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ORIGINAL ARTICLE

Cognitive Fusion Mediates the Impact of Attachment Imagery on Paranoia and Anxiety

Monica Sood[1] · **Katherine Newman-Taylor**[1]

Abstract

Background Paranoia, in both clinical and non-clinical groups, is characterised by unfounded interpersonal threat beliefs. Secure attachment imagery attenuates paranoia, but little is known about the mechanisms of change. Cognitive fusion describes the extent to which we can 'step back' from compelling beliefs, to observe these as mental events, and is implicated in psychopathology cross-diagnostically.

Aims This study extends previous research demonstrating the impact of attachment imagery on paranoia and anxiety to determine whether cognitive fusion mediates these relationships.

Method We utilised a randomized experimental design and recruited an analogue sample with high levels of non-clinical paranoia to test the impact of imagery and the role of cognitive fusion.

Results Secure attachment imagery resulted in reduced paranoia and anxiety compared to threat/insecure imagery. Cognitive fusion mediated the relationships between imagery and paranoia, and imagery and anxiety.

Conclusions Secure attachment imagery is effective in reducing paranoia and anxiety and operates via cognitive fusion. In clinical practice, these interventions should seek to facilitate the ability to 'step back' from compelling threat beliefs, in order to be most beneficial.

Keywords Paranoia · Anxiety · Attachment · Imagery · Cognitive fusion

Paranoia is characterised by unfounded interpersonal threat beliefs and results in substantial distress and disability (Freeman 2007). Paranoia is both a defining symptom of psychosis and common in the general population (Johns and van Os 2001). Clinical paranoia shares and builds on the cognitive and affective processes maintaining paranoia in the general population, so examination of mechanisms in analogue groups provides a valuable basis for the development of clinical interventions (Freeman et al. 2005).

Negative affect, particularly anxiety, plays a key role in the maintenance of paranoia—as threat beliefs, paranoid cognitions are typically associated with anxiety, and heightened anxiety increases the likelihood of threatening interpretations (Freeman 2016). Interventions targeting anxiety as well as paranoia are therefore likely to be beneficial.

✉ Monica Sood
ms13g14@soton.ac.uk

[1] School of Psychology, University of Southampton, Southampton, University Road, SO17 1BJ, UK

Insecure attachment styles are associated with increased paranoia (Lavin et al. 2019), and attachment priming interventions have been shown to reduce paranoia and anxiety (Rowe et al. 2020); however, the cognitive mechanisms remain largely untested.

Attachment

Attachment theory (Bowlby 1969, 1973, 1980) is a lifespan model, proposing that humans are predisposed to seek proximity to significant others (attachment figures) to regulate distress. Repeated interactions with attachment figures produce *working models* of the self, others, and relationships. These lead to congruent behaviours and emotion regulation strategies, termed *attachment styles*, and are typically categorized as secure, insecure-anxious, and insecure-avoidant (Ainsworth et al. 1978; Hazan and Shaver 1987). Securely attached individuals tend to develop positive working models of self, others, and relationships, and use adaptive emotion regulation strategies as a result of consistent

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and responsive caregiving. Insecurely attached individuals tend to develop negative representations of self and/or others and use maladaptive emotion regulation strategies such as extreme emotion expression (anxious attachment) or suppression (avoidant attachment) at times of distress, as a result of suboptimal caregiving (Ainsworth et al. 1978; Bartholomew and Horowitz 1991).

Attachment insecurity is associated with paranoia in clinical (e.g., Korver-Nieberg et al. 2015; Ponizovsky et al. 2013; Wickham et al. 2015) and non-clinical (e.g., Berry et al. 2006; Pickering et al. 2008) populations. In their systematic review of attachment and psychosis, Gumley et al. (2014) found that attachment security is associated with reduced psychotic symptoms and better service engagement. Thus, facilitating attachment security may reduce paranoia and anxiety.

Attachment priming studies have shown that these methods influence cognition and affect. Secure priming fosters *felt security*, the sense that one is safe and attachment figures are available and responsive, and leads to increased positive affect and self-beliefs, and decreased negative affect (including anxiety), compared to insecure or neutral primes (Rowe et al. 2020).

Preliminary experiments of attachment priming in paranoia have used imagery to affect interpersonal safety or interpersonal threat in analog samples with high levels of non-clinical paranoia. These studies show that secure attachment imagery reduces state paranoia, anxiety, and negative affect compared to threat/insecure attachment imagery (Bullock et al. 2016; Newman-Taylor et al. 2017). Similarly, initial case studies suggest that secure attachment imagery leads to increased felt security and reduced paranoia and anxiety in clinical participants (Pitfield et al. in press). While promising, these studies are limited due to lack of random allocation; unrepresentative student samples; researchers not blind to group or hypotheses; or the use of single-case designs with clinical participants. Furthermore, the lack of investigation of mechanisms of change limits the development of targeted psychological interventions.

Cognitive Fusion

Cognitive paradigms predict that it is not only cognitive content but also the relationship with cognition that leads to distress and risk of psychopathology. The psychotherapeutic literature describes several related concepts, including *decentred awareness* and *cognitive fusion*, to explain our relationship to mental experience, and the impact on mental health. Decentred awareness is a broad construct referring to the ability to witness thoughts and feelings as mental events as opposed to necessarily true reflections of the self or reality (Bernstein et al. 2015; Safran and Segal 1990). Similarly, cognitive fusion refers to the meta-cognitive process in which thoughts dominate behaviour (Gillanders et al. 2014). When negative cognitions and other internal experiences are perceived as necessarily valid reflections of the self and reality, individuals become vulnerable to patterns of cognition, affect, and behaviour associated with the maintenance of psychopathology cross-diagnostically (Bernstein et al. 2015; Hayes et al. 2011; Krafft et al. 2019; Teasdale 1999).

