseline)	170	.27	.071	.07	.653	.15	<u>.050</u>	.00	.965
State Paranoia (Post Intervention)	170	.31	<u>.036</u>	-.03	.853	-.04	.582	-.06	.462
Change in State Paranoia	170	-.08	.626	-.17	.275	-.25	<u>.001</u>	-.07	.356

3d. It was predicted that participants with higher levels of paranoia (state and trait) would perceive that their opponent had competed because of hostile motives (the other wanted to reduce participant's earnings), more so than greed-based motives (the other wanted to earn more for themselves).

Significant correlations were found between participant's perception that their opponent had competed due to a hostile motive and both change in state paranoia (negative correlation – see Table 5 and Figure 8), and total trait paranoia (positive correlation), however total trait paranoia did not survive Bonferroni correction for multiple comparisons (cut-off for significance was $p=.017$). Follow up analyses showed that this association was driven by the social reference subscale ($r(167) = .184$, $p = .016$), rather than the persecution subscale ($p = .354$).

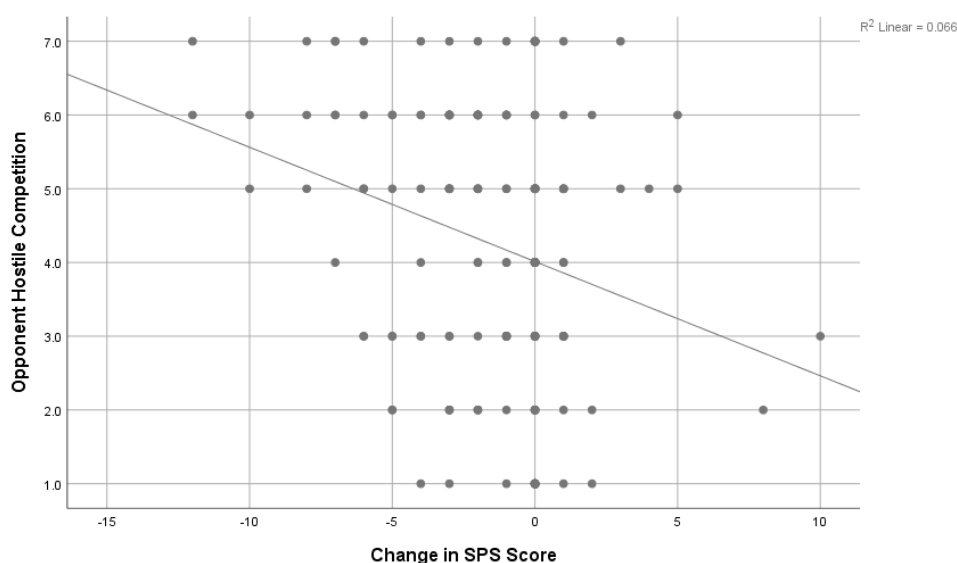


Figure 8. Scatterplot of participant's perception that their opponent competed due to a hostile motive and change in state paranoia scores.

As expected, there were no significant correlations between paranoia (state and trait), and greed-based motives.

Discussion

Research using compassion-focused imagery has shown promising results in reducing paranoia as well as other negative symptoms. Recently, socioeconomic games, such as the Prisoner's Dilemma Game, have been shown to be an effective behavioural measure of paranoia. However, there is no existing research that has examined whether changes following compassion-focused imagery interventions also reduce distrust in interpersonal decision-making.

The Prisoner's Dilemma Game successfully isolated participants who chose to cooperate from those who competed (73.5%, 26.5% respectively). In addition, those who chose to compete tended to have higher expectations that their opponent would also compete, than those participants who chose to cooperate, confirming the use of this task to study trust in the other. The results were broadly consistent with the view that paranoia is associated with greater mistrust of others' intentions. However, whilst both imagery interventions reduced state paranoia and negative affect, there was no evidence for this impacting participants trust-based decision-making. Furthermore, no differences were seen between the mental imagery interventions (compassion-focused imagery, and relaxing imagery), suggesting they are comparable.

Hypothesis one: Effects of intervention on paranoia and affect

The findings do support the hypothesis that the CFI intervention reduces state paranoia scores and negative affect, and increases positive affect scores. However, counter to what was hypothesised, this effect was not significantly stronger in relaxation imagery. Regardless of the type of intervention (CFI or RI), participants experienced significantly lower state paranoia and significantly lower negative affect scores post intervention. Furthermore, there was no change to positive affect scores across both interventions. No difference was found between the type of intervention in state paranoia, even after controlling for engagement with intervention, sex, trait paranoia, anxiety or depression. This suggests that CFI and

RI may have comparable effects on state paranoia and negative affect, although this can only be concluded tentatively because there was no control group. Lincoln et al. (2013) found that state paranoia decreased more in the compassion-focused intervention in comparison to the neutral control by a moderate-size effect (Cohen's $d=0.59$). This indicates that had the current study included a control group, state paranoia would likely not have changed post control, and a difference between the intervention groups (CFI and RI) and the control group would have been seen.

Both types of mental imagery (CFI and RI), despite the difference in content, have a relaxation element to them and use soothing rhythmic breathing. Therefore, it could be concluded that it is potentially this relaxation element, and/or the soothing rhythmic breathing exercise which has reduced state paranoia and negative affect. Therefore, future research would benefit from including a control group (with no relaxation element/soothing rhythmic breathing) to establish this effect.

Regarding positive affect, these findings contrast with a previous study that found an increase in positive affect post compassion-focused intervention (Matos et al., 2017). This is potentially due to the brevity of the mental imagery in this current study, as Matos et al. (2017) found an increase in positive affect after having asked participants to practice compassion-focused imagery exercises for two weeks. Positive affect was not analysed in Lincoln et al. (2013)'s study limiting comparisons between the current study and theirs.

Hypothesis two: Effects of intervention on distrust-based (competitive) decision-making

As no existing research has investigated trust-based decision-making and mental imagery interventions, theoretical ideas led to an expectation this study would find a difference between the two intervention groups (CFI versus RI). This was due to compassion-focused imagery being developed for people with high levels of shame and self-criticism, and therefore being particularly beneficial for

people with paranoia (Gilbert, 2009). Additionally, paranoia is a highly interpersonal phenomenon, which the CFI script this study used focuses on. Furthermore, CFI is theorised to reduce systems involved in perceiving threat, which are purported to be elevated in paranoia. Therefore, the study hypothesised that participants in the compassionate imagery group would have higher rates of cooperative choice rather than competitive choice, and have higher expectations that the other player will cooperate in the Prisoner's Dilemma Game, in comparison to the relaxation imagery group. The findings did not support this hypothesis.

Relatively high rates of cooperation were observed in the present study; 73.5% of participants chose to cooperate, compared to 61.3% observed in a previous study with no mental imagery intervention (Ellett et al., 2013). This suggests that experiencing any mental imagery increases cooperation rates, in comparison to a control. There was no difference between the groups in expectations that the other will cooperate, which remained once controlling for trait paranoia, state paranoia and engagement ratings on the intervention, suggesting both mental imagery interventions are comparable. However, participants who chose to compete expressed higher expectations that their opponent would also compete, suggesting that decision-making had more of an effect on what participants believed their opponent would do, rather than effects of intervention (Hypothesis 3b).

Despite compassion-focused imagery being developed for people with paranoia, CFI and RI appear to hold the same basic component (relaxation element) that potentially explains their comparable effects on affect and paranoia. Furthermore, the interpersonal element of CFI does not seem to create any additional benefits regarding trust-based decision-making than the relaxation imagery intervention. It could also be argued that the soothing rhythmic breathing element, which both interventions hold, is crucial in reducing overall arousal which in

turn may reduce state paranoia and negative affect. Therefore, a clinical implication of this may be that either mental imagery intervention can be beneficial, and interventions do not necessarily need to focus on compassion-focused imagery over relaxation imagery.

This study aimed to investigate CFI in order to understand the mechanism behind how it works. Therefore, the effect of the intervention on paranoia was investigated with the intention that a mediation model could be implemented to consider the effect of change in paranoia on distrust-based decision-making. However, due to no effect of intervention on trust-based decision-making being found, there was no effect to mediate.

Hypothesis three: Effects of paranoia on trust-based decision-making

Contrary to predictions, and Ellett and colleague's (2013) findings, participants with higher rates of paranoia (state and trait) were not found to have significantly higher rates of competing (as opposed to cooperating) on the Prisoner's Dilemma Game (Hypothesis 3a). A potential reason for not finding a significant result here, differing from Ellett et al (2013)'s results, could be due to the phenomena being studied; the majority of participants chose to cooperate. Specifically, 73.5% (n=125) participants chose to cooperate in the current study. Ellett et al. (2013) found that across the three studies, 56-65% of participants chose to cooperate.

The study hypothesised that participants with higher levels of paranoia would report higher distrust-based motives in comparison to greed-based motives when choosing to compete (Hypothesis 3c). That is, participants with higher levels of paranoia would choose to compete because they do not trust the other player, more so than wanting to compete for their own self-interest. The findings partially support the hypothesis. Similarly to previous evidence, in those choosing to compete, higher levels of state paranoia (post intervention) were associated with higher distrust of

the other player. This was the case regardless of intervention. However, this finding did not survive Bonferroni corrections. As expected, no significant correlation was found between participant's motivations to compete because they wanted to earn more for themselves (greed). This is in line with Ellett et al. (2013) results and indicates that the effect is specific to distrust rather than a global effect of paranoia.

