Attachment-related differences in dispositional anger and its experience and expression
following an insult-based anger induction

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Abstract

Variation in how individuals experience and express anger has been linked to their attachment style, particularly in close interpersonal contexts. However, little research has investigated attachment-related differences in anger and aggression in non-relational settings. This multi-method investigation reports two studies. The first investigated associations between adult attachment dimensions (anxiety and avoidance) in 270 participants. The second describes a lab-based anger provocation task, based on a modified version of the Taylor Aggression Paradigm, which examined associations between attachment dimensions and pre-post test change in self-reported anger, physiological responses, anger suppression and aggressive responding ($N = 77$). Results from study 1 indicate that attachment anxiety was a significant independent predictor of trait anger, while attachment avoidance was not. There were no significant interaction effects, suggesting distinct effects of attachment dimensions on anger. In study 2, attachment avoidance was negatively related to anger change scores from baseline to post-provocation and positively to anger suppression (measured by the discrepancy between self-report and physiological measures). Attachment anxiety was positively associated with aggressive responding. In summary, the findings support the high arousal-low control style previously associated with attachment anxiety, evidenced by elevated trait anger and higher aggressive responding. They also align with previous studies that support an association between attachment avoidance and emotion suppression, suggesting that the attachment framework can be usefully extended to understand anger and aggression in non-relational contexts.

Keywords: attachment, anger, aggression, anxiety, avoidance

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While anger is an adaptive emotional response in some contexts (van Dijk, et al., 2008), it has widely been linked to negative psychological and physical health sequelae (Mauss et al., 2007; Gardner & Moore, 2013) and is considered to be a key component of aggressive behaviour (Jones & Hollin, 2004). How individuals experience and express anger is relatively stable across the lifespan (Schum, et al., 2003), suggesting that anger is somewhat dispositional. In line with current socio-cognitive approaches to aggression, attachment theory provides a valuable framework for understanding the relevance of cognitive and developmental factors in the development of aggressive tendencies, but additionally provides much needed insight into the importance of the relational and socio-emotional goals of aggressive behaviour (Moretti & Obsuth, 2011). The current paper describes a multi-method approach to investigating relationships between attachment, anger, and aggression in a non-relational context to determine the impact of attachment on the experience and expression of anger in day-to-day supposedly attachment-irrelevant interactions. In study 1, we investigated relationships between adult attachment dimensions and dispositional anger. Study two employed a modified anger-induction paradigm to investigate attachment-related differences in self-reported anger, physiological responses and aggressive responding.

Background

Contemporary attachment researchers have posited attachment theory as a guiding framework for understanding individual differences in the experience and expression of affect (Cooke et al., 2019). Adult attachment is typically measured by two dimensions: attachment anxiety and attachment avoidance (with low scores denoting security). These dimensions are

viewed to be commensurate with internalised models of early interactions with caregivers (Fraley et al., 2000). Recent research has indicated that attachment dimensions are associated with distinct styles of emotion expression and regulation. Theoretically, securely attached individuals have learned from early caregiver interactions that negative emotional experiences are temporary and can be resolved through the implementation of learned adaptive techniques such as cognitive reappraisal (Mikulincer & Shaver, 2003). However, where caregiving is unresponsive or inconsistent, there can be limited opportunity to dyadically learn adaptive emotion regulation strategies (Mikulincer et al., 2003). The attachment dimensions have thus been associated with distinct styles of emotion regulation that are maladaptive in later life. Attachment anxiety has been characterised by a high arousal/low control regulatory style, where both the experience and expression of emotion is heightened and prolonged (Mikulincer & Shaver, 2019). This elevated outward expression of negative emotion is arguably compatible with the goal of prompting attention and support from others (Shaver & Mikulincer, 2007). On the other hand, avoidance has been associated with an emotion regulation style that is suppressive or denying (Brodie et al., 2019; Goodall, 2015). Given that those high in avoidance have a negative view of others, suppressing emotional responses allows them to avoid appearing emotionally invested, vulnerable or dependant on others (Mikulincer & Shaver, 2007). This suppressive style associated with attachment avoidance is reflected in a discrepancy between self-reported expressions of emotion and physiological responding to that emotion, where self-report is considerably lower than the physiological arousal experience by the individual (Dozier & Kobak, 1992; Richards & Gross, 1999; Szasz et al., 2011). This suggests that suppressing the outward expression of emotions results in an ‘ironic processing effect’, where the physiological experience of the emotion is exacerbated. This indicates that, as found in prior studies (Dozier & Kobak, 1992; Spangler & Zimmermann, 1999), both dimensions are likely to be associated with increased physiological arousal during emotional

experiences. These patterns have been demonstrated in relation to negative (Brodie et al., 2019) and positive emotion (Goodall, 2015) but research linking attachment patterns to anger processing is scarce.

