Abstract

Background and Objectives: Individual differences after trauma vary considerably and can range from posttraumatic stress disorder (PTSD) to posttraumatic growth (PTG). Current theoretical models cannot fully explain this variability. Therefore, we integrated attachment theory with Ehlers and Clark’s (2000) model of PTSD to understand whether attachment style is associated with negative appraisals of a traumatic event(s), posttraumatic stress symptoms (PTS) and PTG. Our aim was to test this integrated model PTSD in an analogue sample who had experienced at least one traumatic event. Methods: The sample comprised 393 university staff and students (Range Age= 18 to 49, 85% female) who completed online measures. Design: We used structural equation modelling to test the association of adult attachment and posttraumatic cognitions (self and world/others) with PTS and PTG using a cross-sectional, correlational design. Results: Attachment anxiety and negative posttraumatic self-cognitions were positively associated. Negative posttraumatic self-cognitions were positively associated with PTS. Attachment anxiety had an indirect effect (via negative posttraumatic self-cognitions) on PTS, whereas attachment avoidance predicted more negative posttraumatic world cognitions and lower perceived PTG. Conclusions: The study highlights the importance of considering how attachment styles influence posttraumatic emotion regulation and cognitive processing of the trauma to determine posttraumatic mental health.

Key Words: attachment, emotion regulation, posttraumatic symptoms, perceived PTG, posttraumatic cognitions
The Associations between Adult Attachment, Posttraumatic Symptoms and Posttraumatic Growth

Traumatic life events present a challenge to the individual who has to assimilate the meaning of the event into pre-existing beliefs about self, other and the world. The majority of people accomplish this assimilation successfully and do not continue to experience post-traumatic symptoms (intrusions, avoidance, and arousal) after the first few weeks or months following a trauma. Indeed some people report positive changes such as finding life more meaningful, valuing relationships more, or discovering spirituality; a phenomenon described as posttraumatic growth (PTG). Of those who do not recover, not all develop full-blown posttraumatic stress disorder (PTSD); some may present with sub-clinical levels of post-trauma symptoms which can be disabling and interfere with daily functioning. Both PTSD and post-traumatic symptoms can persist for long periods after the trauma (Basoglu & Paker, 1994; Yule et al., 2000). Two key maintaining factors in current cognitive models of PTSD (Brewin & Holmes, 2003) that explain this persistence are changes in view of self and others. In this paper, we consider how attachment theory might add to our understanding of these changes and then go on to apply this model to a population of university students and staff who had experienced a traumatic event that met criterion A1 and A2 of the DSM-IV-TR (American Psychiatric Association, 1994) diagnostic criteria for PTSD. We were interested in how current attachment status might be associated with the individual’s view of self and others, and how this, in turn, would relate to both PTS symptoms and PTG. These ideas are developed in more detail below.

In recent cognitive models of PTSD, negative appraisals of a trauma and/or its sequelae create a sense of current threat that maintains the disorder (Ehlers & Clark, 2000; Foa & Rothbaum, 1998). These negative appraisals focus primarily on physical or psychological threats to the self. Psychological threats may include the belief that one is permanently changed for the worse or may relate to negative appraisals of symptoms such as intrusions; for example, many patients with PTS symptoms believe they are going mad when they cannot control intrusive symptoms such as flashbacks. Other appraisals that represent a psychological threat may include judgments about the way the person behaved during or after the trauma,
such as *I’m weak or incompetent*. Such negative appraisals are not limited to individuals who have PTSD, but are also likely to maintain post-traumatic symptoms in those with sub-clinical levels of symptoms.

Negative posttraumatic appraisals of the self (*I’m weak*) are related to PTS symptom severity (Ehiring, Ehlers, & Glucksman, 2008; Ehiring, Frank, & Ehlers, 2008; Hatcher, Whitaker, & Karl, 2008; Karl, Rabe, Zöllner, Maercker, & Stopa, 2009; Kleim, Ehlers, & Glucksman, 2007; Moser, Hajack, Simons, & Foa, 2007). All of these studies used the Posttraumatic Cognitions Inventory (PTCI; Foa, Ehlers, Clark, Tolin, & Orsillo, 1999) to measure negative posttraumatic self-appraisals. The PTCI includes subscales that measure negative world appraisals (*the world is dangerous*), and self-blame (*the event happened because of the way I acted*), but only the negative-self subscale consistently demonstrates a relationship with PTS symptom severity. In contrast, the self-blame subscale has produced conflicting results, with both positive (Foa et al., 1999) and negative correlations (Startup, Makgeken, & Webster, 2007) between self-blame and symptom severity. The negative world subscale failed to predict PTS symptom severity in some (Karl et al., 2009; Startup et al., 2007), but not in other studies (Agar, Kennedy, & King, 2006; Carek, Norman, & Barton, 2010; Foa & Rauch, 2004). These findings suggest that negative self- and world-appraisals may contribute differentially to PTS symptom severity (Beck, et al., 2004; Muller et al., 2010, van Emmerik, Schoorl, Emmelkamp, & Kamphuis, 2006). We also review evidence that suggests that posttraumatic negative appraisals about the self and the world are differentially related to pre-trauma factors and might mediate the effect of pre-trauma factors on PTS.