A qualitative study of interpersonal threat found that people diagnosed with schizophrenia characterised by paranoia described being trapped in their thoughts and unable to step back from threat beliefs (Stopa et al. 2013). Similarly, *believability* (a proxy for fusion) of psychotic experience mediated rehospitalization rates following therapy for inpatients with psychosis (Bach and Hayes 2002), whereas decreased believability (or defusion) mediated reductions in psychosis-related distress (Gaudiano et al. 2010).

Those with attachment anxiety are more likely to experience difficulty stepping back from their negative cognitions (Fraley and Shaver 1997; Gillath et al. 2005; Mikulincer and Orbach 1995), suggesting that these individuals have higher rates of cognitive fusion.

Current Study

Attachment priming influences cognition and affect. Secure attachment priming results in attenuated paranoia and anxiety. Cognitive fusion may be the mechanism by which psychotherapeutic interventions alleviate distress and symptoms cross-diagnostically, but this has not yet been tested for paranoia.

This study examines the impact of attachment priming on paranoia and anxiety and whether cognitive fusion mediates these relationships. The study design addresses limitations of past research, including lack of random allocation and reliance on student samples. We tested three hypotheses: (a) secure attachment imagery will reduce state paranoia and anxiety compared to threat/insecure imagery, (b) cognitive fusion will mediate the relationship between imagery (secure vs. threat/insecure) and paranoia, and (c) cognitive fusion will mediate the relationship between imagery (secure vs. threat/insecure) and anxiety. Additionally, we tested whether secure attachment imagery would decrease cognitive fusion.

Method

Design

An experimental design was used. The independent variable was the manipulation of imagery (secure or threat/insecure).

The dependent variables were state paranoia and anxiety. The hypothesised mediator was state cognitive fusion.

Participants

This study recruited adults with high non-clinical paranoia internationally. Participants were screened using the Paranoia Scale (Fenigstein and Vanable 1992) and invited to participate if they scored at or above 43 (the mean of the standardisation sample). A total of 125 participants completed the survey. Participants with more than 5% missing data from any single measure were excluded ($n = 8$) and all other missing data ($< 5\%$) were replaced with the participant mean (Tabachnik and Fidell 2013). The final sample included 117 participants (84 females), aged 18 to 65 years ($M = 21.60$, $SD = 6.07$).

Most participants were students (68.4%) or in full- or part-time employment (21.4%), and others were unemployed and looking for work (6.0%), retired (0.9%), looking after the home or caring for family (0.9%), 'other situation' (1.7%), or preferred not to answer (0.9%). The sample varied substantially in ethnicity and nationality. Most reported being British (35.9%) and others reported being African (4.3%), American (8.5%), Bangladeshi (0.9%), Caribbean (0.9%), Chinese (2.6%), Hispanic (3.4%), Indian (8.5%), Irish (2.6%), Pakistani (2.6%), White and Asian (4.3%), White and Black African (1.7%), White and Hispanic (0.9%), any other Asian background (1.7%), any other ethnic group (2.6%), any other mixed background (0.9%), or any other white background (16.2%). Most participants reported being from the United Kingdom (58.1%) and United States (16.2%). Others reported that they were from Algeria (0.9%), Australia (1.7%), British Indian Ocean Territory (1.7%), Canada (0.9%), Czech Republic (0.9%), Estonia (0.9%), Germany (1.7%), Greece (1.7%), Guinea-Bissau (0.9%), Hungary (0.9%), India (1.7%), Lithuania (0.9%), Malaysia (0.9%), Mexico (1.7%), Nigeria (0.9%), Norway (0.9%), Portugal (0.9%), Romania (1.7%), Slovak Republic (0.9%), South Africa (0.9%), South Korea (0.9%), or Turkey (1.7%).

Participants reported normal to extremely severe levels of stress ($M = 34.82$, $SD = 9.25$, range: 14–56) and depression ($M = 17.85$, $SD = 6.46$, range: 8–32), and mild to severe levels of anxiety ($M = 16.11$, $SD = 4.94$, range: 8–32) (Lovibond and Lovibond, 1995a).

Following Fritz and MacKinnon (2007), an examination of the sizes of the correlations of paths *a* and *b* in the mediation models indicated that a sample size of 117 is sufficient for 0.8 power.

Measures

Demographics

This was developed for the current research to collect background information including age, gender, nationality, and occupation.

Paranoia Scale (PS)

This is a 20-item measure of trait sub-clinical paranoia (Fenigstein and Vanable 1992). Participants rate the applicability of statements on a 5-point scale and scores are summed to create a total score. Higher scores indicate greater paranoia. The scale has good internal consistency ($\alpha = 0.84$) and adequate test–retest reliability ($\alpha = 0.70$). Internal consistency for the current sample was also good ($\alpha = 0.80$).

Experiences in Close Relationships Inventory (ECR)

This is a 36-item measure of trait attachment style comprising two subscales measuring attachment anxiety and attachment avoidance in close relationships (Brennan et al. 1998; adapted by Carnelley and Rowe 2007). Participants rate their agreement with statements on a 7-point scale, yielding total anxiety and avoidance scores. Higher scores indicate greater insecure attachment. Both the anxiety and avoidance subscales have excellent internal consistency ($\alpha = 0.93$ and 0.95 respectively). Internal consistency for the current sample was good to excellent (anxiety, $\alpha = 0.89$; avoidance $\alpha = 0.90$).

Depression, Anxiety, Stress Scale – Short (DASS-21)

This is a 21-item measure comprising three subscales assessing symptoms of depression, anxiety, and stress (Lovibond and Lovibond 1995a). Participants rate the applicability of items over the past week, on a 4-point scale, yielding a total score with higher scores indicating greater distress. This scale has good to excellent internal consistency ($\alpha = 0.81$–0.91; Lovibond and Lovibond 1995b). Internal consistency for the current sample was excellent ($\alpha = 0.92$).