Anger can be conceptualised as three distinct but related facets (Buss & Warren, 2000). First, individuals differ in their predisposition towards experiencing angry feelings, suggesting a dispositional quality. Second, individuals can differ in the extent to which they engage in angry cognitions, such as feelings of hostility and bitterness towards others. Finally, individuals vary in the degree to which they outwardly express anger, for example through verbal or physical aggression. Attachment-related associations have been noted across these three facets of anger. Compared with securely attached individuals, insecurely attached adolescents and adults demonstrate elevated levels of trait anger and hostility (Özyurt et al., 2018; Troisi & D'Argenio, 2004). With regards to the specific types of insecurity, attachment anxiety appears to be a higher risk factor for trait anger than avoidance (Kidd & Sheffield, 2005; Wright, 2017). Attachment avoidance appears to be related to increased dispositional anger only when high levels of attachment anxiety are also present (Troisi & D'Argenio, 2004). As such, a number of studies indicate that only attachment anxiety specifically, or attachment categories characterised by a combination of both high anxiety and high avoidance (i.e. fearful-avoidant attachment) is associated with increased trait anger (Kidd & Sheffield, 2005; Mikulincer, 1998), and a tendency to respond more frequently with anger in daily interactions (Dutton et al., 1994) in both general and clinical populations (Critchfield et al., 2008). These findings seem to suggest that attachment anxiety may be the strongest risk factor for elevated trait anger, and that this risk increases when coupled with high levels of attachment avoidance (Dutton, et al., 1994), indicating a potential interaction effect.

With regard to the behavioural expressions of anger several studies have highlighted a positive association between insecure attachment and aggressive and antisocial behaviour (Moretti & Obsuth, 2009), and with relational violence perpetration and victimisation (Bartholomew & Allison, 2006; Mikulincer & Shaver, 2007). However, the majority of studies have focused on offenders or those at increased risk of violence (Grady et al., 2017; Grady & Shields, 2018), with limited research on general populations. One study, which examined associations between couples' attachment styles and the nature of their communication during episodes of conflict (Domingue & Mollen, 2009), found a higher prevalence of negative communication behaviours in couples where both partners were insecure, including demand-withdrawal (i.e. where one partner makes a demand and the other avoids it by disengaging), mutual avoidance (i.e. where both partners avoid discussing the problem or avoid each other entirely) and withholding communication (i.e. where both partners withhold emotional and/or physical contact). Theoretically, they argue that, within the context of romantic relationship conflict, insecure attachment is associated with a tendency to either protest a partner's unresponsiveness (in line with attachment anxiety) or deflect dependence needs through avoidance techniques (in line with attachment avoidance). While this provides insight into aggressive expression in the context of a romantic relationship, it is also important to understand attachment-related differences in the expression of anger and aggression in non-relational contexts.

The present study

Study 1 aimed to examine the relationship between adult attachment dimensions and dispositional anger using an online cross-sectional questionnaire. Study 2 used an anger induction paradigm to explore attachment-related differences in self-reported state anger, physiological responses, suppression and subsequent aggressive behaviour following

provocation. Using an anger induction paradigm, where real-time responses and behaviours could be measured, has the potential to provide unique insight into the associations between attachment insecurity and anger expression. Importantly, as most previous literature on attachment and anger is cross-sectional in nature, and conducted within the context of romantic relationships, it is unclear whether these attachment-related differences in anger expression can be found outwith romantic partner interactions, where there is little opportunity for a direct attachment-related threat to arise. Thus, the multi-modal approach presented here has the potential to provide unique and valuable insight into whether the reported attachment-related differences in anger and aggression extend also to general contexts.

Study 1

Given the literature supporting links between attachment anxiety and trait anger (Kidd & Sheffield, 2005; Wright, 2017), we predicted that attachment anxiety would be positively associated with trait anger (H1). However, given the tendency for those high in attachment avoidance to suppress the expression of emotion (Brodie et al., 2019; Goodall, 2015), we did not predict a main effect of attachment avoidance on trait anger. Furthermore, based on research suggesting that a combination of elevated levels of attachment anxiety and attachment avoidance increase levels of trait anger (Dutton, et al., 1994), we predicted a significant interaction effect of anxiety x avoidance on trait anger (H2).

Method

Participants

The final sample comprised of 270 individuals (80.7% female; 56% students) ranging from 18-63 years old ($M_{age} = 29.2$, $SD = 9.78$). An a-priori power analysis, using G* Power 3.1, indicated that a sample of 138 was required to achieve 80% power in detecting a medium

effect size in the regression analysis (based on an alpha of .05). Following ethical approval from the host institution's ethics committee, participants were recruited via social media (Facebook and Twitter) and through a university Research Participation Scheme which awarded course credits for participation.

Measures and procedure

Upon following the link provided, participants read a detailed information sheet before completing a digital consent form. They then completed the following questionnaires via the Online Surveys platform:

Attachment: Experiences in Close Relationships Revised scale (ECR-R; Fraley et al., 2000). The ECR-R is a 36-item self-report measure of adult attachment, assessing two dimensions: anxiety (e.g. 'I often worry that my partner will not want to stay with me') and avoidance (e.g. 'I prefer not to be too close to romantic partners'). Participants respond to items reflecting how they generally behave in romantic relationships on a 7-point Likert-scale (1 = *strongly disagree*, 7 = *strongly agree*). Higher scores on the subscales reflect higher levels of anxiety and avoidance. Internal consistencies were $\alpha = .94$ (anxiety), and $\alpha = .95$ (avoidance).

Trait Anger: State-Trait Anger Expression Inventory-2 (STAXI-2; Spielberger et al., 1999). The STAXI-2 is a self-report measure assessing levels of state anger, trait anger and tendency to use specific anger regulation processes. For the present study only the trait anger subscale was used. This is a 10-item subscale (1 = *almost never*, 4 = *almost always*), in which higher scores reflect a high regularity of angry feelings in everyday life (e.g. 'I am a hot-headed person, I am quick tempered'). The internal consistency of the trait anger subscale was $\alpha = .86$.