In Ehlers and Clark’s (2000) influential model of PTSD, negative appraisals contribute to the sense of current threat that is central to the persistence of PTS symptoms. The model acknowledges the role of pre-existing factors that might influence the development of these symptoms and there is now substantial evidence to show that personality traits such as neuroticism, and factors such as social support, contribute to the likelihood of an individual developing PTSD post-trauma (see meta-analysis by Brewin, Andrews & Valentine, 2000; Ozer, Best, Lipsey & Weiss (2003) for example). Given the importance of attachment theory (Bowlby, 1969) in explaining the individual’s development of internal working models of self (this is explained more fully below), and the way in which these models contribute to emotion regulation, we
considered that attachment styles might make an important contribution to our understanding of how pre-trauma factors influence the development of both PTS and PTG following traumatic events. As a first step, the current study examines the associations between adult attachment, negative appraisals and post-traumatic symptoms (PTS) in a sample of people, all of whom reported at least one traumatic event in their lifetime. We integrated ideas from attachment theory with Ehlers and Clark’s (2000) model of PTSD and then used structural equation modelling (SEM) to test whether an individual’s current attachment style is associated with negative appraisals of a traumatic event(s) in a cross-sectional study. We also looked at whether attachment style was associated with post-traumatic growth (PTG), which is defined as the individual’s ability to find meaning in the trauma and obtain benefit from the experience (Park & Fenster, 2004). This study is intended as a first step that will inform future longitudinal research.

Attachment Theory

According to attachment theory, the quality of early attachment relationships determines the individual’s internal working models of self and others (Bowlby, 1969). These working models vary on a continuum from positive to negative and influence emotion regulation and how individuals cope with stressors (Bartholomew & Horowitz, 1991; Sroufe & Waters, 1977). Given the changes to the individual’s view of self following a trauma (Bryant & Guthrie, 2007), it follows that working models of self developed through early attachment experiences, which are generally quite stable in adulthood (Fraley, 2002), may significantly influence how an individual appraises a traumatic event or its sequelae.

Individual differences in attachment patterns are conceptualized in terms of two dimensions: attachment avoidance (discomfort with closeness and interdependence) and attachment anxiety (fear of abandonment; Brennan, Clark, & Shaver, 1998). In their work on infants, Ainsworth and colleagues (1978) found that overprotective and inconsistent parental care was associated with attachment anxiety (this involves a negative view of self and positive view of others; Bartholomew & Horowitz, 1991). Neglect and rejection were associated with attachment avoidance. This breaks down into two subtypes: dismissive avoidance is associated with positive a view of self and negative view of others, whereas fearful avoidance is associated with a negative view of self and of others; Bartholomew & Horowitz, 1991). By comparison,
sensitive, reliable care was associated with secure attachment, associated with a positive view of self and others. The attachment anxiety dimension best captures views of the self and the attachment avoidance dimension best captures views of others (Brennan et al., 1998).

Mikulincer and Shaver (2007) argued that attachment anxiety triggers the use of a hyperactivating emotion-regulation strategy; individuals are hypervigilant to threat and attachment-related information in their environment. In infants and young children, attention toward threat results in negative emotions and chronic activation of the attachment behavioural system (e.g., exaggerated proximity seeking to the attachment figure that does not result in stress alleviation) and a corresponding neglect of information or activities in other domains, such as exploration. For adults who have experienced a trauma, a hyperactivated emotion-regulation strategy with its corresponding attentional bias towards threat may provide constant reminders of the trauma and reinforce negative appraisals about safety. At the same time, it may prevent those high in attachment anxiety from noticing and processing disconfirmatory evidence, and as such, contribute to the maintenance of PTS.

By comparison, individuals high in attachment avoidance use deactivating emotion-regulation strategies in which they down-regulate the attachment system. They turn attention away from threat- and attachment-related cues in order to avoid feeling negative affect (or suppress the expression of negative affect) and focus instead on other activities. For these individuals, when faced with a traumatic event, this avoidant strategy might impede processing of the traumatic memory and could block natural recovery.

In comparison, securely attached individuals seek proximity to an attachment figure (or an internal mental representation of one), which leads to the alleviation of distress and an ability to focus on other behaviours, such as exploration. Seeking appropriate support, and successfully regulating emotion and arousal without avoidance might explain how secure attachment is protective.