Contrary to Ellett et al. (2013)'s results, no significant correlations were found between trait paranoia and participants choosing to compete for motives of distrust. A possible explanation for no significant findings here is due to trait paranoia being reported at the beginning of the study, crucially before the intervention.

This study hypothesised that regardless of the choice made by participants, once they learned that the other player had competed, they would be more likely to attribute this to hostile motives if they had higher paranoia scores (Hypothesis 3d). The findings partially supported the hypothesis. Both trait paranoia and change in state paranoia scores were associated with participants believing the other player had competed for hostile reasons. However, after Bonferroni corrections, only change in state paranoia scores and the social reference subscale of trait paranoia remained significantly correlated with participants believing the other player had competed for hostile reasons. A reason for finding a correlation with social reference scores and not persecution scores could be a result of the measure; when developing the questionnaire, the social reference scale was found to have a stronger relationship with other already established paranoia scales, than the persecution scale (Fenigstein & Vanable, 1992; Green et al., 2008). Additionally, social reference ideas were found to be more prevalent in non-clinical samples than ideas of persecution (Green et al., 2008).

In agreement with results for Hypothesis 3c and Ellett et al. (2013), no significant correlation was found between paranoia and participants believing the other player competed for greed-based motives. Again, this suggests that paranoia

is specifically associated with distrust, and the perception that the other player is motivated to compete due to hostile intentions (they want to harm the participant) rather than reasons of greed.

Limitations

It is imperative to acknowledge these results in light of the study's limitations. First, the lack of a control group alongside the two intervention groups limited the conclusions that could be drawn from the results regarding the effects of the interventions. A design with an active control group (relaxation imagery) rather than classical passive control group allowed the study to maximise power for the comparison between interventions, especially as previous studies had shown significant differences between compassionate imagery and a control (Ascone et al., 2017; Lincoln et al., 2010). This study found no differences between the CFI and RI intervention groups; having an additional control group would have allowed for further conclusions to be drawn regarding how these mental imagery interventions work. I.e. Both interventions showed an effect in reducing state paranoia and negative affect, however it cannot be concluded with certainty that this was due to the interventions, rather than other effects (e.g. soothing rhythmic breathing, or the intervention acting as a distraction). Future research would benefit from replicating this current study and include a third control group with no intervention. Furthermore, to be thorough, future research could additionally include a fourth intervention group with only soothing rhythmic breathing to determine whether the breathing exercise alone offers the relaxation element needed to have an effect on the variables tested. This would potentially have clinical implications for providing soothing rhythmic breathing as an intervention to reduce arousal, without the need for additional mental imagery.

Second, a further limitation is that by not administering a pre intervention trial of the Prisoner's Dilemma Game, the research was unable to conclusively talk about

the effects of the intervention on the game outcomes. A baseline measure of decision-making (choice whether to cooperate or compete) would have been beneficial to determine whether the intervention (CFI versus RI) had an impact on the number of participants who chose to compete (distrust) with their opponent. Without this, it is unclear whether the results were due to the intervention or other factors. However, by having two trials of the Prisoner's Dilemma Game (pre and post intervention), it would have been difficult to disentangle the effects of how the other player responded on the first trial, and whether participants were influenced by this, rather than it being a direct effect of the intervention. Considering this, having only one trial after the intervention enabled participants to provide their initial response, enabling researchers to see how participants approach interacting with a stranger for the first time, excluding as much external influence as possible. Future research may benefit from exploring ways in which a pre intervention game trial could also be used.

Third, the online nature of this experiment provides limited information as to how engaged participants were with the questionnaires, Prisoner's Dilemma Game and the mental imagery. Furthermore, this study was not able to control for any distractions, unlike in a laboratory based experiment, and could not determine the place (noisy, negative/positive associations) participants completed the study in. The sliding scale included in this study attempted to generate crucial information regarding engagement, however, as a self-report measure it is open to much potential bias, and only engagement with the mental imagery audio was requested.

Lastly, although the study exceeded the sample size calculated by the power analysis, the diversity of the sample is substantially limited. Taken from the universities online recruitment system, participants self-selected for the study, with the majority of participants being female (80.6%), students (80.0%), and were UK based (78.8%), although there was variety in the ethnicities. Moreover, most

participants used computers (88.2%) rather than any other technical device such as tablets or phones. Given the prevalence of mental imagery applications on mobile phones, this study was unable to establish engagement ratings and the effect that 'on the go' mental imagery has on paranoia and affect. An interesting idea for future research is to use mobile phones, as it's a more authentic way to how these mental imagery applications would be used day to day, and would allow for conclusions to be drawn as to their effects. Furthermore, despite the sample size having been exceeded, the group of participants who completed was small, and therefore a larger sample size would be beneficial when analysing these smaller groups within the main sample, from a power perspective.

Scientific and clinical implications of findings

Although this study found some promising findings regarding the effect mental imagery in general has on paranoia, affect and expectations about the other, it was unable to draw clear conclusions about how or why, and if, compassion-focused imagery works. This was because there were no differences found between the two interventions (CFI and RI), and due to not finding a significant effect of compassion-focused imagery on trust-based decision-making, a mediation model was not applicable. Given the results from this study (both interventions reducing state paranoia and negative affect), it is possible that CFI and RI share a relaxation aspect which promotes trust in others, which could be a direct result of the soothing rhythmic breathing exercise at the beginning of the intervention, or it could be due to both interventions sharing a similar content (however, it is unclear what this is). Furthermore, the interpersonal nature that the compassionate imagery script holds, which the relaxation does not, appears to have no additional effects on participant's levels of paranoia. This begs the question as to whether this positive interpersonal element is important when targeting paranoia, but also whether paranoia itself holds other elements that should be targeted instead. If these findings were less tentative

and more conclusive, interventions for paranoia could be more effectively developed for those in the clinical population. Additionally, interventions could also be more effectively developed for those with higher levels of paranoia in the general population that may be at risk of developing psychosis. However, without a control group, the conclusions drawn can only be tentative and do not allow for definitive answers into the exact mechanisms behind the mental imagery interventions, and therefore limit development of more effective interventions. Furthermore, whilst there are benefits to using a non-clinical population in this study (for example, large sample size and high completion rates), the down side of this is that the lower levels of paranoia experienced by participants makes investigating paranoia as a clinical construct more difficult. This also has clinical implications, as findings are therefore not generalisable to individuals with clinical levels of paranoia.

Furthermore, it has been previously evidenced that participants in general are more likely to cooperate rather than compete, with a range from 56%-65% of participants cooperating across four previous studies (Ellett et al., 2013; Raihani & Bell, 2018). This study aligned with this idea after finding 73.5% of participants in the present study choosing to cooperate rather than to compete. However, this creates an inherent issue in the design, as it creates unequal groups because the majority of participants cooperate, and this can have implications for power analysis. Therefore, this tendency for participants to cooperate is important to keep note of for when researchers embark on future research in this area.

Summary

Experiencing a mental imagery intervention did reduce participant's paranoia, and negative affect, however this did not differ between compassion-focused imagery and relaxation imagery. Therefore, given these results, and mediation analysis not being possible, no definitive conclusions can be drawn as to the mechanisms behind how compassion-focused imagery works, and whether the

changes in paranoia impact real-life interpersonal behaviour. Speculatively, it is possible that the relaxation element (including the soothing rhythmic breathing exercise) may be the main active ingredient in reducing state paranoia and negative affect (for example via reducing overall arousal), however further research will need to clarify this. Overall, this study has found that mental imagery appears to be effective in reducing paranoia and negative affect in the general population.

References

- Field, A. P., (2013). *Discovering statistics using IBM SPSS statistics: and sex and drugs and rock 'n' roll / Andy Field*. (4th edition.). Los Angeles: SAGE.
- Ascone, L., Sundag, J., Schlier, B., & Lincoln, T. M. (2017). Feasibility and Effects of a Brief Compassion-Focused Imagery Intervention in Psychotic Patients with Paranoid Ideation: A Randomized Experimental Pilot Study. *Clinical Psychology & Psychotherapy*, 24(2), 348–358.
<https://doi.org/10.1002/cpp.2003>
- Braehler, C., Harper, J., & Gilbert, P. (2012). Compassion Focused Group Therapy for Recovery after Psychosis. In C. Steel (Ed.), *CBT for Schizophrenia* (pp. 235–266). <https://doi.org/10.1002/9781118330029.ch12>
- Ellett, L., Allen-Crooks, R., Stevens, A., Wildschut, T., & Chadwick, P. (2013). A paradigm for the study of paranoia in the general population: The Prisoner's Dilemma Game. *Cognition & Emotion*, 27(1), 53–62.
<https://doi.org/10.1080/02699931.2012.689757>
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41(4), 1149–1160.
<https://doi.org/10.3758/BRM.41.4.1149>
- Fenigstein, A., & Venable, P. A. (1992). *Paranoia and Self-Consciousness*. 10.
- Fett, A. K. J., Shergill, S. S., Joyce, D. W., Riedl, A., Strobel, M., Gromann, P. M., & Krabbendam, L. (2012). To trust or not to trust: the dynamics of social interaction in psychosis. *Brain*, 135(3), 976–984.
<https://doi.org/10.1093/brain/awr359>
- Flett, J. A. M., Hayne, H., Riordan, B. C., Thompson, L. M., & Conner, T. S. (2019). Mobile Mindfulness Meditation: a Randomised Controlled Trial of the Effect