Licencing permission for the STAXI-2 was received from Psychological Assessment Resources Inc.

Results

Independent samples t-tests revealed no significant sex differences (see Supplemental Materials). As shown in Table 1, age was negatively correlated with trait anger ($p = .012$). Trait anger was positively associated with anxiety ($p < .001$), but not avoidance ($p = .051$).

[Table 1]

Preliminary analyses were carried out to ensure that the data did not violate the assumptions of multicollinearity, independent errors, non-zero variances, normality, homoscedacity and linearity. A regression model (Table 2) was developed to test whether anxiety, avoidance and the interaction between the two dimensions predicted variance in trait anger scores, controlling for age and gender. At step 1 of the model, age and gender accounted for a marginally significant proportion of the variance. At step 2, anxiety and age were the only significant independent predictors of trait anger scores, with small to medium effect sizes. The anxiety*avoidance interaction was non-significant.

[Table 2]

Study 1 summary

Attachment anxiety was a significant independent predictor of trait anger, supporting H1, while attachment avoidance was unrelated to trait anger. Furthermore, the interaction

between attachment anxiety and attachment avoidance was not significant, suggesting that attachment avoidance does not have an impact on the attachment anxiety-trait anger relationship, rejecting H2. This initial study provides insight into attachment-related differences in trait anger. Using a lab-based anger induction task, study 2 aimed to probe relationships between attachment dimensions and state anger and aggressive responding.

Study 2

An anger induction paradigm was used to measure self-reported anger, physiological responses and subsequent aggressive behaviour following provocation using a non-experimental repeated measures design. The anger induction procedure used interpersonal insult in the form of negative feedback. Given reported links between low self-esteem and both increased emotional distress following negative feedback (Brown, 2010) and higher levels of hostile aggression (D’Zurilla et al., 2003), self-esteem was included as a control variable.

Based on the results of study 1, and reported associations between attachment anxiety and elevated anger experience and expression (Mikulincer & Shaver, 2019), it was hypothesised that attachment anxiety would be positively associated with physiological activity (H3), self-reported anger (H4) and aggressive responding (H5) following provocation. As attachment avoidance has been associated with a suppressive regulation strategy (Dozier & Kobak, 1992; Richards & Gross, 1999; Szasz et al., 2011), it was hypothesised that attachment avoidance would predict the use of suppression following the anger induction procedure (H6).

Method

Participants

Following ethical approval, participants were recruited using the same approaches as study 1. To ensure reliable physiological data, those currently taking medication with effects on the cardiovascular, respiratory, or central nervous system were excluded. As participants were required to identify a change in stimulus colour in the aggression task, colour blindness was also an exclusion criterion. Participants were asked not to consume caffeine, nicotine or alcohol for two hours prior to the session. A power analysis suggested a sample of 76 participants was required to achieve 80% power in detecting a medium effect size in the regression (based on an alpha of .05). The final sample consisted of 77 registered students (62 females and 15 males), ranging from 18-60 years ($M^{age} = 26.2$, $SD = 10.5$).

Measures

Attachment security was measured using the ECR-R (see study 1). The following additional measures were used:

Anger Expression: Self-Reported Affect Scale. Based on the scale used by Harmon-Jones and Sigelman (2001), participants indicated the extent to which they felt a variety of emotions on a scale of 0 (*not at all*) to 5 (*extremely*). The scale comprised twenty-four items, including 10 items reflecting anger (e.g. hostile, agitated). Additional items reflecting fear (e.g. scared), and positive affect (e.g. uplifted) acted as distracters. In the present study, the alpha coefficient for baseline self-reported anger was $\alpha = .82$, while the post-induction coefficient was $\alpha = .89$. A pre-post self-report anger change score was used in the upcoming analysis.

Anger Experience: Physiological change; MAP and FT. Physiological reactivity to the anger induction was assessed by mean arterial pressure (MAP; the average pressure in the

arteries during one cardiac cycle) and finger temperature (FT). A formula was used to calculate MAP from systolic blood pressure (SBP; the highest pressure in the vessels when the heart is contracted) and diastolic blood pressure (DBP; the highest pressure when the heart is at rest); $SBP + (DBP \times 2) / 3 = MAP$ (Sinha et al., 1992). Previous research indicates that these two methods are effective in identifying sympathetic activation of the cardiovascular system, and changes in both have been linked to emotional reactivity (i.e. increased BP and reduced FT; Gross, 1998; Mauss et al., 2007; Richards & Gross, 1999). BP was measured using an Omron M5-I Digital Automatic Blood Pressure Monitor, placed on the participant's dominant arm, and FT was measured using a Testoterm 1100 Thermometer, which was placed on the index finger and middle finger of the participant's non-dominant hand. The FT scores from the participant's index and middle finger were combined and averaged at each measurement point to provide a mean FT score for both baseline and post-anger induction. Pre-induction physiology scores were compared with post-induction scores to determine FT and MAP change scores.

Anger Suppression. Anger suppression was estimated by the discrepancy between an individual's physiological and self-report scores (i.e. low self-reported anger but increased physiological arousal). Based on Dworkin et al. (2019) an anger suppression index was created by computing the difference between standardized post-induction self-report anger scores and standardized post-induction finger temperature (FT) scores (i.e. expression - experience).