**Attachment Patterns and Posttraumatic Stress Symptoms**

In support of these ideas, there is evidence that both attachment anxiety and attachment avoidance are positively related to severity of PTS (Dieperink, Leskela, Thuras, & Engdahl, 2001; Fraley, Fazzari, Bonanno, & Dekel, 2006; Kanninen, Punamaki, & Qouta, 2003; Renaud, 2008; Solomon, Ginzberg,
Mikulincer, Neria, & Ohry, 1998). Attachment anxiety was a unique predictor of posttraumatic stress and trauma-related psychological problems in several studies (Besser & Neria, 2010; 2012; Besser, Neria, & Haynes, 2009; Salo, Qouta, & Punamaki, 2005), whereas avoidant attachment was associated with PTS in only one study (O’Connor & Elklit, 2008). One study collapsed anxiety and avoidance into a general category of insecure attachment and found a positive association between insecure attachment and PTS (Ghafoori, Hierholzer, Howsepián, & Boardman, 2008). By comparison, secure attachment was associated with reduced PTS severity 3-months post-trauma when security is assessed concurrently (Benoit, Bouthillier, Moss, Rosseau, & Brunet, 2010), and 4-months post-trauma (Besser & Neria, 2010) when security is assessed 4-months prior to PTSD. This research suggests that insecure attachment is a risk factor for PTS, but does not provide information about the mechanism underlying this elevated risk.

If insecure attachment makes individuals more vulnerable and secure attachment protects individuals from developing PTS symptoms post-trauma, then integrating attachment theory within current models of PTSD might start to tease apart the mechanisms responsible for the observed relationships between attachment and PTS. As discussed above, key components of attachment patterns are working models of self and others. Correspondingly, changes in self-appraisals (and in appraisals of others and the world in some studies) are conceptualised as key maintaining factors in cognitive models of PTSD (e.g. Ehlers & Cark, 2000). In Figure 1, we have brought these two models together to provide an integrated account of how attachment theory might contribute to our understanding of the maintenance of PTS. In this integrated model, we hypothesised that both attachment anxiety and avoidance would have direct and indirect effects on PTS. As past research shows that attachment anxiety is associated with low self-esteem (Bartholomew & Horowitz, 1991) we predicted that attachment anxiety would be associated with negative posttraumatic self-appraisals. Furthermore, as attachment anxiety is associated with PTS (Muller, Sicoli & Lemieux, 2000), we predicted that attachment anxiety would have a direct effect on PTS and an indirect effect on PTS via negative self-appraisals.

Because attachment avoidance is characterized by either a positive self-view (dismissing) or a negative self-view (fearful), we expected attachment avoidance to be unrelated to negative posttraumatic
appraisals of the self. We expected attachment avoidance to be linked to negative posttraumatic appraisals about the world due to their negative views of others, and furthermore, predicted attachment avoidance would have an indirect effect on PTS via negative posttraumatic appraisals about the world.

**Posttraumatic Growth (PTG)**

If it is difficult to explain the variability in negative responses to trauma, it is perhaps even more puzzling why some people report beneficial changes following traumatic events, namely PTG (e.g., Helgeson, Reynolds, & Tomich, 2006), and some of the existing findings appear paradoxical. Helgeson et al.’s (2006) meta-analysis of 87 studies that used a self-report measure of perceived PTG found that PTG was related to less depression and higher well-being. However, PTG was also related to more intrusive and avoidant thoughts, which are hallmark symptoms of PTS. This latter relationship is hard to interpret, because, as Helgeson et al. point out it could indicate that perceived PTG is a coping strategy employed in response to high levels of distress or alternatively, it might represent the individual’s effective processing of the trauma.

Just as attachment style might contribute to the development of PTS, we hypothesize that it might also be associated with PTG. Mikulincer et al. (2006), for example, suggest that securely attached individuals may be more likely to demonstrate PTG. Secure individuals have positive models of the self and others and may be more personally resilient, have better relationships, and therefore more likely to be able to resolve traumatic experiences and find meaning in them. Indeed, there is evidence in support of this proposal. Salo et al. (2005) found positive associations between secure attachment and perceived PTG, in particular for the personal strength, affiliation to others, and spiritual change subscales of the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996). However, the evidence for a relationship between secure attachment and PTG is not consistent. In Dekel’s (2007) study, attachment anxiety and attachment avoidance were positively associated with PTG. Arikan and Karanci’s (2012) study found similar effects, although only attachment anxiety was positively associated with PTG. Helgeson et al.’s suggestion that PTG may be a coping strategy for PTS could explain these contradictory findings; however, neither Dekel nor Arikan and Karanci measured PTS. Furthermore, in Dekel’s (2007)
study participants had not directly experienced trauma, as they were war prisoners’ wives. The effects of indirect exposure to trauma may be very different from direct exposure. At the moment there is no clear picture of the relationship between attachment and PTG, but the existing research suggests that it is important to examine PTG and PTS simultaneously because current PTS may influence growth. Accordingly, we have examined attachment, PTS and PTG together in the following structural equation model (SEM).