- of Two Popular Apps on Mental Health. *Mindfulness*, 10(5), 863–876.
<https://doi.org/10.1007/s12671-018-1050-9>
- Gilbert, P. (2009). Introducing compassion-focused therapy. *Advances in Psychiatric Treatment*, 15(3), 199–208. <https://doi.org/10.1192/apt.bp.107.005264>
- Green, C. E. L., Freeman, D., Kuipers, E., Bebbington, P., Fowler, D., Dunn, G., & Garety, P. A. (2008). Measuring ideas of persecution and social reference: the Green et al. Paranoid Thought Scales (GPTS). *Psychological Medicine*, 38(1), 101–111. <https://doi.org/10.1017/S0033291707001638>
- Gumley, A., Braehler, C., Laithwaite, H., MacBeth, A., & Gilbert, P. (2010). A Compassion Focused Model of Recovery after Psychosis. *International Journal of Cognitive Therapy*, 3(2), 186–201.
<https://doi.org/10.1521/ijct.2010.3.2.186>
- Henry, J. D., & Crawford, J. R. (2005). The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *British Journal of Clinical Psychology*, 44(2), 227–239. <https://doi.org/10.1348/014466505X29657>
- Laithwaite, H., O'Hanlon, M., Collins, P., Doyle, P., Abraham, L., Porter, S., & Gumley, A. (2009). Recovery After Psychosis (RAP): A Compassion Focused Programme for Individuals Residing in High Security Settings. *Behavioural and Cognitive Psychotherapy*, 37(05), 511.
<https://doi.org/10.1017/S1352465809990233>
- Leys, C., Ley, C., Klein, O., Bernard, P., & Licata, L. (2013). Detecting outliers: Do not use standard deviation around the mean, use absolute deviation around the median. *Journal of Experimental Social Psychology*, 49(4), 764–766.
<https://doi.org/10.1016/j.jesp.2013.03.013>
- Lincoln, T. M., Hohenhaus, F., & Hartmann, M. (2013). Can Paranoid Thoughts be Reduced by Targeting Negative Emotions and Self-Esteem? An Experimental Investigation of a Brief Compassion-Focused Intervention.

Cognitive Therapy and Research; New York, 37(2), 390–402.

<http://dx.doi.org.libproxy.ucl.ac.uk/10.1007/s10608-012-9470-7>

- Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, 33(3), 335–343. [https://doi.org/10.1016/0005-7967\(94\)00075-U](https://doi.org/10.1016/0005-7967(94)00075-U)
- Matos, M., Duarte, C., Duarte, J., Pinto-Gouveia, J., Petrocchi, N., Basran, J., & Gilbert, P. (2017). Psychological and physiological effects of compassionate mind training: A pilot randomised controlled study. *Mindfulness*, 8(6), 1699–1712. <https://doi.org/10.1007/s12671-017-0745-7>
- McEwan, K., & Gilbert, P. (2016). A pilot feasibility study exploring the practising of compassionate imagery exercises in a nonclinical population. *Psychology and Psychotherapy: Theory, Research and Practice*, 89(2), 239–243. <https://doi.org/10.1111/papt.12078>
- Raihani, N. J., & Bell, V. (2017). Paranoia and the social representation of others: a large-scale game theory approach. *Scientific Reports*, 7(1), 4544. <https://doi.org/10.1038/s41598-017-04805-3>
- Raihani, N. J., & Bell, V. (2018). Conflict and cooperation in paranoia: a large-scale behavioural experiment. *Psychological Medicine*, 48(9), 1523–1531. <https://doi.org/10.1017/S0033291717003075>
- Watson, D., Clark, L. A., & Tellegen, A. (1988). *Development and Validation of Brief Measures of Positive and Negative Affect: The PANAS Scales*. 8.

Part 3: Critical Appraisal

Introduction

The aim of this appraisal is to reflect upon the process and challenges of conducting doctoral research. The main focus will be on the empirical paper, with consideration given to the design, and the online nature of the study. The current study was based on a second proposal I had worked on, after the first (for an entirely different project) was deemed not feasible. Having had the experience of thinking through one project in detail, and evaluating that it was unrealistic for a DClinPsy single project, the feasibility of this current research was of paramount importance to me to ensure success. Therefore, much time was invested in consideration of the design.

Developing key design elements

Number of intervention groups

The study included two intervention groups (compassion-focused imagery and relaxation imagery). However, much consideration was given to how many intervention groups there should be, and also what these interventions should consist of. Compassion-focused imagery was the main intervention I wanted to investigate, so the decision focused on what to compare it with. Initially, discussion centred around comparing compassion-focused imagery with a threat-focused imagery group. However, given the limited time I had due to the late start of the current project, and the ethical implications of providing a threat-focused imagery to participants, (with the added implication of the study being conducted online), having a threat-focused intervention group was just not feasible. However, if the study had included this, it may have provided important data illustrating differences between compassion-focused imagery and threat-focused imagery. Therefore enabling conclusions to be drawn as to what impact negative imagery (threat) has on paranoia, in comparison to imagery based on compassion.

The next focus of discussion regarding how many and what interventions to include, revolved around the idea of having a neutral control group. Previous studies have used neutral control groups such as asking participants to imagine a chair and think about the physical properties of it (Lincoln, Hohenhaus, & Hartmann, 2013). However, whilst differences between the groups may provide evidence that compassion-focused imagery holds something that a neutral control does not, I predicted that only limited conclusions could be drawn from this as to how compassion-focused imagery is effective.

Finally, with support from my supervisors, I decided to compare compassion-focused imagery with a relaxation imagery intervention. Both imageries included a brief introduction to how mental imagery works, and then a soothing rhythmic breathing exercise (as is normal procedure) before the main imagery began. The reason why I chose a relaxation imagery intervention, was that it was fairly similar to the compassion-focused imagery regarding the breathing exercise, and the positive, relaxing nature of the content. However, the one key difference between them was the content of what participants were asked to imagine. The compassion-focused imagery intervention used in this study asked participants to imagine a being who is perfect, compassionate towards them, and everything they could hope for in another. Whilst, the relaxation imagery asked participants to focus on creating a relaxing and soothing place. The key difference was in the interpersonal nature of the compassion-focused imagery, in comparison to the relaxation imagery only providing a calming therapeutic space. By comparing two imagery interventions that were similar, but had one key difference, allowed for an understanding as to how any changes in paranoia post intervention come about, either compassion-focused imagery holds an element that is key to this change, or whether the interventions generate similar impacts. From this, clinical implications for treatment for people

who have higher levels of paranoia, and are at risk of developing psychosis, can be formed.

As the results of the current study found no difference between the intervention groups, a conclusion was drawn that they are equally effective in reducing paranoia and negative affect, speculating this was due to the relaxation element of the imageries, however the conclusions drawn are limited. Future research would benefit from including: a neutral control (without the soothing rhythmic breathing, potentially imagining a chair like previous research), the compassion-focused imagery, the relaxation imagery and also an intervention group with only soothing rhythmic breathing. The addition of the breathing only group would allow researchers to determine whether the soothing rhythmic breathing exercise alone generates the same results (a reduction in negative affect and paranoia), and therefore would have important clinical implications. However, a key aspect that future researchers would have to consider is the length of the breathing only exercise, and the neutral control (imagining a chair exercise) in comparison to the 13-15 minutes of the compassion-focused and relaxation imagery to ensure results are not confounded by the length of the intervention rather than the content.

Mental imagery

The compassion-focused imagery script was taken with permission from a previous study, with the lead author providing me also with the relaxation imagery script (Kamboj et al., 2015). A challenge I faced was recording the scripts, giving careful consideration to the type of voice used (male/female, younger/older), as well as the tone of the voice of the person, and the speed at which they spoke. Additionally, given the need for comparison between the two intervention groups, it was important to keep both imagery interventions as similar as possible with regard to the aforementioned elements, and the length of time each took. The compassion-focused imagery was a longer script than the relaxation imagery: 772 words

compared with 429 words respectively. I chose not to exclude any of the words from the compassion-focused imagery script, and instead shortened and excluded some of the pauses within this script.

After coaching a middle-aged male with a background in television production to record the scripts, they were approximately 24 minutes each in length (including the introduction to mental imagery, and the soothing rhythmic breathing exercise). Discussing the length of the recording with my supervisors, the length of the whole study came into consideration. We considered participant's potential engagement rates, potential dropout rates and willingness to participate in a study that was predicted to take 24 minutes (mental imagery script) plus an additional approximate 15-20 minutes for the questionnaires and Prisoner's Dilemma Game trial. We aimed to reduce the recording to match that of the study in which the compassion-focused script came from: 18 minutes (Kamboj et al., 2015). By speeding up the scripts and eliminating some of the pauses, the introduction and breathing exercise had a recording length of approximately 3 minutes, and the scripts were 12 minutes (compassion-focused imagery) and 10 minutes (relaxation imagery). This editing was an unanticipated lengthy process, however one that was vital in ensuring that participants stayed as engaged as possible, whilst still maintaining the effectiveness of the intervention. This was of vital importance, especially when considering that the method of recruitment was online, and participants were only receiving course credit, with the chance of winning a prize.