State-Trait Anxiety Inventory (STAI)

This is a 40-item measure that comprises two subscales, each containing 20 items, to assess state (situational) and trait (dispositional) anxiety in adults (Spielberger et al. 1983). Participants rate the applicability of items on a 4-point scale and scores are summed to yield total trait and state anxiety scores. Higher scores indicate greater anxiety. The scale has good to excellent internal consistency for both state ($\alpha = 0.90$–0.94) and trait ($\alpha = 0.89$–0.92) subscales. Test–retest reliability of the trait subscale is good ($\alpha = 0.86$). Internal consistency of the state subscale in the current sample was excellent at Time 1 ($\alpha = 0.93$) and Time 2 ($\alpha = 0.96$). Internal consistency of the trait subscale in the current sample was also excellent ($\alpha = 0.90$).

Cognitive Fusion Questionnaires (CFQ)

This study used both trait (Gillanders et al. 2014) and state (Bolderston et al. 2019) CFQs, which are 7-item measures assessing the extent to which people are fused with their thoughts generally or situationally. Participants rate how true each item is on a 7-point scale and scores are summed to create total trait and state cognitive fusion scores. Higher scores indicate greater fusion. The trait CFQ has good test–retest reliability ($\alpha = 0.80$) and excellent internal consistency in student and community samples ($\alpha = 0.90$). Internal consistency was excellent in the current sample ($\alpha = 0.92$). The state CFQ has excellent internal consistency ($\alpha = 0.90$), which was also excellent in the current sample at Time 1 ($\alpha = 0.93$) and Time 2 ($\alpha = 0.97$).

Adapted Paranoia Checklist (APC

This is an 18-item measure of state paranoia (Lincoln et al. 2010). Participants indicate how distressing items are, at the moment, on a 10-point scale. Scores are summed to create a total state paranoia score and higher scores indicate greater distress. The APC has good internal consistency ($\alpha > 0.86$). Internal consistency for the current sample was excellent at Time 1 ($\alpha = 0.93$) and Time 2 ($\alpha = 0.96$).

Experimental Manipulation

Imagery Manipulation Scripts

Imagery manipulation scripts initially developed for social anxiety (Hirsch et al. 2003), were adapted for paranoia (Bullock et al. 2016). The scripts draw on traditional attachment primes (e.g., Bartz and Lydon 2004), and prompt threat beliefs characteristic of paranoia (primes available on request). The scripts ask participants to recall a memory of a time when they felt safe, secure, and trusting (secure attachment condition) or wary, suspicious, and untrusting (threat/insecure condition). Once an image of an event is identified, participants are prompted to close their eyes and recreate the situation as vividly as possible, focussing on all of their senses.

Manipulation Checks

Participants first rate the vividness of the image on a 10-point scale. They then report *Felt Security* (Luke et al. 2012), a 10-item measure assessing the extent to which individuals feel safe and secure. Participants rate the applicability of items on a 6-point scale. Scores are summed to yield a total felt security score with higher scores indicating greater attachment security. This measure has excellent internal consistency ($\alpha = 0.97$), which was also excellent for the current sample ($\alpha = 0.99$).

Procedure

The study was advertised and made available on social media platforms (i.e., Facebook, Twitter, Instagram, Reddit, and LinkedIn), a research website open to the general population (i.e., Psychological Research on the Net), and a University of Southampton website (i.e., eFolio) available only to university students. The study was also advertised on the University campus using posters. Participants self-selected (i.e., volunteered) to complete the study. See Fig. 1 for procedural details from first contact with participants. Potential participants were informed that the study would examine the effects of imagery on their mood, and that they will complete some brief questionnaires and an imagery task which involves listening to a brief audio recording. Student participants received credit in exchange for participation. Other participants did not receive any reward for participation, but were informed of the benefits of the research (i.e., increasing knowledge about the field) prior to the study. After providing informed consent, participants completed the paranoia screen (i.e., the PS) to determine a high-paranoia group eligible for the study (i.e. those scoring $< = 43$). Ineligible participants were thanked and debriefed.

Eligible participants were automatically identified by the software, and provided with the link to the second part of the study. Participants were asked to complete Part 2 in one sitting, alone, and in a quiet space. Participants provided demographic information, completed trait measures of attachment, distress, anxiety, and cognitive fusion (ECR, DASS-21, STAI-trait, and trait CFQ), and state measures of paranoia, anxiety, and cognitive fusion (APC, STAI-state, and state CFQ). They were then automatically randomly allocated to a secure or insecure group where they listened to a 5-min audio recording to prime attachment style (secure or threat/insecure). Having completed the imagery manipulation task, participants were prompted to hold the image in mind while repeating the state measures. Finally, participants completed the imagery manipulation checks (i.e., felt security, vividness of the image, and the percentage of the time during the task that the image was held in mind)