**Hypothesised SEM**

To summarise, the aim of the present study was to explicate the association of the two insecure attachment dimensions (attachment anxiety and attachment avoidance), and negative posttraumatic cognitions with PTS and perceived PTG in a cross-sectional study. We examine the direct associations between attachment dimensions, posttraumatic cognitions related to world and self, and PTS. We also tested the following links: negative posttraumatic cognitions and PTS, negative posttraumatic cognitions and perceived PTG, attachment avoidance and perceived PTG, and PTS and perceived PTG (See Figure 1).

We hypothesised that attachment anxiety would be positively associated with negative posttraumatic self-cognitions (a). On the other hand, attachment avoidance would be positively related to negative posttraumatic world cognitions (b). We hypothesised that anxiety dimension of attachment (c) and avoidance dimensions of attachment (d), negative posttraumatic self-cognitions (e) and negative posttraumatic world cognitions (f) would be linked with increased PTS. Furthermore, attachment avoidance (g), negative posttraumatic self-cognitions (h) and negative posttraumatic world cognitions would be linked with reduced perceived PTG (i). Finally, PTS would be positively associated with PTG (j) (See Figure 1). We were interested in potential mediators of the associations between our key variables; however, as this was a cross-sectional study and the predictor, outcome and potential mediators were all tested at the same time, we were only able to test mediation in the statistical sense and could not draw causal conclusions. Bearing this in mind, we predicted that negative posttraumatic world cognitions would mediate the association between attachment avoidance and PTS; negative posttraumatic self-
cognitions would mediate the association between attachment anxiety and PTS; PTS would mediate the association between attachment anxiety and PTG; PTS would mediate the association between negative posttraumatic world cognitions and PTG; and finally negative posttraumatic world cognitions would mediate the association between attachment avoidance and PTG.

Method

Participants and Procedure

We followed Kline’s (2005) recommendation that SEM necessitates a sample of N > 200 for deciding on the required sample size and report details about data exclusions below. We used mass e-mailing and flyers to recruit participants from a British University for an online study of trauma who had experienced a traumatic event. There were 771 entries into the online survey. Thirty-three percent of the participants had double entries (entries at different times with the same IP number), or left questionnaires completely blank leading to mass missing values; they were removed. Among the 515 participants, 408 participants were native speakers and had experienced a traumatic life event according to criterion A1 or A2 of the DSM-IV (American Psychiatric Association, 1994; i.e., having experienced a severe traumatic event which was either life-threatening or associated with helplessness and horror). Following removal of univariate and multivariate outliers (Tabachnick & Fidell, 2001), the final sample comprised 393 people (age range 18 to 49, \( M = 20.30, SD = 2.75; 85\% \) female). If they reported more than one traumatic event, they selected the most distressing event when answering trauma-related questions. Length of time since the traumatic event was: within the last 6 months for 39 participants (10\%), between 6 months and 5 years ago for 224 participants (57\%), more than 5 years ago for 130 participants (33\%). The traumatic event with the greatest impact was an accident or adult trauma for 273 participants (69\%) and an interpersonal or early trauma for 131 participants (31\%). PTSD symptom severity was low to mild (scoring below 11) for 318 participants (81\%), moderate (scoring between 11 to 20) for 71 participants (18\%), and severe (above 21) for 4 participants (1\%) (categories based on Foa, 1996).
Participants provided informed consent and completed questions in this order: demographics, trauma and PTSD symptoms, posttraumatic cognitions, attachment, and posttraumatic growth. The study was approved by the Psychology Ethics Committee.

Measures

**Adult attachment dimensions.** The Relationship Structures Questionnaire (Fraley, Niedenthal, Marks, Brumbaugh, & Vicary, 2006) consists of 40 questions derived from the Experiences in Close Relationships-Revised (Fraley, Waller, & Brennan, 2000) scale to assess attachment anxiety and avoidance in four relational contexts: mother, father, romantic partner, and best-friend. We averaged scores across the four targets to obtain an index of global attachment anxiety (alpha=.85) and attachment avoidance (alpha=.92). Participants rated items on a 7-point scale (1=strongly disagree; 7=strongly agree).

**Posttraumatic cognitions.** The Posttraumatic Cognition Inventory (PTCI; Foa et al., 1999) has 33 questions yielding three subscales: negative cognitions about the self (21 items; alpha=.92), negative cognitions about the world (7 items; alpha=.84), and self-blame (5 items; alpha=.82). Items were rated on a 7-point scale (1=totally disagree, 7=totally agree). We created two latent variables, negative posttraumatic self-cognitions, consisting of items for subscale PTCI self (alpha = .95) and negative posttraumatic world cognitions consisting of items for subscale PTCI world (alpha=.88). Due to previous psychometric concerns about the subscale self-blame we did not include items for this subscale in our model.