Number of trials

Using the Prisoner's Dilemma Game as a way to measure paranoia brought about some much needed discussion regarding the number of trials that were introduced, as well as where this would fit within the wider design of the study. As briefly mentioned in the discussion section of the empirical paper, having a baseline measure of decision-making on the Prisoner's Dilemma Game (where participants

choose whether to cooperate or compete with the other player), would have been ideal for comparison purposes. However, by asking participants to share their decision on this game more than once, introduces the possibility of the other players choice (which was a pre-programmed computer response in this study), to influence participant's choice in the next round. Therefore, having one trial pre intervention and one trial post intervention may not have provided accurate data on the impact of the intervention itself, and may have been consciously, or unconsciously, a response to how the first trial went. Therefore, having just one trial seemed to be the best option. However, research has shown that having only one single trial can strongly increase competition (Ellett, Allen-Crooks, Stevens, Wildschut, & Chadwick, 2013; Pruitt & Kimmel, 1977). Therefore, the best option that would enable the most accurate results was for participants to be told there would be between one and six trials of the game, however, every participant only experienced one trial of the game. This element of deception was necessary and was outlined in the debrief page for participants.

Increasing the believability that the other player was human

Further deception within this study was necessary. Ellett and colleagues (2013) previously found a correlation between state paranoia and behavioural choice (whether participants chose to compete or cooperate), only when participants believed they were playing against a person rather than a computer. Therefore, a significant effort was made to generate the belief that participants were playing against another person rather than a computer. For example, screens were made displaying messages stating that participants were waiting/had been connected to another player. However, the feedback from the pilot study indicated that participants still believed they were playing against a computer rather than a person, which meant that the interpersonal aspect of the Prisoner's Dilemma Game was non-existent in the eyes of the participants which may have impacted the results.

Therefore, further effort was made to enhance the believability that their opponent was human.

Additional screens were set up throughout the study explaining that the study is searching for another player to connect with, additionally, the message 'searching for another player...' appeared on most pages at the bottom of the screen. Further amendments included: naming the other player as 'player #44', and naming the participant 'player #42'; 'player #44' was referred to in many questions to increase the interpersonal nature of the online relationship, on-screen messages informing participant #42 that player #44 knows they are connected to them and knows them by the ID #42, stating that both the participant and player #44 will be listening to the audio script at the same time, and finally, the word 'person' was used more frequently than 'player'.

Whilst considering how to increase the believability of the other player being human, and generating the ideas stated above, culture and language became important factors which I spent much time reflecting upon. I wanted to increase the interpersonal element of the game by naming the other player, however this generated numerous questions. For example: Should the name be female or male or have no gender?; What names are considered to be culturally neutral?; What if I find a name that alludes to no specific gender and is culturally neutral but reminds participants of a person they either like or dislike? (This may affect their choice on the Prisoner's Dilemma Game); If a single letter was used, would this still generate reminders for participants of a specific person they know, or promote potential positive/negative feelings for participants?

Considering the complexities of attempting to increase the believability of the other player being human, the most neutral name I could give to another player, whilst also trying to increase the interpersonal element of the game, was giving both players an ID number: player #42, and player #44. Unfortunately participants still

scored their believability that the other player was human low; scoring 1.98 for believing 'now', and a mean of 2.78 for believing 'then' (when they played the game), on a 10-point Likert scale from 0 (certain they were not) to 10 (certain they were). However, after conducting a t-test, it was shown that on average, participants believed they were interacting with a real human-being rather than a computer, suggesting that these changes did make a difference to the believability.

Future studies would benefit from continuing to try to increase the believability that the other player is human as this may affect the results, especially given Ellett et al. (2013) found that this will affect the choice participants make on a game. However, given the online nature of the game this is a significant challenge. Therefore, future studies may want to carry out a pilot asking for suggestions from participants about how to do this, and potentially even ask participants from the main study to provide qualitative feedback with the reasons why they felt the other player was not human so these can then be targeted.

Language

Following on from the idea of language being an important consideration in increasing the believability that the other player is human, I believe language, (specifically the way in which the other player was described/referred to), had the potential to influence whether participants were more or less likely to want to compete or cooperate with the other player. The other player was given the name 'player #44', and I was conscious not to refer to them as 'opponent' as I felt this may give rise to feelings of opposition and consequently may increase participants desire to compete with them on the Prisoner's Dilemma Game. Additionally, the term 'player' suggests a game, in which some participants with a competitive nature may experience an increased desire to compete. Furthermore, for others who are not competitive, it may allude to the Prisoner's Dilemma Game only being a game, and not to be taken too seriously which again may affect their choice and consequently

the results. Given the difficulties stated above, I used the term 'person' as much as possible to refer to the other player with the hope of increasing the interpersonal element of the study and therefore increasing the believability the other player/person was human.

Online nature of study

Technical issues within Gorilla

Despite the benefits of having an online study, such as the increased ability to reach a larger and more diverse population, and the economic benefits, a range of difficulties were still present. The study used Gorilla, an online software for behavioural experiments, which is a platform I had not used before and was apprehensive, lacking confidence and experience, before developing the experiment. Additionally, the technical issues that I had anticipated, were realised quickly during the pilot and during the main experiment.

During the pilot, a couple of technical issues arose regarding the audio not playing, due to the particular browser used, and also the type of device used (mobile phones experienced an issue switching to landscape mode half way through the experiment). I therefore amended the mechanism after seeking advice from the Gorilla technical team. I added a supplementary screen to precede the audio reminding participants 'the audio cannot be paused so try your best to ensure you will not be distracted or interrupted for the next 10-15 minutes'.

During the main experiment a few participants emailed with further issues regarding the audio not playing, and them still not being able to switch to landscape mode. After contacting the Gorilla team these difficulties were investigated and resolved, however, I was aware that it meant I had lost those participants as it was important for participants to complete the study in one sitting due to the nature of measuring their affect and paranoia pre and post the intervention.

Further technical issues arose when I downloaded the data. Apart from the software organising the data into individual files for each questionnaire and task making it time consuming to collate and then input into SPSS, I had more data than expected for one questionnaire. Gorilla's technical team helpfully supported investigating where the extra data had come from, concluding that one participant had filled in one questionnaire twice, potentially due to an error in refreshing the webpage. The main issue with this was that the participant's answers were not identical. On one question a different answer (by one point) was given. I checked the times and concluded that the first set of data (which was inputted two minutes before the second set) would be the most reliable and accurate, so I included that, and excluded the second set.

The technical issues experienced by participants I felt frustrated at, due to the potential effect that had on their motivation and ability to continue with the study. Furthermore, the technical issues took time to be investigated, causing the experiment to be taken offline for a few days whilst the problem was rectified; this again was frustrating. However, the Gorilla technical support team were responsive and helpful, making these difficulties noted more manageable.

Participants motivation

Participants were recruited through UCL's internal research recruitment system, with the incentive of gaining course credits and being entered into a prize draw in which they could win one of five vouchers worth £50 each. I was positively surprised by how many people participated, given they were not paid, and only 59 (35%) participants made contact asking to be entered into the prize draw suggesting the prize draw was not an incentive for many. Furthermore, I received a few emails with positive feedback regarding their experience of the experiment and the mental imagery, describing it as interesting, and calming. However, I also received many more emails requesting confirmation of when participants would receive the course

credits, leading me to question how motivated some participants were in completing my study accurately. It could be the case that many participants only completed the study to gain course credits, and being an online study taking only approximately 25-30 minutes to complete, was an 'easy' option to gain the credits. Future studies could monitor this further by considering the time participants took to complete each questionnaire, to determine whether they accurately completed it. Additionally, recruiting participants from an alternative platform which does not provide any incentive would enhance researchers belief that participants are taking part because they are interested in the study, rather than completing it for an alternate gain. However, this will inevitably reduce the sample size.

Summary

The process of conducting research at doctoral level has brought many challenges which have been reflected upon in this critical appraisal. However, through working closely with my supervisors, and requesting technical support from Gorilla, I feel I have developed confidence in my research skills, and overcome the challenges that this project brought. I have appreciated the opportunity to further develop my independent thinking and decision making, and have enjoyed being part of a growing area of research.

References

- Ellett, L., Allen-Crooks, R., Stevens, A., Wildschut, T., & Chadwick, P. (2013). A paradigm for the study of paranoia in the general population: The Prisoner's Dilemma Game. *Cognition & Emotion*, 27(1), 53–62.
<https://doi.org/10.1080/02699931.2012.689757>
- Kamboj, S. K., Kilford, E. J., Minchin, S., Moss, A., Lawn, W., Das, R. K., ... Freeman, T. P. (2015). Recreational 3,4-methylenedioxy-N-methylamphetamine (MDMA) or 'ecstasy' and self-focused compassion: Preliminary steps in the development of a therapeutic psychopharmacology of contemplative practices. *Journal of Psychopharmacology*, 29(9), 961–970.
<https://doi.org/10.1177/0269881115587143>
- Lincoln, T. M., Hohenhaus, F., & Hartmann, M. (2013). Can Paranoid Thoughts be Reduced by Targeting Negative Emotions and Self-Esteem? An Experimental Investigation of a Brief Compassion-Focused Intervention. *Cognitive Therapy and Research; New York*, 37(2), 390–402.
<http://dx.doi.org.libproxy.ucl.ac.uk/10.1007/s10608-012-9470-7>
- Pruitt, D. G., & Kimmel, M. J. (1977). Twenty Years of Experimental Gaming: Critique, Synthesis, and Suggestions for the Future. *Annual Review of Psychology*, 28(1), 363–392.
<https://doi.org/10.1146/annurev.ps.28.020177.002051>

Appendices

Participant Information Sheet

Please save or print this information sheet if you would like to keep a copy. Alternatively, you could contact the research team to request a copy.