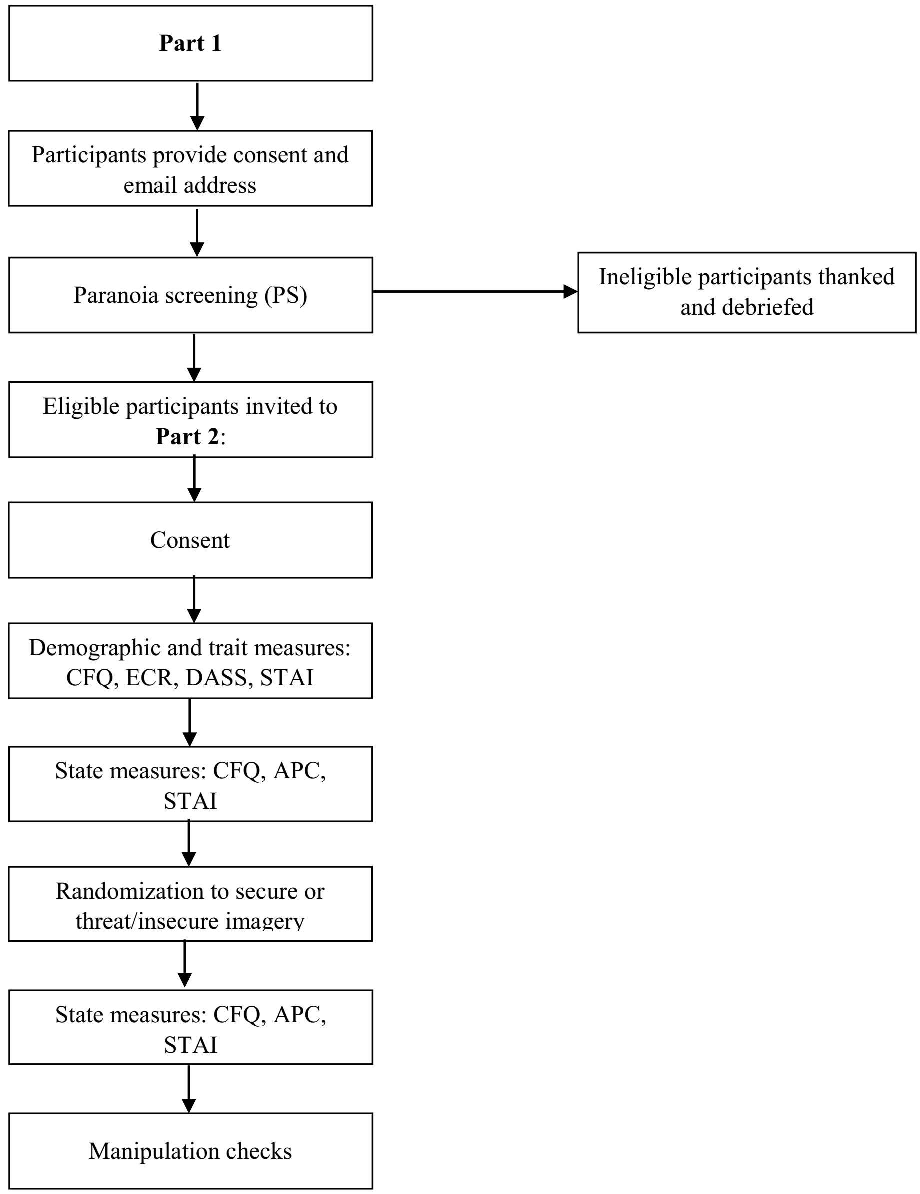

Fig. 1 Flow chart depicting the study procedure. The order of the measures in each text box represents the order in which participants completed the measures. *PS* paranoia scale, *CFQ* cognitive fusion questionnaire, *ECR* experiences in close relationships inventory, *DASS* depression, anxiety, stress scale, *STAI* state-trait anxiety inventory, *APC* adapted paranoia checklist

and an optional mood repair exercise, after which they were debriefed and provided with contacts for support in the case of any discomfort.

The entire study lasted 25 min, and was completed online on the University of Southampton research platform. Participants could complete the survey at their convenience using their electronic devices.

Data Analyses

The data were inspected for normality and analysed using SPSS 26 for Windows. Two mixed model analyses of variance (ANOVA), with one between-subjects factor (secure vs. threat/insecure imagery manipulation) and one within-subjects factor (pre vs. post imagery manipulation [Time 1 vs. Time 2]), were employed to test whether secure attachment imagery reduced state paranoia, anxiety, and cognitive fusion compared to threat/insecure imagery. Simple effects for the dependent variables were identified using post hoc *t*-tests. A Bonferroni corrected *p* value ($\alpha = 0.016$ [0.05/3]) was used for all ANOVAs and post hoc tests. Inspection of histograms, Q-Q plots, and normality tests revealed that although most variables were normally distributed, some were skewed and/or kurtotic. Analyses were continued because ANOVAs and *t*-tests are robust and, thus, the normality assumption can be violated with trivial effects (Field 2013).

Mediation analyses were conducted using PROCESS (Hayes 2018) to investigate whether cognitive fusion explained the imagery–paranoia, and imagery–anxiety relationships. The independent variable was the imagery manipulation (secure vs. threat/insecure), dependent variables were Time 2 paranoia and anxiety, and the hypothesised mediator was Time 2 cognitive fusion. Time 1 variables were added as covariates (Hayes 2018).

Results

Pre-Manipulation Differences between Groups

Table 1 shows descriptive statistics for demographic and trait measures. Differences between the secure and threat/insecure groups on these measures were tested using *t*-tests and the chi-square test (for gender).

There were no differences in age ($t(115) = -0.49$, $p = 0.628$), gender ($\chi^2(2, N = 117) = 1.10$, $p = 0.576$), attachment anxiety ($t(115) = 0.74$, $p = 0.460$), attachment avoidance ($t(115) = -0.60$, $p = 0.553$), trait paranoia ($t(115) = -0.74$, $p = 0.461$), trait anxiety ($t(115) = -0.21$, $p = 0.838$), trait distress ($t(115) = 0.16$, $p = 0.876$), and trait fusion ($t(115) = -1.07$, $p = 0.288$) indicating that the two groups were comparable on all demographic and trait measures.