Self-Esteem: The Self-Liking/Self-Competence Scale Revised (SLSC-R; Tafarodi & Swann, 1995). Self-esteem was measured using the SLSC-R. This scale measures self-esteem on two 8-item subscales: self-competence (e.g. 'I am highly effective at things I do') and self-liking (e.g. 'I feel great about who I am'). Participants respond to items on a 5-point Likert-scale (1 = *strongly disagree*, 5 = *strongly agree*). Cronbach's alpha coefficient for the composite score used in the present study was $\alpha = .87$.

Procedure

This procedure took place in a university psychology lab over a one-hour period. Participants were provided with an information sheet indicating that the study was investigating the relationship between intelligence, personality and physiological well-being. They were also told that another participant was currently participating in another room, with another experimenter, and that they would be collaborating during the experiment. However, the other participant did not exist (herein referred to as the ‘fictional other’); the impression of another participant was included as part of the anger induction procedure.

After providing written consent, participants were asked to close their eyes, relax and remain still for four minutes so that baseline physiological data could be obtained. Subsequently, three readings were taken for each physiological marker (i.e. index and middle finger temperature (FT), and diastolic and systolic blood pressure (BP)). Self-report affect ratings were then taken to reflect baseline anger, introduced as a questionnaire measuring emotional well-being.

Anger Induction Task. A high impact manipulation technique was used to induce anger through interpersonal insult, similar to that used by Harmon-Jones and Sigelman (2001), given the theoretical proposition mentioned earlier that anger can be an emotional reaction to perceived injustice (Baumeister et al., 1990). Participants were given 10 minutes to write a short essay arguing their views on a chosen issue, which was then to be evaluated by the fictional other. Participants were given a free choice from the topics: 1) Should assisted suicide be legal?, 2) Should Scotland have gone independent?, 3) Can people be born evil?. They were told that the other participant was given a choice of three different topics. Participants received a standard feedback sheet which was presented as being rated by the fictional other. The

fictional feedback awarded the participant low scores (ranging from 1 to 3) on six 9-point rating scales (*unintelligent-intelligent; boring-thought-provoking; unfriendly-friendly; illogical-logical; disreputable-respectable; irrational-rational*), and a further negative statement in the ‘additional comments’ box: “I can’t believe an educated person would think like this. I hope this person learns something at university!”.

Post-induction self-report affect ratings were then taken and BP and FT were recorded three times each in the two minutes following feedback. Following the anger induction procedure, participants took part in a competitive reaction time task (introduced as an additional intelligence measure) to assess aggressive behaviour toward the fictional other following provocation.

Competitive Reaction Time Task. Aggression following provocation was measured using a modified version of the Taylor Aggression Paradigm (TAP; Taylor, 1967), run using the Competitive Reaction Time software (Bushman & Baumeister, 1998) on a laptop computer. This involved a 25-trial competitive reaction time game in which participants were led to believe that they were competing against the fictional other. The game required participants to react to an on-screen stimulus colour change, and the slowest responder received an unpleasant white noise blast. Participants were asked to select the intensity and duration of the noise blast to be received by the fictional other if they were to lose a trial, on scales from one to ten (intensity range = 60dB to 105dB; duration range = 500ms to 5000ms). Aggression was operationalised as the mean duration and intensity of the initial noise blast given on trial 1 (i.e. trial 1 duration + trial 1 intensity/2). While only the data from the first trial was used, the remaining 24 trials were kept in to give the impression that the task was legitimate. Research supports that this is a valid measure of physical aggression (Anderson & Bushman, 1997; Giancola & Chermack, 1996).

Finally, a post-induction interview was conducted to determine whether the participant was suspicious of the manipulation (i.e. that there was no other participant) and to provide debriefing.

Results

Paired samples t-tests demonstrated that all physiological measures and self-reported anger changed significantly in the expected directions following the anger induction (see Supplemental Materials). Further independent samples t-tests were conducted to determine any impact of suspicion of manipulation, as indicated in the post-experiment interview. The only significant difference between suspicious ($n = 3$) and non-suspicious ($n = 74$) participants was identified for the FT change variable. Independent samples t-tests revealed no significant sex differences (see Supplemental Materials) and age was unrelated to any main study variables.

Table 3 presents descriptives and correlations for all predictors, covariates and outcome variables. Anxiety demonstrated a negative relationship with self-esteem ($p = .001$) and positive relationship with aggressive behaviour ($p = .003$). There were no significant relationships between anxiety, anger change, physiological change scores or anger suppression. Avoidance was negatively associated with anger change ($p = .004$) and positively associated with anger suppression ($p = .034$). Avoidance was also negatively associated with self-esteem ($p < .001$) but unrelated to any physiological change scores.

[Table 3]

Attachment variables as predictors of self-report and physiological change

Multiple regression models were used to examine whether attachment variables significantly predicted variance in change scores for self-report anger, FT, and MAP

controlling for age, gender, self-esteem, and baseline scores at step 1 (Table 4). Preliminary analyses confirmed that the data did not violate necessary assumptions. In the first model, at step 1, baseline self-report anger was a significant predictor of anger changes scores. At step 2, avoidance and baseline self-report anger were the only significant independent predictors of anger change scores. In the second model, at step 1, only baseline FT scores were a significant predictor of FT change. At step 2, baseline FT remained the only significant predictor of FT change scores. In the final change score model, at step 1, age and baseline MAP scores were significant predictors of MAP change. At step 2, age and baseline MAP remained the only significant predictors of MAP change. These models indicate that attachment avoidance is a significant predictor of anger change scores, in that higher avoidance predicts a reduction in self-reported anger from baseline to post-provocation, but neither attachment variables are predictive of physiological change.