Title of Study: Exploring social expectations and behaviour in ambiguous social situations

PARTICIPANT INFORMATION SHEET FOR ADULTS

UCL Research Ethics Committee Approval ID Number: CEHP/2014/519

Department: Research Department of Clinical Educational and Health Psychology

Name and Contact Details of the Researcher: Claire Bibbey ucjucbi@ucl.ac.uk

Name and Contact Details of the Principal Investigators: Dr. Liam Mason, l.mason@ucl.ac.uk; Dr. Vyv Huddy, v.huddy@sheffield.ac.uk

You are being invited to take part in a doctorate research project. Before you decide whether to take part, it's important for you to understand why the research is being done and what participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What's the project's purpose?

The purpose of this research is to investigate whether imaginative procedure can effectively induce mood. We are interested in the processes behind the induction and their underlying mechanisms.

Why have I been invited?

Participants are being recruited partly by 'convenience sampling', in which the researcher is contacting people they know who they believe might be interested in taking part. Participants are also being recruited from UCL's internal recruitment system (Sona). We are aiming to recruit at least 100 participants to the study.

Who must we exclude?

We must ask you not to participate if you are currently, or have in the past, received professional help for a mental health difficulty. Our study aims to understand experiences of people who have not received help for any distress they might be experiencing now or in the past. We also ask you not to participate if you are aged below 18.

Do I have to take part?

No. It is up to you to decide whether or not to take part. If you do decide to take part, you can withdraw at any time up until you submit your answers, without giving a reason and without judgement.

What does taking part involve?

If you agree to take part, you will be asked to complete online questionnaires, then you will be assigned to one of two research conditions where you will listen to slightly differing audio scripts that focus on mental imagery. You will be guided through a short breathing exercise followed by an exercise in mental imagery. Following this, you will be asked to answer some questionnaires and play an online game with another person. This will involve making choices to earn points, providing your reasons for the choices, and considering the other player's choices. The study should take approximately 20-30 minutes to complete.

What are the possible benefits of taking part?

We hope that you will be helping to shape future research that is aimed towards promoting mental health and wellbeing. You will have the option of being entered into a prize draw to win one of five £50 Amazon vouchers.

What are the possible disadvantages and risks of taking part?

The risks involved in participating are minimal. If there are questions that you find distressing or intrusive, you are free to not answer those questions or to leave the experiment. If you find yourself becoming distressed during the study, you can choose to stop at any time. If you feel you require any additional support, wish to raise a complaint, and/or participation has distressed or harmed you in any way, you can contact the principal investigators using the details above for further advice and information. Further to this, if you have filed a complaint and it has not been handled to your satisfaction you can contact the Chair of the UCL Research Ethics Committee – ethics@ucl.ac.uk.

What if something goes wrong?

If you wish to raise a complaint, you can do so by contacting the Principal Investigators, Dr. Liam Mason, l.mason@ucl.ac.uk or Dr. Vyv Huddy, at v.huddy@ucl.ac.uk. If you feel the Principal Investigator has not handled your complaint to your satisfaction, you can contact the Chair of the UCL Research Ethics Committee, at ethics@ucl.ac.uk.

Will my taking part in this project be kept confidential?

Data will be collected and stored in accordance with the Data Protection Act. All personal information will remain confidential and you will not be able to be identified in any ensuing reports or publications. Confidentiality will be respected, unless there are compelling and legitimate reasons for this to be breached. If this was the case, we would inform you of any decision that might limit your confidentiality. Data gathered in this study will be held securely using an encrypted memory stick.

Intent of Study

Research designs often require that the full intent of the study not be explained prior to participation. Although we have described the general nature of the tasks that you will be asked to perform, the full intent of the study will not be explained to you until after the completion of the study. All data is anonymous, however, you will have the option to not submit your answers once you know the full intent of the study. As all data is completely anonymous, you will not be able to withdraw your data after you have submitted the data at the end of the study (after the full intent of the study has been disclosed).

What will happen to the results of the research project?

The results of the research project will be published as a doctorate thesis, submitted to UCL. It will not be possible to identify participants from information included within the report. If you would like a copy of the results, please email us after participating. The project may be published in a research journal following submission to UCL. You will not be identified in any publication as all data is anonymous.

If I decide to take part, what happens next?

If you do decide to take part, after reading this information sheet online, you will be asked to consent to take part in the study by clicking in tick boxes on the next page. You can print the information and consent sheet off to keep for your records. Alternatively, please contact the researcher for pdf versions of this information.

Data Protection Privacy Notice:

The data controller for this project will be University College London (UCL). The UCL Data Protection Office provides oversight of UCL activities involving the processing of personal data, and can be contacted at data-protection@ucl.ac.uk. UCL's Data Protection Officer is Lee Shailer and he can also be contacted at data-protection@ucl.ac.uk.

Your personal data will be processed for the purposes outlined in this notice. The legal basis that would be used to process your personal data will be the provision of your consent. You can provide your consent for the use of your personal data in this project by completing the consent form that will be provided to you.

Data will be anonymous, and your personal data will be processed only so long as it is required for the research project. If you are concerned about how your personal data is being processed, please contact UCL in the first instance at data-protection@ucl.ac.uk. If you remain unsatisfied, you may wish to contact the Information Commissioner's Office (ICO). Contact details, and details of data subject rights, are available on the ICO website at: <https://ico.org.uk/for-organisations/data-protection-reform/overview-of-the-gdpr/individuals-rights/Contact> for further information.

We'll be glad to answer any further questions that you might have regarding the study and its outcome.

Who is organising and funding the research?

This research is funded by the Department of Clinical Psychology, University College London (UCL).

Who do I contact for further information?

If you would like any further information about this study, please contact us by email: Claire Bibbey: ucjucbi@ucl.ac.uk Liam Mason: l.mason@ucl.ac.uk Vyv Huddy: v.huddy@ucl.ac.uk If you would like a copy of this information sheet, please request via email.

Thank you for reading this information sheet and for considering taking part in this research study.

Appendix B. Participant consent form

Participant Consent Form

Title of Study: Exploring social expectations and behaviour in ambiguous social situations

UCL Research Ethics Committee Approval ID Number: CEHP/2014/519

Department: Research Department of Clinical Educational and Health Psychology

Name and Contact Details of the Researcher: Claire Bibbey ucjucbi@ucl.ac.uk

Name and Contact Details of the Principal Investigators: Dr. Liam Mason, l.mason@ucl.ac.uk; Dr. Vyv Huddy, v.huddy@sheffield.ac.uk

This study is conducted by the Department of Clinical, Educational and Health Psychology, University College London. It has been approved by the UCL Research Department of Clinical, Educational and Health Psychology Ethics Chair.

Please complete this Consent Form after you have read the Information Sheet and had the opportunity to speak to the researcher if you wish to. If you need any further information to help you decide whether or not to take part, then please speak to the researcher before completing this form.

Please print this for your records, or you can contact the researchers and request a pdf copy.

☐ I confirm that I understand that by ticking each box below I am consenting to this element of the study. I understand that it will be assumed that unticked boxes means that I DO NOT consent to that part of the study. I understand that by not giving consent for any one element that I may be deemed ineligible for the study.

☐ 1. I have read and understood the Information Sheet (previous web page) for this study. I have had an opportunity to consider the information and what will be expected of me. I have also had the opportunity to ask questions which have been answered to my satisfaction.

☐ 2. I consent to the processing of my personal data for the purposes explained to me in the Information Sheet. I understand that my information will be handled in accordance with all applicable data protection legislation and ethical standards in research.

☐ 3. I understand that my information may be subject to review by responsible individuals from UCL for monitoring and audit purposes.

☐ 4. I understand that I am free to withdraw from this study at any time without giving a reason and this will not affect my future medical care or legal rights.

- ☐ 5. I understand that my data will be fully anonymous and it will not be possible to identify me in any reports or publications.
- ☐ 6. I understand the potential benefits and risks of participating, the support available to me should I become distressed during the research, and who to contact if I wish to lodge a complaint.
- ☐ 7. I understand the inclusion and exclusion criteria in the Information Sheet. I confirm that I do not fall under the exclusion criteria.
- ☐ 8. I understand that my fully anonymous personal data can be shared with others for future research, shared in public databases and in scientific reports.
- ☐ 9. I voluntarily agree to take part in this study.
- ☐ 10. I understand that if I choose to opt in to the prize draw I will be sending my personal data (email address) to the researchers, and will (if a winner) be contacted via this email address by the researchers. I understand that my email address will be held securely. Personal data will only be accessible to the study team and individuals authorised by the study team or the research funder working with them.
- ☐ 11. I understand that the study includes mental imagery audio which I will need to listen to carefully. I will ensure that I have headphones, or will be in a quiet place where I can engage and concentrate on the audio.

Player #42, please enter your demographic information below

Please select your sex:

- ☐ Female
- ☐ Male
- ☐ Rather not say
- ☐ Other (please specify)

How old are you?

Where is your country of residence?

What is your ethnicity?

What is your occupation status?

Please continue to the next page to begin the questionnaires.

Next

Appendix D. Screenshots from Gorilla showing deception

Deception - increasing the believability the other player was human rather than a pre-programmed computer

Informing participant they will be connected to someone soon

Player #42

Currently searching for available players to connect you to.