Table 1 Descriptive statistics for demographic and trait measures

	Secure ($n = 61$) *M (SD)*	Insecure ($n = 56$) *M (SD)*
Age	21.33 (4.79)	21.88 (7.25)
Attachment anxiety (ECR)	77.77 (17.41)	75.34 (18.09)
Attachment avoidance (ECR)	67.07 (19.56)	69.04 (15.84)
Trait paranoia (PS)	56.36 (10.48)	57.77 (10.04)
Trait anxiety (STAI)	53.57 (9.80)	53.95 (9.88)
Trait distress (DASS-21)	47.43 (13.16)	47.07 (11.14)
Trait cognitive fusion (CFQ)	33.02 (9.30)	34.70 (7.53)

ECR experiences in close relationships inventory, *PS* paranoia scale, *STAI* state-trait anxiety inventory, *DASS-21* depression, anxiety, stress scale, *CFQ* cognitive fusion questionnaire

Table 2 shows state measures of paranoia and anxiety pre- and post-imagery in the secure and threat/insecure groups.

ANOVA

A 2 (condition: secure or threat/insecure imagery) × 2 (time: pre- and post-imagery) mixed model ANOVA on state paranoia indicated that there was a main effect of condition, $F(1,115) = 6.12$, $p = 0.02$, $\eta_p^2 = 0.05$, a main effect of time, $F(1,115) = 18.56$, $p < 0.001$, $\eta_p^2 = 0.14$, and a condition by time interaction, $F(1,115) = 39.81$, $p < 0.001$, $\eta_p^2 = 0.26$ (see Fig. 2). Post hoc *t*-tests revealed that the two conditions did not differ at Time 1, $t(115) = -0.58$, $p = 0.567$, and significantly differed at Time 2, $t(115) = 4.05$, $p < 0.001$, $d = 0.75$. State paranoia decreased from Time 1 to Time 2 in the secure attachment condition, $t(60) = 8.85$, $p < 0.001$, $d = 0.54$, but did not change over time in the threat/insecure condition, $t(55) = -1.23$, $p = 0.224$.

A second 2 (condition: secure or threat/insecure imagery) × 2 (time: pre- and post-imagery) mixed model ANOVA on state anxiety indicated that there was a main effect of condition, $F(1,115) = 12.24$, $p = 0.001$, $\eta_p^2 = 0.10$, a main effect of time, $F(1,115) = 6.85$, $p = 0.010$, $\eta_p^2 = 0.06$, and a condition by time interaction, $F(1,115) = 35.93$, $p < 0.001$, $\eta_p^2 = 0.24$ (see Fig. 2). Post hoc *t*-tests revealed that the two conditions did not differ at Time 1, $t(115) = -1.05$, $p = 0.296$, and significantly differed at Time 2, $t(115) = -5.29$, $p < 0.001$, $d = 0.98$. State anxiety decreased from Time 1 to Time 2 in the secure attachment condition, $t(60) = 5.63$, $p < 0.001$, $d = 0.58$, and increased over time in the threat/insecure condition, $t(55) = -2.69$, $p = 0.009$, $d = 0.24$.

A final 2 (condition: secure or threat/insecure imagery) × 2 (time: pre- and post-imagery) mixed model ANOVA on state cognitive fusion indicated that there was a main effect of condition, $F(1,115) = 12.45$, $p = 0.001$, $\eta_p^2 = 0.01$, a main effect of time, $F(1,115) = 45.16$, $p < 0.001$, $\eta_p^2 = 0.282$, and a condition by time interaction, $F(1,115) = 28.17$, $p < 0.001$, $\eta_p^2 = 0.197$ (see Fig. 2). Post hoc *t*-tests revealed that the two conditions did not differ at Time 1, $t(115) = -0.43$, $p = 0.576$, and significantly

Table 2 Descriptive statistics for state paranoia, anxiety, and cognitive fusion pre- and post-imagery

	Secure ($n = 61$)		Insecure ($n = 56$)	
	Time 1 *M (SD)*	Time 2 *M (SD)*	Time 1 *M (SD)*	Time 2 *M (SD)*
Paranoia	37.59 (14.90)	29.54 (14.62)	39.05 (12.41)	40.57 (14.80)
Anxiety	46.61 (11.70)	39.23 (13.80)	48.93 (12.23)	51.82 (11.74)
Cognitive fusion	32.15 (9.78)	20.90 (11.69)	32.88 (8.41)	31.55 (9.99)

Time 1 (pre-imagery); Time 2 (post-imagery)