**Posttraumatic stress symptoms.** The Posttraumatic Stress Disorder Diagnostic Scale (PDS; Foa, Cashman, Jaycox, & Perry, 1997) identifies the presence and symptom severity of PTSD, and level of impairment according to *DSM-IV* criteria (alpha=.91).

Based on previous research (Arikan & Karanci, 2012; Turner & Lloyd, 1995), we added eight additional traumatic events (e.g., having an abortion) to the original twelve. Participants identified the most troubling traumatic event and recorded the presence and frequency of the three clusters of PTSD symptoms (intrusions, avoidance and arousal). Frequency was measured on a 0 (Not at all or only one
time) to 3 (5 or more times a week/almost always) scale. The PDS has acceptable reliability, validity and test-retest reliability (.77-.85; Foa et al., 1997). Although diagnosis of PTSD was not our aim, it was useful to assess the percentage of the sample who met diagnostic criteria for PTSD using the PDS, which has good diagnostic agreement with the Structured Clinical Interview for PTSD (Spitzer, Williams, Gibbons, & First, 1990).

**Perceived posttraumatic growth.** The Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) has acceptable construct validity, internal consistency, and test-retest reliability over 2 months. Five subscales (21 items, alpha=.87) measure: new possibilities, relating to others, personal strength, spiritual change, and life appreciation. Items were rated from 0 (I did not experience this change as a result of trauma) to 5 (I experienced this change to a very great extent).

**Results**

**Analytic Strategy**

We used the Statistical Package for Social Sciences version 17.0 and MPlus version 7 (Muthén & Muthén, 2012) for the analysis. Our SEM analyses had two aims. First, we tested the measurement model in order to establish that the latent variables were well explained by the indicators (Anderson & Gerbing, 1988). We used item parcels (Brown, 2006), which were based on established questionnaire subscales for the majority of our measures. For posttraumatic cognitions about the world and self subscales we had only one indicator initially. Although the model converged, it revealed problematic negative error variances (Heywood cases). Brown (2006) suggests using at least 3 indicators per latent variable to solve this problem. In order to do this, we first checked the item-total correlation for each item of the respective scales; they were satisfactory ranging between .55 to .77 for PTCI world and .54 to .80 for PTCI self. We then subdivided items into three approximately equal-sized parcels in the order of their appearance and ensuring a similar spread of item-total correlations’ size. Parcels showed high factor loadings (.85-.88) on the latent variables indicating they represented the latent variable well. To address multivariate non-normality we applied the robust maximum likelihood estimation (MLR) provided by MPlus (Muthén & Muthén, 2012) for all our models.
Second, we tested the overall goodness of fit of our theoretical model following Hu and Bentler’s (1999) suggestion. We present three goodness of fit indices: root-mean-square error of approximation (RMSEA; values of .06 or less indicate adequate fit), standardized root-mean-square residual (SRMR; values of .08 or less indicate adequate fit), and Comparative Fit Index (CFI), which should be equal to, or greater than, .90 (Fan, Thompson, & Wang, 1999). Where the goodness of fit was not acceptable we explored slightly altered versions of the model. To allow model comparison for non-nested models, we tested the Akaike’s Information Criterion (AIC) and the sample-size-adjusted Bayesian Information Criterion (saBIC). Both measure the parsimonious model fit; although no significance test is available for AIC and BIC, a smaller value indicates better fit (Byrne, 2001).

Third, once a model showed acceptable fit, we investigated whether the variables predicted the hypothesised outcomes. We used bootstrapping to evaluate the significance of indirect effects (Shrout & Bolger, 2002) which randomly re-samples from the data (Efron & Tibshirani, 1993), using 1,000 samples and a 95% confidence interval (CI).

Data Preparation

We excluded 15 cases due to univariate (Z-score > 3.29) and multivariate outliers (Mahalonobis distance $p < .001$). We conducted square root transformation for attachment anxiety dimension and negative posttraumatic self-cognitions which were positively skewed. However, negative posttraumatic cognitions was still positively skewed. Mardia’s test (1970) indicated that the data were not multivariately normal, indicating that we need to apply the robust maximum likelihood estimation (MLR, Muthe & Kaplan, 1985). If there was only a single data point missing in a scale, we used mean substitution (Tabachnick & Fidell, 2001).

Descriptive statistics and Pearson correlation coefficients for the variables in the model are summarized in Table 1. The measurement model showed a satisfactory fit for only some of the fit indices (MM1, Table 2). Inspection of the modification indices, which estimate the statistical improvement in the model fit if a particular parameter is constrained or a variable association is accounted for, revealed correlated measurement errors between the attachment indicators of avoidance and anxiety and PTG.
subscales. We made changes according to modification indices in the model and obtained a statistically significantly improved measurement model with acceptable fit indices (MM2, Table 2).