You will be connected to someone shortly – in the meantime please read the instructions on the next page and practice for the game

Next

Informing participant they are connected to another person

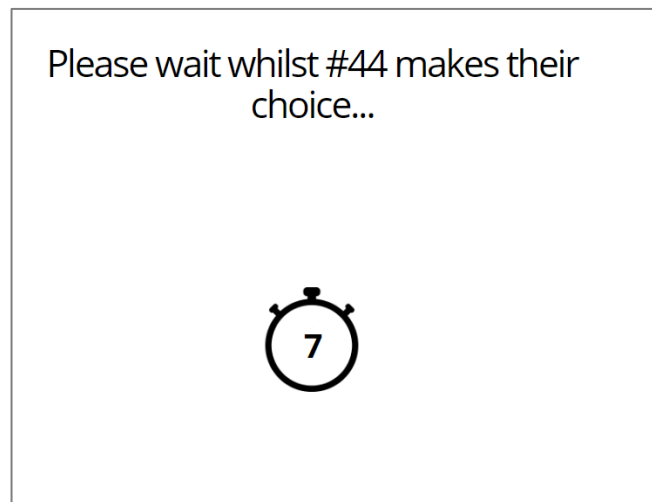
**Player #42, you are now
connected to another person
- Player #44**

(Player #44 has been notified that they are playing with you as 'Player #42')

Please click 'Continue' when you are ready

Continue

Timer after participants have made their choice on the Prisoner's Dilemma Game



Asking participants for reasons why they chose to compete, (this is one of four questions)

While you wait for #44's choice, please rate each item indicating **why you chose to compete**

I wanted to defend myself against the actions of person #44 (Scale 1-7)

Not at all Very much

4


Next

A rectangular box with a thin purple border. Inside, the text "While you wait for #44's choice, please rate each item indicating **why you chose to compete**" is at the top. Below it is the text "I wanted to defend myself against the actions of person #44 (Scale 1-7)". Underneath is a horizontal slider scale from "Not at all" to "Very much". A white circle marker is positioned at the 4th tick mark, with a small black box containing the number "4" above it. At the bottom center is a red button with the text "Next".


Asking participants to rate certainty of the other player being human at two time points

Please rate (0-10) how certain you are that person #44, who you played against online, was human:

At the time of interacting with player #44

Certain they were not human  Certain they were human

Now

Certain they were not human  Certain they were human

[Next](#)

Game rounds will begin with #44
soon...!

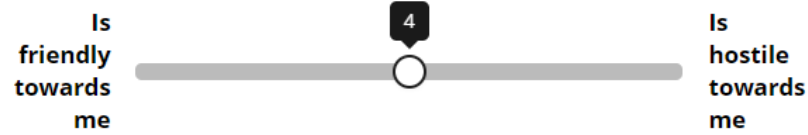
You will be reminded of the instructions on the
next page.

Please note that there will be between 1 and 6 rounds of the game.

Next

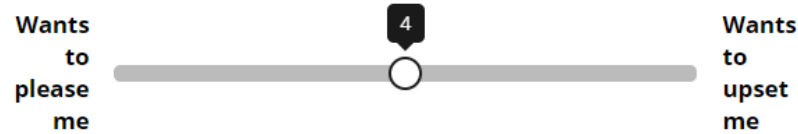
Appendix F. Screenshots from Gorilla showing State Paranoia Questions

#42 please rate (using scale 1-7) how you perceive **#44**, the person you are connected to:



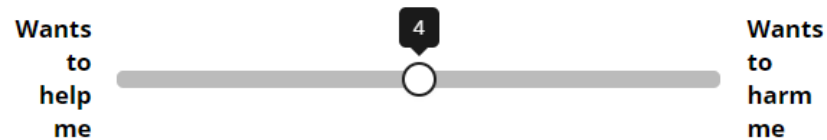
Continue

#42 please rate (using scale 1-7) how you perceive **#44**, the person you are connected to:



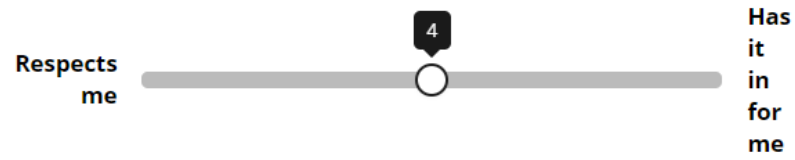
Continue

#42 please rate (using scale 1-7) how you perceive **#44**, the person you are connected to:



Continue

#42 please rate (using scale 1-7) how you perceive #44, the person you are connected to:



Continue

Appendix G. Prisoner's Dilemma Game

Screenshots from Gorilla of the instructions, practice, response screens (correct and incorrect), trial of the game and other players choice.

Instructions for the Prisoner's Dilemma Game

Instructions

You will be playing a game with another person online. There will be between one and six rounds of the game. You will be able to make one of two choices in each round:

1. To **cooperate** with the other player, **or**
2. To **compete** against the other player.

The number of points you earn will depend on your choice/s. In each trial of the game, the maximum number of points you can earn is 100, and the minimum is 25.

Below are possible choice combinations and their points:

1. If you and the other person decide to cooperate, you will each earn **75** points
2. If one person competes and the other cooperates, the competitor will earn **100** points. The co-operator will earn **25** points
3. If both players choose to compete, you will each earn **50** points

Click below to proceed to practice rounds

		Other player	
		Cooperate	Compete
You	Cooperate	75 75	25 100
	Compete	100 25	50 50

Searching for a player to be connected to you...

Continue

Practice questions, (one of two). Green tick indicates the correct answer was chosen

1. If you and the other player both choose to cooperate how many points will you each earn?

		Other player	
		Cooperate	Compete
You	Cooperate	75	25
	Compete	25	50

Searching for a player to be connected to you...

75

50



Practice questions, (two of two). Red cross indicates the incorrect answer was chosen

2. If you choose to compete whilst the other player cooperates how many points will you earn?

		Other player	
		Cooperate	Compete
You	Cooperate	75	25
	Compete	25	50

Searching for a player to be connected to you...

100

25



Results generated after practice questions

You got 1 out of 2 correct.

Searching for a player to be connected to you...

Continue

Introduction to the Prisoner's Dilemma Game, reminder of the instructions and matrix

Game

The rounds will begin on the next page!

Below are possible choice combinations and their points:

1. If you and #44 decide to cooperate, you will each earn **75** points
2. If one person competes and the other cooperates, the competitor will earn **100** points. The co-operator will earn **25** points
3. If both you and player #44 choose to compete, you will each earn **50** points

		Other player	
		Cooperate	Compete
You	Cooperate	75 / 75	25 / 100
	Compete	100 / 25	50 / 50

Continue

Trial of Prisoner's Dilemma Game, choice of 'compete' or 'cooperate'

Would you like to Compete or Cooperate with player #44?

		Other player	
		Cooperate	Compete
You	Cooperate	75, 75	25, 100
	Compete	100, 25	50, 50

Compete Cooperate

Participants are informed other player has chosen to compete

Player #44 has chosen to ...

Compete

Please press the 'next' button

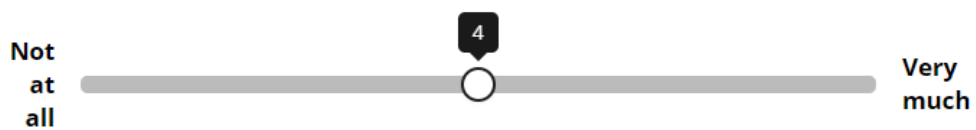
Next

Appendix H. Participants perception of why the other player chose to compete

Question one of four, asking participants to rate why they think the other player chose to compete

Please rate each item indicating **why you think the OTHER PLAYER (#44) chose to compete**

Person #44 wanted to reduce my earnings (Scale 1-7)



Next

Prepare for audio screen

You and player **#44** will now both listen to a mental imagery script

Please ensure that you are in a quiet environment (with headphones if needed) so that you can hear and concentrate on the mental imagery audio.

Please note that the audio cannot be paused so try your best to ensure you will not be distracted or interrupted for the next 10-15 minutes.

You will be asked to press '**Play**' on the next page when you are ready to begin.

Next

Instructions for mental imagery and soothing rhythmic breathing exercise

Instructions

You will now hear an audio explaining mental imagery.

Please listen carefully player #42

It will last approximately **3 minutes**.

Press 'Play'

If you cannot hear the audio for any reason please do not continue with the study and contact the researchers

Once the audio has finished the study will automatically continue to the next page.

▶ Play

Compassion-Focused Imagery script

Instructions

You will now hear an audio guiding you through mental imagery.

Please listen carefully player #42

It will last approximately **12 minutes**.

Press 'Play'

If you cannot hear the audio for any reason please do not continue with the study and contact the researchers

Once the audio has finished the study will automatically continue to the next page



Relaxation Imagery script

Instructions

You will now hear an audio guiding you through mental imagery.

Please listen carefully player #42

It will last approximately **10 minutes**.

Press 'Play'

If you cannot hear the audio for any reason please do not continue with the study and contact the researchers

Once the audio has finished the study will automatically continue to the next page



Appendix J. Mental Imagery Scripts

Introduction (for both groups)

Explain of Study Aims

This study explores your reactions to mental imagery.

First I will explain a bit about what mental imagery is. You will then be guided through a short breathing exercise followed by an exercise in mental imagery. When we have finished these exercises we'll ask you to answer some questions about your experiences of the imagery.

We are interested to know about your thoughts and feelings when you try to imagine the different scenes described. People respond in many different ways to this kind of imagery, so remember there are no right or wrong ways to feel when you try it. Just flow with the instructions the best you can.