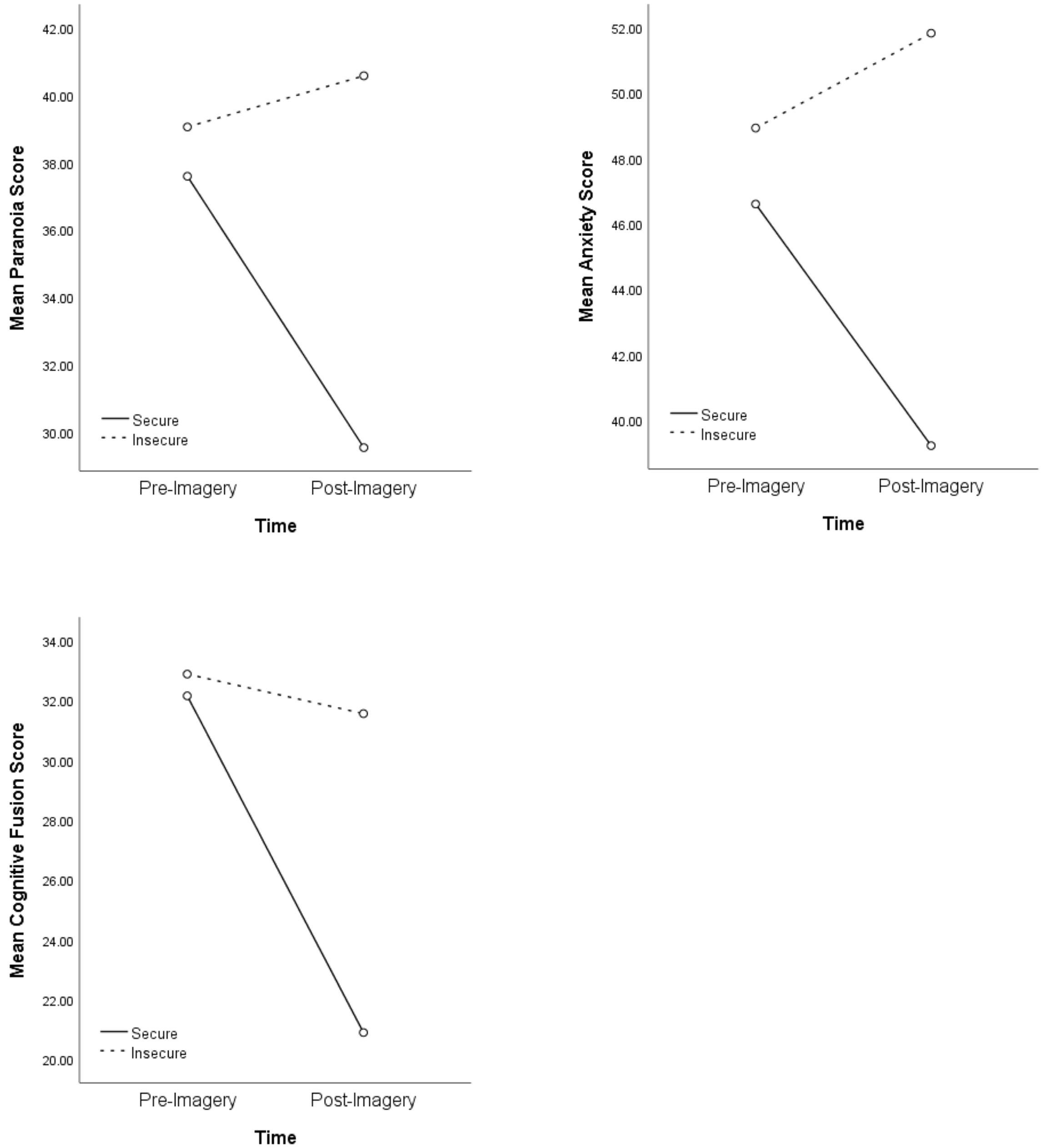

Fig. 2 Change in state paranoia, anxiety, and cognitive fusion pre- and post-imagery in the secure attachment and threat/insecure imagery conditions

differed at Time 2, $t(115) = -5.27$, $p < 0.001$, $d = 1.05$. State cognitive fusion decreased from Time 1 to Time 2 in the secure attachment condition, $t(60) = 7.92$, $p < 0.001$, $d = 1.04$, and did not change over time in the threat/insecure condition, $t(55) = -1.11$, $p = 0.271$.

Mediation

The percentile bootstrapping approach, using 5000 bootstrapped samples, was used to infer the significance of indirect effects. This produced the 95% confidence interval (CI) for each indirect effect. When the CI does not contain zero, a significant mediation is observed. The percentile bootstrap CI is the recommended method for inferring indirect effects as it balances validity and power considerations (Hayes 2018). Partially standardised direct and indirect effects were reported and interpreted following Hayes (2018), who recommends against the use of completely standardised effects when the independent variable is dichotomous. Any designation of *small*, *medium*, or *large*

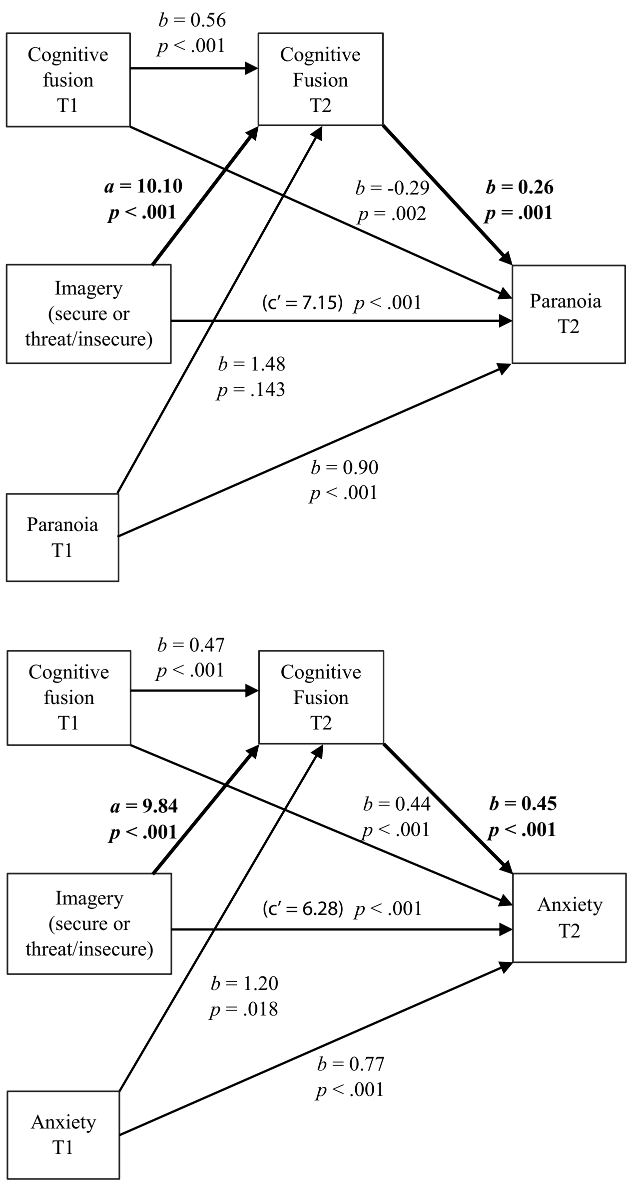

Fig. 3 Mediation of the effect of imagery on paranoia (upper panel), and imagery on anxiety (lower panel), by cognitive fusion. The arrows and text for paths *a* and *b* are in bold. The coefficient in parentheses (c') is the direct effect. *T1* Time 1 (pre-imagery), *T2* Time 2 (post-imagery); *b* = unstandardized regression coefficient

effect sizes are fundamentally arbitrary and, therefore, we do not report effect size magnitudes, but interpret effect sizes in line with Hayes (2018). Two models were tested, each is discussed in turn.