[Table 4]

Attachment variables as predictors of anger suppression and aggression

Table 5 displays the results of analysis examining relationships between attachment and anger suppression. At step 1, age, gender, baseline FT, baseline self-report anger and self-esteem were controlled for. At step 2, gender, avoidance and baseline FT were the only significant independent predictors of anger suppression.

[Table 5]

The final model (Table 6) examined whether attachment dimensions predicted significant variance in aggressive responding. At step 1, age, gender and self-esteem were controlled for. At step 2, anxiety was the only significant independent predictor of aggression).

[Table 6]

Study 2 summary

In summary, neither attachment anxiety nor avoidance were related to physiological change scores, rejecting H3. Attachment anxiety was not significantly associated with pre- to post-test changes in self-reported anger, while attachment avoidance was negatively related to anger change scores, contrary to H4. Attachment anxiety was a significant predictor of aggression scores measured through the TAP, while attachment avoidance was not, lending support for H5. In support of H6, attachment avoidance was a significant predictor of anger suppression.

Discussion

Using a multi-method approach, two interlinked studies investigated attachment-related differences in trait anger, state anger and aggressive responding. The results from study 1 indicated positive associations between trait anger and attachment anxiety, but not avoidance, even when interacting with attachment anxiety. The second study probed relationships between attachment and state anger and aggressive responding using self-report, physiological and behavioural measures. This study found that attachment avoidance alone was associated with a reduction in self-reported anger following the anger induction and with anger suppression, as measured by the discrepancy between self-reported anger and physiological responding.

Finally, attachment anxiety was positively associated with aggressive behaviour following induced anger, while attachment avoidance was not, indicating that those with high attachment anxiety may be more prone to responding to insult in an aggressive manner.

Trait and state anger

The positive association between attachment anxiety and trait anger aligns with attachment-based patterns seen in previous studies (e.g. Kidd & Sheffield, 2005; Troisi & D'Argenio, 2004), and supports the view that those with higher levels of attachment anxiety will be prone to experiencing anger. As the interaction between anxiety and avoidance was not significant, these findings further dispute the notion of an 'angry attachment', reflected by high levels of both attachment anxiety and attachment avoidance (Dutton et al., 1994).

Previous research has indicated that individuals who are more insecurely attached tend to have higher self-reported trait anger (Dutton et al., 1994; Muris et al., 2004). However, investigations based on 'insecure' categories are likely to mask the distinct contribution of the anxiety and avoidance dimensions. Studies investigating the contribution of these dimensions report negative association between attachment avoidance and self-reported anger (Diamond et al., 2006; Mikulincer & Shaver 2007), and significantly lower levels of self-reported anger in those classified as avoidantly attachment, compared with those categorised as secure or anxious (Mikulincer, 1998). Study 2 supports these findings by demonstrating that induction of anger was associated with decreased self-reported anger change scores from baseline to post-induction for those high in avoidance. By contrast, attachment anxiety was unrelated to state anger. The latter finding was somewhat unexpected as the majority of previous literature suggests that attachment anxiety (or categories of insecure attachment characterised by high anxiety; e.g. fearful avoidant and preoccupied) is associated with higher levels of anger (Kidd

& Sheffield, 2005; Troisi & D'Argenio, 2004) and indeed this was suggested in study 1 using a dispositional measure.

While there is a theoretical argument that those high in attachment anxiety may be likely to either suppress anger (to avoid alienating others; Brenning & Braet, 2013), or under-regulate the expression of anger (in order to cease unwanted behaviour in others; Campbell & Muncer, 2008) depending on their specific goal, the findings from this study suggest that while this dimension may be associated with increased trait anger, it is unrelated to changes in self-reported anger expression in the context of a non-relational negative feedback-based anger induction paradigm. Theoretically, it is possible that the negative self-appraisals associated with attachment anxiety (Collins & Read, 1994; Shaver & Clark, 1994) may cause them to perceive such adverse feedback as warranted, serving to confirm their negative model of the self. This proposition is supported to some extent by the negative relationship between attachment anxiety and self-esteem found in study 2. In other words, those high in attachment anxiety may not have been sufficiently angered by the negative feedback if they believed it was just (Baumeister et al., 1990). Future research adopting a negative feedback-based anger induction procedure should control for this by asking participants whether they believe that their markers comments were justified during the post-experiment manipulation check. Nonetheless, these findings suggest that there are distinct attachment-related differences in self-reported anger reactions, and future research should therefore continue to consider these dimensions independently to detect these differences.

Anger suppression

Contrary to studies suggesting that both attachment anxiety and avoidance are associated with increased physiological arousal during emotional episodes (Dozier & Kobak, 1992; Spangler & Zimmermann, 1999), in study 2 attachment dimensions were unrelated to

physiological reactivity following anger induction. However, attachment avoidance was a significant predictor of anger suppression following the anger induction procedure. In other words, those with high levels of attachment avoidance demonstrated a larger discrepancy between their low self-reported anger levels and their physiological arousal. This finding converges with previous research suggesting that individuals with avoidant styles tend to suppress expressions of emotion, including anger (Diamond et al., 2006; Vrticka & Vuilleumier, 2012).