Creating Mental Imagery

First let me explain a little bit about mental imagery – what it is and how it works:

We use our ability to imagine in many ways, for example, anticipating a holiday, or a conversation with someone. When we do this we create in our minds certain situations - imagining their sounds, sights, and sensory qualities. Sometimes this happens easily. At other times we struggle to get much in the way of images or feelings even though we try. Please don't worry if this happens to you. Also don't worry if your mind keeps wandering onto other thoughts. Just notice that your mind has wandered, and then gently bring it back to have another go at the imagery. Remember it is your efforts that are important and not whether you have clear images and feelings.

Some people feel they can't do mental imagery very well and this is often because they are trying to create very clear visual images. In fact mental imagery is mostly about impressions. For example if I ask you "what is a bicycle," or "what did you have for breakfast," what usually comes to mind are minor images – they appear as brief flashes and they may be very hazy and fuzzy and impressionistic but that's just what they are. So the imagery exercise you will be guided through is mostly about orientating yourself to a particular theme which we will discuss further. If you have clear impressions or images, that's fine but try not to "force yourself".

One reason mental images are important is because they stimulate our bodies. For example if you're very hungry and you imagine a meal, that can stimulate saliva and stomach acids, and an erotic mental image can cause arousal in your body. In other words the images we create stimulate powerful systems in our brains and bodies. In this study we're interested in stimulating the positive emotional systems of the brain.

Soothing Rhythmic Breathing (for both groups)

We'll begin by spending a few minutes composing the mind and body through rhythmic breathing. The aim is for your body to be relaxed, but for your mind to be alert and aware.

So, sitting upright in your chair.....with your back straight and your feet flat on the floor about a shoulder width apart..... Rest your hands gently on your lap. Keep your head and chin up in line with your belly button so that your head doesn't drop forward -but stays in a sort of alert position. You can do this with your eyes closed or looking down at about 45°.

Now turn your attention to your breathing..... breath in slowly, allow the air to go deep into your diaphragm, noticing your stomach gently lifting and falling with each breath. For soothing rhythmic breathing, the aim is to breathe a little slower and deeper than you would normally breathe: around 5-6 breaths per minute with the in- and out-breathe being the same duration. Try to let the breath come out naturally. Everything is as gentle and as easy as you can manage. I'll guide your breathing to start with and then let you continue to breathe rhythmically and slowly.

So, let's start. Breathing in2...3....4 and out ...2...3....4 in2....3....4..., out2...3...4, and now in 2...,3...,4.... 5....., and out 2...,3...,4...,5..... Now finding your own rhythm and pace continue with this steady rhythm, breathing in through your nose and out through your nose..... with a gentle, even pace.....feeling the mind and body slowing down....

If your mind wonders – which it will – gently bring your attention back to your breathing.

(Allow 30 seconds)

Notice how as you're slowing the breath you're also feeling slightly heavier in your chair. With each breath, focus on the sensation of just gently slowing down in body and mind.

(Allow 15 seconds).

Now notice if you can feel a point of stillness somewhere in your centre such as your diaphragm or stomach. So the idea here is that we relax but not for all the muscles just to become loose but for us to stay alert in a state of calm soothing preparation. A good analogy is the diver on the high board who settles and balances himself before diving in -- so it's mainly finding that point of stillness and calmness within that's the key here rather than just becoming loose and relaxed.

(Allow 15 seconds).

Group 1: Relaxation Imagery Script

Now draw your attention to the muscles in your face. Let these muscles relax and now gently make a smiling expression as if you've been reminded of a very pleasant experience. This is a friendly, gentle smiling expression (10 sec)

Explain relaxing imagery

In a few minutes we'll ask you to create an image in which you imagine yourself to be in a very relaxing and soothing place. Just like you might imagine your ideal holiday you can also create images of being totally relaxed and peaceful. draw your attention inwards, and try to conjure up in your mind an image of a place that is very beautiful to you, somewhere that you feel very peaceful, and very safe. Take your mind's focus away from the outer world, to your own relaxing and peaceful place.

(Allow 15 seconds).

Begin to develop the image of yourself in this relaxing, peaceful and safe place in your mind's eye. This place may be somewhere you've actually been to in your life, or it may be a place you've visited before in your imagination. It could be a new place, or somewhere you've never imagined yourself going to before, or some combination. It doesn't matter. A good example might be a beach, or your garden, or

you may even just imagine yourself floating in the clouds. Continue to imagine, making the scene more vivid and real in your mind's eye

(Allow 30 seconds).

While you experience this look around you and notice what you can see in this peaceful and relaxing place. Observe the details of the scene; notice the colours and the shapes of the things you can see there.

(Allow 15 seconds).

Begin to be aware any sounds you may be able to hear.

(Allow 15 seconds).

You may also imagine an aroma, odour or fragrance in this special place.

(Allow 15 seconds).

You may also notice the temperature, the time of day and the season of this place.

(Allow 15 seconds).

Whilst you are focusing on the details of this place, be aware of how relaxed and peaceful you feel in this place, and focus on why this place is particularly relaxing for you. Allow yourself to relax into these feelings and allow your body and mind to recharge.

(Allow 30 seconds).

Remember that if you feel yourself becoming distracted by other thoughts or by external sounds, gently bring yourself back in, to focus on this relaxing and peaceful place. Use your breathing to help you to re-tune back into the sounds, sights and smell of this place.

(Allow 30 seconds)

Now, in your own time open your eyes, letting the images begin to fade away but bringing back with you any sense of relaxation, peacefulness and refreshment.

Group 2: Compassion Focused Imagery Script

Now draw your attention to the muscles in your face. Let these muscles relax and now gently make a friendly expression as if you're greeting somebody you really like and feel safe with. This might be a friendly, gentle smiling expression (10 sec)

Explain Compassion Imagery

In a few minutes we'll ask you to create an image in which you imagine yourself to be the focus of a compassionate being that cares for, and about you. Just like you might imagine your ideal holiday or a friend who has all the qualities you would want of them, you can also create images of an ideal compassionate being who has the qualities you would want from someone who cares deeply about you. For example you might want them to always be kind, patient, understanding, never judgmental, available and so on. This being can be beyond human failing or inconsistencies and be exactly as you need them to be.

Some people find that having visual images of a compassionate human-like being helps them to feel like they are receiving compassion. Some have images of people or animals. Images can be male or female.....or they might not have a gender. They can appear as older or younger than you. For others, a compassionate being is represented by the sea or sun, or an energy, while others do not get clear images but just a 'hazy sense of something or someone' that is being compassionate towards them. Remember any images of a compassionate source that you create might be fragments, very hazy or fuzzy rather than clear images. The main thing is that you try to get a sense of its presence, even if you can't see it clearly.

You might only have sensations in your body or hear a voice in your head that makes you feel that you are experiencing the presence of a compassionate being that wishes you well and would want to relieve you from distress or pain.

Whatever form your imagery takes we would like you to imagine that the mind of this ideal compassionate being has certain qualities. These are superhuman qualities – complete and perfect compassionate qualities that are there for you to experience.

They include;

- a *Deep Commitment* to you – to help you cope with and relieve your suffering, and take joy in your happiness

- *Wisdom* gained through experience and maturity. An understanding of the struggles of life - and particularly an understanding of the struggles you go through in life.

- Strength of mind* – this being cannot become overwhelmed by your pain or distress, but remains present, enduring it with you. Try to sense that it has a stillness and calm within itself.

- Warmth*- conveyed by kindness, gentleness, care and openness

- Acceptance* – it is never judgemental or critical, it understands your struggles and accepts you as you are.

Please don't worry about remembering all of these qualities and emotions because you will be guided through them. Try to simply 'go with' the instructions without judging your experience or wondering too much about whether you are doing it right.

Pause

Now ask yourself the following questions:

What would I want my ideal compassionate image to look and sound like? Focus for a moment on what a compassionate, kind voice would sound like if it spoke to you right now.

Pause

Next consider what colours, sounds and physical sensations you associate with the qualities of wisdom, strength, warmth and non-judgement?.....

Pause

Now bring to mind the compassionate being you were asked to think about. Take a moment to develop a sense of its qualities.....think about how deeply committed this being is to your happiness and wellbeing.... (30 sec)

Imagine yourself experiencing a feeling of safeness with the strength and dependability of this compassionate being; this wise and caring mind... (30 sec)

Focus on the wisdom and understanding that is expressed towards you... (30 sec)

Imagine feeling completely understood and accepted (30 sec)

Focus on the great warmth and kindness that permeates the whole image and is directed at you... (30 sec)

Focus on the feelings of loving kindness that are there for you.... (30 sec)

Imagine feeling a sense of care and concern directed towards you(30 sec)

Imagine the gentle warmth of this compassion flowing toward you (30 sec)

Imagine the emotions that are being expressed towards you: kindness, care, acceptance, understanding..... (30 sec). Allow yourself to hear a compassionate voice that expresses a desire for your well-being, and your sense of friendliness and safeness even joyfulness as you experience this compassionate-being relating to you in this way

Now, in your own time open your eyes, letting the images begin to fade away but bringing back with you any sense of being the focus of total acceptance, wisdom, understanding and kindness expressed towards you.

Appendix K. Debrief Page

Participant Debrief Sheet

Please save or print this information sheet if you would like to keep a copy. Alternatively, you could contact the research team to request a copy.

PLEASE CLICK 'NEXT' TO SUBMIT YOUR ANSWERS...