The results of model one (see Fig. 3) indicate that imagery (secure or threat/insecure) predicted both paranoia and fusion, fusion predicted paranoia, and there was a significant indirect effect of imagery on paranoia via fusion, $ab = 2.64$, $SE = 0.93$, 95% CI [1.01, 4.66]. The partially standardised indirect effect ($ab_{ps} = 0.17$, $SE = 0.06$, 95% CI [0.06, 0.30]) suggests that, relative to the secure group, the threat/insecure group had, on average, 0.17 standard deviations higher paranoia as a result of the indirect effect through cognitive fusion. The partially standardised direct effect ($c'_{ps} = 0.46$) suggests that independent of cognitive fusion, the threat/insecure group had, on average, 0.46 standard deviations higher paranoia than the secure group.

The results of model two (see Fig. 3) indicate that imagery (secure or threat/insecure) predicted both anxiety and fusion, fusion predicted anxiety, and there was a significant indirect effect of imagery on anxiety via fusion, $ab = 4.47$, $SE = 1.44$, 95% CI [2.03, 7.65]. The partially standardised indirect effect ($ab_{ps} = 0.31$, $SE = 0.10$, 95% CI [0.14, 0.53]) suggests that, relative to the secure group, the threat/insecure group had, on average, 0.31 standard deviations higher anxiety as a result of the indirect effect through cognitive fusion. The partially standardised direct effect ($c'_{ps} = 0.44$) suggests that independent of cognitive fusion, the threat/insecure group had, on average, 0.44 standard deviations higher anxiety than the secure group.

Manipulation Checks

There were no differences between the secure and threat/insecure groups in the percentage the image was held in mind ($t(114) = 0.96$, $p = 0.340$), indicating that the two groups held images in mind to a similar extent. Felt security was successfully manipulated ($t(115) = 10.04$, $p < 0.001$) with the secure group ($M = 47.14$, $SD = 13.10$) reporting higher security than the threat/insecure group ($M = 22.88$, $SD = 13.00$). However, the groups did not evoke comparably vivid images, ($t(115) = 1.97$, $p = 0.052$, $d = 0.36$). The secure group ($M = 7.18$, $SD = 2.08$) evoked more vivid images than the threat/insecure group ($M = 6.41$, $SD = 2.15$).

Discussion

This study aimed to replicate previous research demonstrating the relationship between imagery and paranoia, and imagery and anxiety, and extend this to determine whether cognitive fusion accounts for these relationships. In line with our hypotheses, the results indicated that secure attachment and threat/insecure imagery were strongly associated with paranoia and anxiety, and these relationships were mediated by cognitive fusion.

The imagery tasks affected paranoia, anxiety, and cognitive fusion, and this was largely accounted for by the impact of secure attachment imagery which resulted in significant reductions in paranoia, anxiety, and cognitive fusion over time. When participants recalled events when they felt safe, secure, and trusting of other people, their paranoia, anxiety, and cognitive fusion substantially decreased compared to when they imagined a time when they felt wary, suspicious, and untrusting of other people.

The felt security manipulation check revealed that the secure imagery group felt substantially more secure after the imagery task than the threat/insecure group, indicating that felt security was successfully achieved. Both groups held the images in mind for similar proportions of time and were comparable on key demographic, trait, and state variables prior to the imagery manipulation. Considering these results and the experimental design of the study, the changes in paranoia, anxiety, and cognitive fusion can be attributed to the imagery task.

The results are consistent with previous research (e.g., Bullock et al. 2016; Carnelley and Rowe 2007; Newman-Taylor et al. 2017; Pitfield et al. in press; Rowe and Carnelley 2003), replicating evidence of the impact of attachment imagery in people with high levels of paranoia.

The results are also consistent with the broader attachment theory literature which suggests that secure attachments facilitate emotion regulation by creating a sense of security and that these functions tend to fail in those with insecure attachment styles (Bowlby 1973; Luke et al. 2012). These emotion regulation and interpersonal security functions of the attachment system are demonstrated by the present results, which show reductions in paranoia, anxiety, and cognitive fusion in the secure imagery group. Further, the results contribute to the body of literature which demonstrates that simply imagining secure or insecure attachments can influence cognition and affect by evidencing these relationships for people with high non-clinical paranoia.

In addition to replicating previous findings, this study shows that cognitive fusion mediates the relationship between imagery and paranoia, and imagery and anxiety. Relative to the secure imagery group, the threat/insecure group reported higher cognitive fusion which, in turn, resulted in higher levels of paranoia and anxiety. Thus, when individuals believe the literal content of their thoughts and are unable to decentre or defuse from them, they tend to experience more paranoia and anxiety. By contrast, when individuals are able to accurately perceive their thoughts as transient mental events, paranoia and anxiety tend to decrease. These results are consistent with research demonstrating that fusion is a significant predictor of anxiety (Bardeen et al. 2014) and paranoia (Bolderston et al. 2014; Newman-Taylor et al. 2020) and that fusion mediates reductions in psychotic-type experience (Bach and Hayes 2002; Gaudiano et al. 2010), by evidencing this for paranoia specifically.