Aggression

Suppressing the outward expression of anger may enable avoidantly attached individuals to maintain a disassociated and disinvested outer exterior and, in this case, it is potentially a successful strategy as there was no relationship between attachment avoidance and aggressive responding to an insult. As attachment avoidance was also associated with low self-reported anger responses to the anger induction procedure, this may provide evidence for the effectiveness of suppression for negating the outward expression of anger (Gross, 1998; Szasz et al., 2011). By contrast, attachment anxiety was associated with responding aggressively which is potentially linked to the under-regulation and poor anger control processes previously associated with this dimension (Brodie et al., 2019; Lopez, 2001; Wei et al., 2005). Furthermore, those who express anger habitually (i.e. leave it under-regulated or uncontrolled) tend to express elevated levels of aggression when faced with insulting criticism (Bushman et al., 2001). While attachment anxiety was unrelated to self-reported anger and physiological arousal following the anger induction, it could be argued that physical aggression itself (measured using the TAP) reflects under-regulated or uncontrolled anger. Indeed, the literature does often refer to aggressive behaviour as a direct reflection of unregulated anger (Fernandez, 2008; Novaco, 1976). Therefore, it could be inferred that attachment anxiety may

be related to the under-regulation of anger in this study, as it is a significant independent predictor of aggressive behaviour. This suggests that attachment anxiety is not only related to increased trait anger (study 1), and increased dispositional aggression (see Brodie et al., 2019), but it is also associated with a tendency to react aggressively in real-time when provoked.

Limitations and future directions

The cross-sectional, correlational nature of these studies limits causal inference due to the limited timescale in which the data were collected (Levin, 2006). However, study 2 does attempt to alleviate this to an extent by measuring outcomes across different timepoints to detect change in the context of direct provocation.

The sample of both studies were predominantly women (80.7% in study 1; 80.5% in study 2). However, studies indicate relatively comparable levels of self-reported anger between men and women (Deffenbacher et al., 1996). While there is evidence to suggest that males are more physically aggressive than females (Burton et al., 2007) there is also a substantial body of work showing that laboratory provocation ameliorates the gender differences in levels of aggressive behaviour (Arriaga & Aguiar, 2019; Bettencourt & Miller, 1996), especially where provocation involves insulting evaluation as was the case in study 2. It is recommended that future replications include representative male samples.

It is also important to note that no significant attachment-related differences were found for the physiological change scores in the study 2. Potentially, these relationships were not detected as there was no activation of the attachment system via attachment-related threat. This suggests that attachment-based differences in self-reported anger, anger suppression and aggressive responding may exist, even in the absence of activation of the attachment system, providing potential evidence for attachment-related differences in managing and responding to

anger in general situations, not only interpersonal relationships. However, it is unclear whether this extends to physiology, and future research needs to examine this further.

Finally, no control group was included in study 2, which limits the extent to which it can be argued that changes in physiological and self-report measures are in fact a direct result of the anger induction procedure. However, taking a within-subjects approach prevented interference from potentially confounding individual difference factors (Price et al., 2015). Future studies could help further the findings here by utilising a control group design.

Conclusion

These studies extend previous cross-sectional work by using a multi- method approach to provide a more real-time, ecologically valid investigation of attachment-related differences in anger expression and aggressive behaviour. High attachment avoidance was associated with a tendency to report a reduction in anger when being directly provoked, and also predicted anger suppression following provocation, extending the evidence for an association between attachment avoidance and suppression to the context of anger. It is proposed that the suppression of anger allows these individuals to preserve their disinvested façade, and the findings of this study suggest that this may be an effective strategy where anger is concerned, as attachment avoidance did not predict aggression or physiological responses to the anger induction procedure.

Attachment anxiety, on the other hand, was not significantly related to changes in self-reported anger scores from pre- to -post induction but was associated with heightened dispositional anger and physical aggression when provoked. This is commensurate with prior cross-sectional research which demonstrates a relationship between anxiety and trait physical aggression but supports these findings from a unique multi-method standpoint, illustrating that

attachment anxiety is associated with elevated trait anger and aggression in the absence of direct attachment-system activation.

Implications

Taken together, these findings suggest that there are distinct attachment-related differences in dispositional anger and responses to an anger induction procedure. These studies suggest that suppression may be an effective technique in alleviating the external expression and internal experience of anger for those high in attachment avoidance. On the other hand, attachment anxiety is an independent risk factor for elevated dispositional anger and aggressive behaviour, and such, a focus on the development of adaptive methods for controlling and regulating one's anger may help reduce aggressive responding for those high in attachment anxiety. Finally, and perhaps most importantly, these studies provide unique insight into the impact of attachment on the experience and expression of anger outwith the context of attachment-related interactions, and in the absence of attachment-related threat. Theoretically, this highlights the wide-ranging effect of the internal working models of self and others developed through attachment relationships, which seem to have the propensity to influence experiences and interactions with complete strangers.

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Tables

Table 1.

Correlations and descriptive statistics for age, attachment anxiety, attachment avoidance, and trait anger (N = 270).

	<i>Mean</i>	<i>SD</i>	1	2	3	4
1 Age	29.19	9.78	1.	-.09	.05	-.15*
2 Attachment Anxiety	3.01	1.24		1.	.45**	.26**
3 Attachment Avoidance	2.96	1.20			1.	.12
4 Trait Anger	19.62	5.52				1.