**Testing the Goodness of Fit of the Structural Equation Model**

The hypothesised model in Figure 1 (original model, OM, Table 2) demonstrated a satisfactory fit. To test whether it could be improved further, non-significant paths in the model were restricted step-by-step, starting from the path showing the smallest coefficients. Each model with restricted paths (OM1-OM4, Table 2) was tested against the current model (OM) using the Strictly Positive Satorra-Bentler Chi-Square Difference Test for nested models, designed for MLR estimations (Satorra & Bentler, 2010) and the difference between AIC and saBIC where a smaller value denotes a better model. However, constraining the non-significant paths did not reveal a significant improvement, therefore, we accepted the OM without path restrictions.

**Final model.** The original adjusted model (OM) is shown in Figure 1 and was used for analyses of direct and indirect effects. Table 3 shows the standardized and unstandardized coefficients for the final model OM. Figure 2 shows the detailed associations between the latent variables and standardized coefficients for the indicators and the associations.

**Testing for Significant Predictor and Mediator Effects**

**Direct and indirect effects of attachment anxiety and negative posttraumatic self-cognitions on PTS.** The hypotheses, which predicted a positive association between attachment anxiety and negative posttraumatic self-cognitions were confirmed (see Figure 2). Moreover, negative posttraumatic self-cognitions were positively associated with PTS. As hypothesised, there was a significant indirect effect of attachment anxiety via negative posttraumatic self-cognitions on PTS, $\beta = .21, SE = .054, p < .001, 95\%$ CI [0.12, 0.30], but there was no significant direct effect of attachment anxiety on PTS (although the coefficient approached statistical significance with $\beta = .23, SE = .120, p = .054, 95\%$ CI [0.03, 0.43] indicating that self-cognitions fully mediated the effect of attachment anxiety on PTS (see Table 3).

**Direct and indirect effects of attachment avoidance and negative posttraumatic world cognitions on PTS.** As hypothesized, attachment avoidance was positively associated with negative
posttraumatic world cognitions. The direct effect of attachment avoidance on PTS was not significant (Table 3). Negative posttraumatic world cognitions were not associated with PTS and negative posttraumatic cognitions did not mediate the relationship between attachment avoidance and PTS (Table 3).

**Direct and indirect effects of attachment anxiety, attachment avoidance, negative posttraumatic self-cognitions and PTS on perceived PTG.** Although attachment anxiety predicted PTS indirectly via negative posttraumatic self-cognitions, and PTS was positively associated with perceived PTG, we found no significant indirect effect of attachment anxiety on perceived PTG via negative posttraumatic self-cognitions or PTS. There was a negative association between attachment avoidance and perceived PTG, suggesting that higher attachment avoidance results in lower levels of posttraumatic growth. Negative posttraumatic world cognitions were not associated with perceived PTG and did not mediate the link between attachment avoidance and PTG.

**Discussion**

The aims of this study were to integrate attachment theory with Ehlers and Clark’s model to better understand PTS, and to explore the role of adult attachment in PTG. We examined whether an individual’s attachment style was associated with PTS and perceived PTG, and whether any observed relationship had its impact via negative posttraumatic cognitions. Below we discuss the relationship between attachment and PTS, and between attachment and perceived PTG.

In line with attachment theory and with Ehlers and Clark’s PTSD model, we hypothesised two pathways through which adult attachment could contribute to the development and/or maintenance of PTS. The first hypothesised pathway was that attachment anxiety could have an indirect effect on posttraumatic symptoms via more negative self-appraisals. We confirmed this hypothesis in that attachment anxiety was associated with more negative posttraumatic self-cognitions, which is consistent with both Ehlers and Clark’s model and attachment theory.

Our results suggest that the impact of anxious attachment on PTS is fully mediated by negative posttraumatic self-cognitions. Although we cannot draw causal inferences from this cross-sectional study, our results are consistent with the hypothesis that pre-existing negative self-models associated with...
attachment anxiety could elevate the risk of PTS following trauma exposure by increasing the probability of making negative self-appraisals. There is consistent with evidence that supports a causal role for attachment style in PTSD development. Mikulincer et al. (2006) showed that attachment anxiety prior to a traumatic event (2 months before war) predicted stronger daily reports of PTSD-related intrusions during the war and Besser and Neria (2010) found that attachment anxiety assessed during a trauma (fighting in the 2009 Israeli-Gaza war) predicted PTSD four months later. Our results suggest that the psychological mechanism involved in this causal link is posttraumatic negative self-appraisals.

There is an alternative explanation in which the presence of PTS leads to increased attachment insecurity, particularly given that stressful life events and psychopathology can move people from secure to insecure attachment styles over time (Mikulincer & Shaver, 2007). We tested this possibility and although the model fit was significantly better compared to our final model (see supplementary material), the nature of the associations between our latent variables was retained in this model. These findings suggest that although we found support for Ehlers and Clark’s model and attachment theory in our original model, we cannot rule out the possibility that this relationship operates in the opposite direction and that PTSD and a lack of PTG may lead to attachment insecurity. To address this unequivocally, future longitudinal studies that measure both adult attachment and symptoms at different time points is needed.