The results can be integrated within an attachment framework. The ability to infer and reflect on one's own and others' mental states (*mentalization*) develops in early life, in the context of a secure attachment (Allen 2008) and has clear conceptual overlaps with cognitive fusion and decentred awareness. Those with insecure attachments are typically less able to mentalise and, we would hypothesise, have higher levels of cognitive fusion. Indeed, evidence indicates that those with attachment anxiety experience difficulty stepping back from negative cognitions and memories (Fraley and Shaver 1997; Gillath et al. 2005; Mikulincer and Orbach 1995). Our results show that, in people with heightened paranoia, secure imagery priming reduces interpersonal threat beliefs (i.e., paranoia) and linked emotion (i.e., anxiety) and does so at least in part by facilitating the capacity to reflect on internal experience (i.e., by reducing cognitive fusion).

Interestingly, the partially standardised indirect effect was larger for anxiety than paranoia suggesting that cognitive fusion is a stronger predictor of anxiety than paranoia. However, since this is the first study of this kind, the results need to be replicated before definitive conclusions can be drawn.

There are some concerns regarding replicability of social priming experiments in psychological research (Cesario 2014; Molden 2014). This is likely to be due to limits to experimental control of all potentially confounding variables. For example, participants' mood state and environment when subject to a social prime may affect their responses. Repeated replication of effects is therefore essential before drawing conclusions about the likely impact of specific primes. Decades of attachment priming research repeatedly demonstrate that secure attachment priming improves positive affect and reduces negative affect (e.g., Carnelley et al. 2016; Carnelley and Rowe 2007; Rowe and Carnelley 2003). Recent systematic reviews suggest that attachment security priming is robust, with consistent results in multiple studies using various priming methods (Gillath and Karantzas 2019; Rowe et al. 2020). Gillath and Karantzas (2019) concluded that attachment imagery is particularly effective. The concerns regarding replicability of social priming experiments do not therefore extend to attachment imagery priming. The results of the current study are consistent with the weight of the existing attachment priming research, suggesting that the effects are reliable.

Limitations

A number of limitations are noted. Firstly, state cognitive fusion was measured at the same time points as paranoia and anxiety (see Fig. 1). Although cognitive fusion was measured directly before paranoia and anxiety, we cannot assume that cognitive fusion *caused* changes in paranoia and anxiety; however, there is good theoretical reason for assuming causality (e.g., Bach and Hayes 2002) as well as evidence that cognitive fusion predicts anxiety (Bardeen and Fergus 2016) and paranoia (Bolderston et al. 2014; Newman-Taylor et al. 2020). The role of anxiety could also be examined more closely, and specifically whether anxiety mediates the imagery–paranoia relationship, in addition to cognitive fusion. Measuring mediators and dependent variables at the same time point is considered appropriate when testing novel relationships (e.g., Gaudiano et al. 2010). Longitudinal research using repeated priming is now needed to evidence a causal argument for the role of cognitive fusion in this paradigm.

Secondly, the secure group evoked more vivid images. It may be that this group was more willing to engage in the task and, so experienced the images as more vivid. Differences in vividness may explain the results, rather than the nature of the imagery. However, the pattern of results (see Fig. 2) suggests that this resulted in a more modest (rather than greater) change in paranoia and anxiety over time in the threat/insecure condition, which nevertheless differed significantly from the secure imagery group.

Thirdly, though participants were asked to complete the study alone and in a quiet space, we did not verify this. Participants may have experienced distractions during the imagery task, which affected their responses. Future research using this paradigm online should seek to verify that participants were free from distractions for the duration of the study.

Finally, the study is limited by the use of self-report measures, and the high proportion of females and students in our general population sample. Given that people who agree to complete online studies are self-selecting, they may not be truly representative of the wider population.

Implications

Despite these limitations, the results have clear implications for psychological interventions in the treatment of paranoia. Firstly, the results suggest that imagery-based interventions, which facilitate a sense of interpersonal security, are likely to be effective in reducing paranoia and anxiety in non-clinical populations. A longitudinal design using repeated imagery primes would determine if the effects can be sustained and confirm the role of cognitive fusion. Secondly, if the effects are replicated and sustained in clinical groups, this would provide support for the use of attachment imagery to help reduce cognitive fusion to treat clinical paranoia. Such interventions could be incorporated in first-line treatments for psychosis, such as cognitive behavioural therapy. Finally, our study was wholly online and given the rapid growth of online technology in healthcare, and evidence that online interventions are acceptable to people with psychosis and psychotic-type experience (Alvarez-Jiminez et al. 2012; Stafford et al. 2015), further work might focus on the scalability of the secure imagery task.

Conclusion

This study investigated the impact of attachment imagery on paranoia and anxiety, and cognitive fusion as a mediating mechanism. Using an experimental design, we showed that secure attachment imagery reduces paranoia and anxiety compared with threat/insecure imagery, and that cognitive fusion accounts for these effects, in an analogue sample with high levels of non-clinical paranoia. These results have important implications for both non-clinical and clinical populations. Attachment imagery which facilitates people's ability to 'step back' from compelling threat beliefs, could be incorporated into recommended treatments for people with psychosis to improve clinical outcomes.

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Data Availability The data that support the findings of this study are available on request from the corresponding author (M.S.). The data are not publicly available due to privacy/ethical restrictions.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in this study were in accordance with the ethical standards of the institution and 1964 Helsinki Declaration and its later amendments. The study was approved by the University of Southampton Ethics Committee.

Research Involving Human and Animal Rights All institutional and national guidelines for the care and use of laboratory animals were followed.

Informed Consent Informed consent was obtained from all individual participants included in the study and all participants gave informed consent regarding the publication of their data.

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