* $p < .05$ ** $p < .01$

Table 2

*Hierarchical multiple regression analysis predicting trait anger scores with attachment anxiety, attachment avoidance and anxiety*avoidance, controlling for age and gender (N = 270)*

					<i>Unstandardized</i>		<i>Standardized</i>		<i>95% CI</i>		
	R^2	ΔR^2	F_{change}	R^2_{change}	B	$Std. Error$	B	t	p	LL	UL
<i>Step 1</i>	.02	.02*	3.13	.02							
Age					-.09	.03	-.15*	-2.49	.014	-.15	-.02
Gender					.01	.85	.00	.01	.989	-1.66	1.69
<i>Step 2</i>	.09	.07**	6.01	.06							
Age					-.08	.03	-.13*	-2.22	.027	-.14	-.01
Gender					-.24	.83	-.02	-.28	.777	-1.87	1.40
Anxiety					1.09	.30	.24**	3.64	.000	.50	1.68
Avoidance					.08	.31	.02	.25	.807	-.52	.68
Anxiety*Avoidance					-.02	.30	-.00	-.06	.955	-.61	.57

*Note: * $p < .05$; ** $p < .01$*

Table 3*Correlations and descriptive statistics for all main study variables (N = 77)*

	<i>Mean</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1 Age	26.18	10.47	1.	-.19	-.19	.10	-.01	.05	.20	-.12	.15
2 Attachment Anxiety	2.81	1.00		1.	.32**	-.37**	-.04	-.03	.15	.33**	0.11
3 Attachment Avoidance	3.25	1.14			1.	-.42**	-.32**	.16	-.09	.03	.24*
4 Self-Esteem	49.12	9.65				1.	.12	-.16	.02	-.21	-.06
5 Anger Change	6.16	5.24					1.	-.29*	.13	.09	-.63**
6 FT Change	-2.56	3.12						1.	-.11	-.03	.22
7 MAP Change	5.20	6.87							1.	-.02	.02
8 Aggression	3.26	2.14								1.	-.14
9 Anger Suppression	12.53	6.28									1.

* $p < .05$ ** $p < .01$

Table 4

Hierarchical multiple regression analysis predicting change scores with attachment anxiety and attachment avoidance, controlling for age, gender, and baseline scores (N = 77)

					Unstandardized		Standardized			95% CI	
	R^2	ΔR^2	F_{change}	R^2_{change}	B	$Std. Error$	B	t	p	LL	UL
Anger Change											
Step 1	.15	.11*	3.25	.15							
Age					-.00	.06	-.01	-.05	.965	-.11	.11
Gender					2.33	1.5	.17	1.58	.119	-.62	5.27
Self-Esteem					.05	.06	.09	.84	.402	-.07	.17
Baseline Anger					-.59**	.20	-.32	-2.94	.004	-.99	-.19
Step 2	.25	.18**	4.25	.09							
Age					-.01	.05	-.03	-.27	.792	-.12	.09
Gender					2.50	1.42	.19	1.76	.083	-.33	5.32
Self-Esteem					.010	.065	.018	.153	.879	-.120	.140
Baseline Anger					-.59**	.20	-.32	-2.96	.004	-.99	-.19
Anxiety					.88	.62	.17	1.41	.164	-.37	2.12
Avoidance					-1.49**	.55	-.32	-2.73	.008	-2.58	-.40
FT Change											
Step 1	.28	.24**	6.84	.02							
Age					.05	.03	.15	1.52	.133	-.01	.11
Gender					-.88	.81	-.11	-1.08	.283	-2.49	.74
Self-Esteem					-.03	.03	-.09	-.86	.393	-.09	.04
Baseline FT					-.32**	.07	-.50	-4.87	.000	-.45	-.19
Step 2	.30	.24**	1.17	.02							
Age					.05	.03	.17	1.57	.120	-.01	.11
Gender					-.93	.81	-.12	-1.15	.254	-2.54	.68
Self-Esteem					-.02	.04	-.06	-.49	.628	-.09	.06

*Note: * $p < .05$; ** $p < .01$*

Table 5

Hierarchical multiple regression analysis predicting anger suppression scores with attachment variables, controlling for age, gender, baseline FT, baseline SR anger, and self-esteem (N = 77)

					Unstandardized		Standardized				
	R^2	ΔR^2	F_{change}	R^2_{change}	B	Std. Error	B	t	p	LL	UL
<i>Step 1</i>	.22	.17**	4.12	.22							
Age					.06	.06	.10	.95	.347	-.07	.19
Gender					-3.31	1.71	-.21	-1.94	.057	-6.71	.10
Baseline FT					.47	.14	.37**	3.38	.001	.19	.75
Baseline SR Anger					-.24	.23	-.11	-1.03	.305	-.71	.23
Self-Esteem					-.06	.07	-.10	-.89	.376	-.20	.08
<i>Step 2</i>	.33	.27**	5.63	.11							
Age					.08	.06	.12	1.20	.236	-.05	.20
Gender					-3.53	1.61	-.22*	-2.19	.032	-6.73	-.32
Baseline FT					.48	.13	.37**	3.62	.001	.21	.74
Baseline SR Anger					-.23	.23	-.11	-.99	.321	-.69	.23
Self-Esteem					-.01	.08	-.02	-.16	.871	-.16	.14
Anxiety					-1.19	.71	-.19	-1.68	.097	-2.61	.22
Avoidance					1.93	.62	.35**	3.11	.003	.69	3.17