Study: Investigating the effect compassion focused and relaxation scripts have on nonclinical paranoia in the general population, using the Prisoner's Dilemma Game

UCL Research Ethics Committee Approval ID Number: CEHP/2014/519

Department: Research Department of Clinical Educational and Health Psychology

Name and Contact Details of the Researcher: Claire Bibbey ucjucbi@ucl.ac.uk

Name and Contact Details of the Principal Investigators: Dr. Liam Mason, l.mason@ucl.ac.uk; Dr. Vyv Huddy, v.huddy@sheffield.ac.uk

Thank you for your participation in our study.

We told you in the beginning that this study aims to study whether imaginative mood induction procedure could effectively induce mood. However, the actual purpose of the listening to the audio recording was to reduce people's sense of interpersonal threat versus a more neutral situation.

The aim of this was to investigate the effects of a compassionate imagery scenario on choices in a well-known task for investigating social thinking, the Prisoner's Dilemma Game. The purpose of this was to find out if a compassionate imagery makes it less likely that people will choose a competitive option in the game and expect another player to behave similarly.

We know that people with difficulties with unwanted thoughts about social threats do have an increased tendency to choose compete. We would like to find out if compassionate mental imagery reduces the tendency to choose compete and, if so, this might be a helpful way of reducing the impact of thoughts about social threats.

Finally, the other participant was a stooge who didn't actually play the game – the other player's response was pre-determined, as you were playing against the computer. This was necessary, as previous studies have shown that the experimental effects are only present when participants believe they are interacting with another person, rather than simply playing against a computer.

Additionally, there was only one trial of the game for everyone who took part. This was again necessary as evidence shows that participants knowing they only have a single trial can strongly increase competition.

If you have any further questions, or you feel you've been adversely affected by taking part in the study, please feel free to contact the research team using the contact information below:

Principal investigators: Dr. Liam Mason, l.mason@ucl.ac.uk; Dr. Vyv Huddy, v.huddy@sheffield.ac.uk

Researcher: Claire Bibbey, Claire.bibbey.16@ucl.ac.uk

Everyone who took part can be included in the prize draw to win amazon vouchers:

5 prizes of £50

If you would like to be included in the prize draw, please email the researchers on this address:

ucjucbi@ucl.ac.uk

By emailing, you are consenting to the researchers emailing you if you are a winner.

Winners will be chosen at random once recruitment is complete.

Thank you again for your participation.

PLEASE CLICK 'NEXT' TO SUBMIT YOUR ANSWERS AND FINISH

All data is anonymous, however, if you no longer wish to submit your answers please slide the circle across to 'withdraw my answers' and click 'next'. If you are happy to submit your answers please keep the circle where it is and click 'next'.

Submit
answers



Withdraw
my
answers

Next

Appendix L. Ethical Approval with amendment approval emails

Amendment Approval Request Form

1	Project ID Number: CEHP/2014/519	Name and Address of Principal Investigator: Dr Liam Mason Dr Vyv Huddy
2	Project Title: Investigating the effect compassion focused and relaxation scripts have on nonclinical paranoia in the general population, using the Prisoner's Dilemma Game Lay title: Exploring social expectations and behaviour in ambiguous social situations	
3	Type of Amendment/s (tick as appropriate) Research procedure/protocol (including research instruments) <input checked="" type="checkbox"/> Participant group <input type="checkbox"/> Sponsorship/collaborators <input type="checkbox"/> Extension to approval needed (extensions are given for one year) <input type="checkbox"/> Information Sheet/s <input checked="" type="checkbox"/> Consent form/s <input checked="" type="checkbox"/> Other recruitment documents <input checked="" type="checkbox"/> Principal researcher/medical supervisor* <input checked="" type="checkbox"/> Other <input type="checkbox"/> <i>*Additions to the research team other than the principal researcher, student supervisor and medical supervisor</i> <i>do not need to be submitted as amendments but a complete list should be available upon request *</i>	
4	Justification (give the reasons why the amendment/s are needed) The amendment is required for a study to be run by a DClinPsy trainee. The study will investigate the effect of compassionate or relaxation imagery on choices (competition versus cooperation) on the prisoner's dilemma game. Differences in choice behaviour - more competitive choices - in those with heightened paranoia have been reported. We wished to establish if compassion imagery reduces the rate of competitive choices and perceptions of hostility.	

	<p>Additionally, there have been changes made to the information sheet, consent form and debrief to be in-fitting with the new aim and GDPR changes. Additional measures are also included in the study (I-PANAS-SF).</p>
5	<p>Details of Amendments (provide full details of each amendment requested, state where the changes have been made and attach all amended and new documentation)</p> <p>The task yielding the dependent variable for this study - the Prisoner's Dilemma Game - has already been approved.</p> <p>Please see attached for the new structure of the experiment</p> <p>As before, the study will be conducted online using Gorilla software and all participants (general population) will partake in all aspects of the study. Participants will be asked to a complete questionnaires that will measure tendency towards suspicious attributions (GPTS, SPS), as well as positive and negative affect (I-PANAS-SF) and only the anxiety questions on the DASS-21. The study will not ask any items related to depression or suicidal ideation. The GPTS and the SPS have been extensively validated in healthy participants. Please see structure sheet for more information about what participants will be completing in what order.</p> <p>Gorilla software will randomly allocate participants to one of two groups to experience one of two manipulations which participants will listen to on audio: compassion focused imagery or a relaxation control (an example of the script to be used is provided). We will follow the same procedure as a previously approved doctoral project (PI: Dr Sunjeev Kamboj) which confirmed no adverse effects. Participants will be asked a few questions of their experience of listening to the script at the end of the experiment (please see attached structure for details of questions).</p> <p>Participants will be asked to complete the International Positive and Negative Affect Schedule Short Form (I-PANAS-SF) on two occasions, to determine whether the intervention has had any immediate effect on their levels of positive and negative affect.</p> <p>During this study, participants will also be presented with information on the Prisoner's Dilemma Game (PDG), which has been approved via a previous amendment to this project programme.</p> <p>Recruitment and incentive for participating</p> <p>The study will recruit adults from the general population using a number of sources, including: email, posters, social media, the universities internal recruitment system (Sona).</p> <p>All participants will have the option of entering into a prize draw of three £50 and five £20 amazon vouchers by sending an email to ucjucbi@ucl.ac.uk, outlining they've taken part in the study and would like to be entered. Once the study has finished recruitment, the winners will be selected at random and prizes will be arranged. In addition, participants recruited through Sona who are UCL psychology undergraduate students will be reimbursed for their time in course credits, as well as having the option of the prize draw.</p> <p>Information sheets and debrief</p>

	The information sheet, consent form and debrief have been adjusted accordingly. These are attached.
6	<p>Ethical Considerations (insert details of any ethical issues raised by the proposed amendment/s)</p> <p>Deception</p> <p>The ethical issue of deception remains the same as previous amendments which was deemed scientifically justifiable and therefore approved.</p> <p>In this current study, further effort will be made to generate belief that participants will be playing against another person rather than a computer. I.e. participants will be informed that the experiment is only active at certain times each day, to increase the believability that they are playing another person online.</p> <p>Also, there will only be one trial of the game, however participants will be told there will be between 1 and 6 trials, as evidence shows that participants knowing they only have a single trial can strongly increase competition (Ellet et al., 2013; Pruitt & Kimmel, 1977).</p> <p>Distress</p> <p>The compassion versus relaxation imagery are intended to have soothing and calming emotional effects. They are unlikely to elicit distress or discomfort. This procedure has already been approved in previous pharmacological study (Dr Sunjeev Kamboj) and no issues arose.</p> <p>Participants will be informed that they can withdraw at any time, and the debrief outlines researchers contact details if participants have been effected by the study.</p>
7	<p>Other Information (provide any other information which you believe should be taken into account during ethical review of the proposed changes)</p>

Declaration (to be signed by the Principal Researcher)

- I confirm that the information in this form is accurate to the best of my knowledge and responsibility for it.
- I consider that it would be reasonable for the proposed amendments to be implemented
- For student projects, I confirm that my supervisor has approved my proposed modifications

Signature:



Date: 31/10/18

FOR OFFICE USE ONLY:

Amendments to the proposed protocol have been by the Research Ethics Committee.

Signature of the REC Chair:

Date:

Emails showing ethical approval

From: _____
Sent: Wednesday, October 31, 2018 4:10 PM
To: _____
Subject: Re: Ethics Amendment CEHP2014519 Huddy (FINAL!)

Dear _____

I'm happy to approve this amendment. I have copied in the REC for filing - we operate an electronic-only system so please keep this email as a record of the approval.

Best wishes,

From: _____
Sent: 31 October 2018 16:06:40
To: _____
Subject: Re: Ethics Amendment CEHP2014519 Huddy (FINAL!)

Dear _____,

As you may know, I have taken over as internal supervisor for one of _____'s trainees (Claire Bibbey, now in her final year). The ethics process had already been kicked off before I joined and I can see it's pretty convoluted in terms of amendments.

In order for Claire's project to go ahead, it needs some minor amendments around task (Prisoner's Dilemma variant) and an additional questionnaire measure or two that were suggested by _____ as part of the internal research proposal review.

We've tried to make these changes as clear as possible on the attached amendment form and are hoping that you are able to approve them as discussed. I can give you my assurances that I won't be putting in further amendments to this ethical approval again.

Can you let me know that you've received this and a rough idea of when you might get to it?

Bw