The second hypothesised pathway was that attachment avoidance would have an indirect effect on PTS through negative posttraumatic world-cognitions. Although higher attachment avoidance was significantly associated with more negative posttraumatic world cognitions, the path between negative world cognitions and PTS was not significant and therefore our second hypothesis was not supported. The failure to find an association between posttraumatic world cognitions and PTS fits with the mixed evidence in the literature. Some studies have found a positive association between posttraumatic world cognitions and PTS symptoms (Agar et al., 2006; Carek et al., 2010; Foa & Rauch, 2004), whereas other studies failed to do so (Karl et al., 2009; Startup et al., 2007). One explanation might be that in our model negative self-cognitions explain much of the variance in PTS and therefore the association between PTS and world cognitions is not significant. As we have noted, both negative posttraumatic world and self-cognitions have been defined by
Foa et al. (1999) as related yet distinct constructs loading onto a common factor (Muller et al., 2010), namely, negative posttraumatic cognitions. We note that in contrast to previous research that shows a moderate correlation between the subscales (Foa et al., 1999), we found a high zero-order correlation between negative posttraumatic self and world cognitions ($r = .89; p < .01$), which indicates overlap of these two variables. We addressed this issue by conducting a number of additional models (see supplementary material) which support our assumption that in our sample a better fit was obtained when negative posttraumatic world cognitions were removed from the model. However, not considering negative posttraumatic world cognitions is not in line with existing theory (Ehlers & Clark, 2000). Based on Startup et al.’s (2007) findings, we also tested the hypothesis that individuals with a history of interpersonal compared to accidental trauma may have stronger associations between negative world cognitions and PTS.

We used multiple group analyses comparing subsamples with accidental vs. interpersonal trauma (see supplementary material), but failed to confirm this hypothesis. These analyses must be considered with caution because of the small size of the sub-samples. Lastly, in light of the association between attachment avoidance and negative posttraumatic world cognitions, we assessed whether avoidance moderated the association between negative posttraumatic world cognitions and PTS, but this was not confirmed by our data (see supplementary material). To summarize, in our study the most likely explanation for the absence of an association between negative posttraumatic world cognitions and PTS was the higher amounts of shared variance between negative posttraumatic world and self-cognitions.

Our second aim was to explore the associations between perceived PTG, attachment style, and PTS. There were two principal findings. First, we found the predicted negative association between attachment-avoidance and perceived PTG. Second, we found that PTS was positively associated with perceived PTG. At first sight, the positive association between PTS and perceived PTG is puzzling. However, it is consistent with the conflicting findings in Helgeson et al.’s (2006) meta-analysis that found growth in conjunction with increased avoidance and intrusive thoughts. PTSD and PTG might co-exist because growth is an ongoing process that occurs while the individual is coming to terms with the trauma, rather than a final outcome (Tedeschi, Park, & Calhoun, 1998). Alternatively, as Helgeson et al. suggest, high PTGI
scores may not reflect genuine growth but may indicate a coping strategy in response to high distress. This is an avenue for future research. In addition, it is likely that individual differences in the time since trauma affect the association between attachment styles, posttraumatic cognitions, PTSD and PTG. We tested this possibility by running multiple group analyses (see supplementary material). Although individuals in the sub-sample up to 3 years post trauma showed greater explained variance for PTG and different path coefficients than individuals in the sub-group more than 3 years post trauma, there was no significant improvement in the model fit. However, due to the small size of the sub-samples we cannot rule out the possibility that time since trauma moderates the associations between attachment styles, posttraumatic cognitions, PTSD and PTG. Future longitudinal research in a larger sample that assesses these variables at different time points is necessary to test this thoroughly.

**Strengths and Limitations**

Our study had a number of strengths. We integrated Ehlers and Clark’s model of PTSD and attachment theory for the first time in the literature, which allowed us to test hypotheses about the possible mechanisms by which adult attachment patterns are associated with PTS severity. We used a large and diverse non-clinical sample, albeit some participants met diagnostic criteria for PTSD, which enabled us to test complex relationships between attachment, negative appraisals and PTS and PTG using SEM.

Inevitably there were some limitations. It was a cross-sectional study conducted on a non-clinical, mostly female sample and the data were collected online. This cross-sectional study is a necessary first step in testing the hypothesized model and provides a platform for testing causal relationships between attachment and individual responses to trauma in longitudinal studies, including the examination of more diverse community and clinical samples. Although there have been criticisms that online surveys are less reliable, Gosling and colleagues (2004) and Fraley (2007) showed that studies conducted on the internet produced similar findings to those obtained from traditional methods. Finally, we relied on a self-report measure of attachment rather than using the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1986). Although the AAI is often seen as the gold standard in attachment research, there is robust evidence that self-report measures of adult attachment are positively associated with assessments of processes outside
awareness such as physiological changes and reaction times (Mikulincer & Shaver, 2002), confirming their construct validity.