*Note: * $p < .05$; ** $p < .01$*

Table 6

Hierarchical multiple regression analysis predicting aggression scores with attachment variables, controlling for age, gender, and self-esteem (N= 77)

					<i>Unstandardized</i>		<i>Standardized</i>				
	R^2	ΔR^2	F_{change}	R^2_{change}	B	$Std. Error$	B	t	p	LL	UL
<i>Step 1</i>	.07	.03	1.74	.07							
Age					-.02	.02	-.10	-.91	.369	-.07	.03
Gender					-.59	.63	-.11	-.94	.349	-1.84	.66
Self-Esteem					-.04	.03	-.19	-1.64	.104	-.09	.01
<i>Step 2</i>	.15	.09*	3.42	.08							
Age					-.02	.02	-.08	-.71	.481	-.06	.03
Gender					-.49	.61	-.09	-.80	.427	-1.70	.73
Self-Esteem					-.03	.03	-.15	-1.15	.253	-.09	.02
Anxiety					.65	.26	.30*	2.49	.015	.13	1.16
Avoidance					-.29	.24	-.15	-1.22	.229	-.75	.18

*Note: * $p < .05$; ** $p < .01$*

SUPPLEMENTAL MATERIALS

Table S1

Independent samples t-test examining gender differences for anxiety, avoidance, and trait anger (N = 270)

Variable	Males		Females		<i>t</i>	<i>df</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Anxiety	2.81	1.23	3.05	1.24	.210	268	.210
Avoidance	2.77	1.04	3.00	1.24	.216	268	.216
Trait Anger	19.42	5.54	19.67	5.52	.7730	268	.7730

Table S2*Hierarchical multiple regression analysis predicting trait anger scores with gender interactions (n= 270)*

	<i>Unstandardized</i>					<i>95% CI</i>					
	<i>R²</i>	<i>ΔR²</i>	<i>F_{change}</i>	<i>R²_{change}</i>	<i>B</i>	<i>Std. Error</i>	<i>B</i>	<i>t</i>	<i>p</i>	<i>LL</i>	<i>UL</i>
<i>Step 1</i>	.02	.02*	3.13	.02							
Age					-.09	.03	-.15*	-2.49	.014	-.15	-.02
Gender					.01	.85	.00	.01	.989	-1.66	1.69
<i>Step 2</i>	.09	.07**	9.05	.06							
Age					-.08	.03	-.13*	-2.23	.027	-.14	-.01
Gender					-.24	.83	-.02	-.29	.775	-1.87	1.40
Anxiety					1.09	.30	.24**	3.67	.000	.50	1.67
Avoidance					.08	.30	.02	.25	.806	-.52	.67
<i>Step 3</i>	.09	.06**	.30	.00							
Age					-.07	.03	-.13*	-2.14	.034	-.14	-.01
Gender					-.15	.91	-.01	-.17	.867	-1.94	1.63
Anxiety					1.21	1.39	.27	.87	.385	-1.52	3.94
Avoidance					1.39	1.62	.30	.86	.390	-1.79	4.58
Anxiety*Avoidance					.96	1.66	.19	.58	.564	-2.30	4.22
Anxiety*Gender					-.85	1.03	-.02	-.83	.409	-1.90	1.76
Avoidance*Gender					-.07	.93	-.29	-.08	.938	-2.88	1.18
Anxiety*Avoidance*Gender					-.52	.88	-.20	-.59	.557	-2.24	1.21

*Note: *p<.05; **p<.01*

Table S3*Paired samples t-test comparing mean scores from baseline to post-induction*

	Baseline			Post-Induction			95% CI for		t	df
	M	SD	n	M	SD	N	Mean Difference			
Self-Report Anger	7.73	2.85	77	13.88	5.06	77	-7.35, -4.97		-10.305	76
MAP	85.52	11.40	77	90.71	12.19	77	-6.76, -3.64		-6.634	76
FT	29.02	4.91	77	26.41	4.30	77	1.91, 3.32		7.380	76

Table S4

Independent samples t-tests comparing suspicious and non-suspicious participants on main study variables

	Suspicious			Not Suspicious			95% CI for Mean Difference	t	df
	M	SD	n	M	SD	N			
SR Anger Change	6.00	5.57	3	6.16	5.27	74	-6.35, 6.03	-0.052	75
MAP Change	6.00	5.36	3	5.16	6.95	74	-7.27, 8.94	0.205	75
FT Change	2.43	5.77	3	-2.76	2.84	74	1.72, 8.66	2.981	75
Aggression	2.00	1.73	3	3.31	2.15	74	-3.82, 1.20	-1.039	75
Anger Suppression	14.33	6.86	3	12.45	6.29	74	-5.52, 9.28	0.506	75

Table S5

Independent samples t-test examining gender differences for all main study variables (N = 77)

Variable	Males		Females		<i>t</i>	<i>df</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Anxiety	3.03	.83	2.76	1.04	.91	75	.368
Avoidance	3.37	1.40	3.24	1.08	.39	75	.700
Self-Esteem	46.71	9.28	49.65	9.72	-1.03	75	.306
Anger Change	3.93	3.43	6.65	5.46	-1.78	75	.079
FT Change	-1.84	3.19	-2.72	3.09	.95	75	.344
MAP Change	4.01	5.81	5.46	7.10	-.71	75	.480
Aggression	3.86	2.18	3.13	2.13	1.16	75	.251
Anger Suppression	15.32	6.13	11.91	6.19	1.87	75	.065