Conclusions

The aim of the current study was to integrate attachment theory into Ehlers and Clark’s PTSD model. The key finding was that attachment anxiety was positively related to PTS, and that this was fully mediated through negative posttraumatic self-cognitions. Results showed that although avoidance predicted negative posttraumatic world cognitions, these cognitions were not related to PTS. Finally, attachment avoidance predicted low PTG.

Clinically, we know that successful treatment involves reappraisal of negative self-beliefs (Ehlers, Clark, Hackmann, McManus, & Fennell, 2005). The current study suggests that individuals with high attachment anxiety may be more at risk of developing negative self-appraisals after trauma. The next step is to test this model longitudinally with a sample of individuals with PTS to see if our results are replicated. If they are, then potential clinical implications include screening people at risk for PTS (e.g., emergency workers, aid workers, armed forces) and evaluating whether modifying attachment styles reduces the risk of developing PTS and helps to promote PTG.
References


### Table 1

**Correlation and Descriptive Statistics**

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<tr>
<th>Variables</th>
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<th>5</th>
<th>6</th>
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<th>SD</th>
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<td>.41**</td>
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<td>.30**</td>
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**p < .01, † = Square root transformed variables**
### Table 2

**Model fit indices of the SEMs**

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<th>SRMR</th>
<th>RMSEA</th>
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<th>AIC</th>
<th>saBIC</th>
<th>$\chi^2$</th>
<th>df/c</th>
<th>R² PTG/PTSD</th>
<th>Models comparison</th>
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<td>.079-.092</td>
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<td>30173</td>
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**Note:** c = MLR correction factor; AIC = Akaike’s Information Criterion; saBIC = Sample-size adjusted Bayesian Information Criterion; Δ$\chi^2_{SB}$ = Strictly positive Sartorra Bentler Chi square difference test; MM = Measurement models; MM1 = Measurement Model 1; MM2 = Measurement Model 2; OM = Original Path Model (See Figure 1); OM1 = Path model with negative posttraumatic self-cognitions and PTG association restricted to zero; OM2 = Path model negative posttraumatic world-cognitions and PTG association restricted to zero; OM3 = Path model with negative posttraumatic self-cognitions and PTG associations restricted; OM4 = Path model with negative posttraumatic self- and world-cognitions and PTG associations and negative posttraumatic world-cognitions and PTSD associations restricted. All the models above are significant ($p < .001$).
Table 3

**SEM Coefficients for Direct and Indirect Effects of Attachment Dimensions, and Posttraumatic Cognitions on PTS and PTG**

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<th>DV</th>
<th>IV</th>
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<td>Std.error</td>
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<td>.03</td>
<td>-.13</td>
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<td>ns</td>
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<tr>
<td>PTG</td>
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<td>.02</td>
<td>.02</td>
<td>.18</td>
<td>.21</td>
<td>ns</td>
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</table>
Figure 1. Proposed structural equation model

Note: Abbreviations in the figure refer to: a) proposed positive association between attachment anxiety and negative posttraumatic self-cognitions; b) proposed positive association between attachment avoidance and negative world cognitions; c) proposed positive association between attachment avoidance and PTS; d) proposed positive association between avoidance dimension of attachment and PTS; e) proposed positive association between negative posttraumatic self-cognitions and PTS; f) proposed positive association between negative posttraumatic world cognitions and PTS; g) proposed negative association between attachment avoidance and PTG; h) negative association between negative posttraumatic self-cognitions and PTG; i) proposed negative association between negative world cognitions and PTG; j) proposed negative association between PTS and PTG
Figure 2. Structural equation model with standardised coefficients.

Note: Abbreviations in the figure refer to Dadanx = father attachment anxiety; Peeranx = peer attachment anxiety; Relatanx = relationship attachment anxiety; Momanx = mother attachment anxiety; Momav = mother attachment avoidance; Relatav = relationship attachment avoidance; Peerav = peer attachment avoidance; Dadav = father attachment avoidance; Pself1, Pself2, Pself3 = negative posttraumatic self view item clusters; Rel = PTGI relationship subscale; New = PTGI new possibilities subscale; Strength = PTGI personal strength subscale; spirit = PTGI spiritual change subscale; App = PTGI appreciation of life subscale; Intr = PTS intrusion symptoms; Avoid = PTS avoidance symptoms; Hyper =PTS hyperarousal symptoms; Pworld1, Pworld2, Pworld3 = Negative posttraumatic world cognitions item clusters.