



Psychological Well-being and Coping: the Predictive Value of Adult Attachment, Dispositional Mindfulness, and Emotion Regulation

Jodie C. Stevenson¹ · Abigail Millings¹ · Lisa-Marie Emerson¹

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Abstract

The primary aim of this study was to examine the underlying relationship between adult attachment, dispositional mindfulness, and emotion regulation, and investigate how well these constructs can predict coping and well-being. A university sample of participants ($n = 174$) completed an online survey to assess attachment (anxiety, avoidance, disorganized), emotion regulation, dispositional mindfulness, coping behaviors, and psychological well-being. Exploratory factor analysis assessed the underlying relationship between measures of attachment, emotion regulation, and mindfulness, and presented a two-factor solution accounting for 47% of total variance across participant scores. Attachment, mindfulness, and emotion regulation subscales differentially loaded across the two factors. The first factor, “resilient mental functioning,” accounted for 33% of variance; the second factor, “disorganized emotional functioning,” accounted for 14% of total variance. These two extracted factors were used in subsequent mediation modeling to determine the effects of coping behaviors on the relationship between the extracted factors and six subscales of psychological well-being. Mediation analyses revealed that defeatism coping was a significant mediator in the relationship between resilient mental functioning and five of the psychological well-being scales and between disorganized emotional functioning and all six of these scales. The results add to the current understanding of the relationship between all three constructs and are the first to examine the construct of adult disorganized attachment and its possible role in the relationship between adult attachment and dispositional mindfulness, as well as its influence on emotion regulation.

Keywords Adult attachment · Coping · Disorganized attachment · Emotion regulation · Mindfulness · Psychological well-being

While attention and awareness are relatively constant features of normal functioning, mindfulness can be considered a state of enhanced attention to, and awareness of, current experiences (Brown and Ryan 2003). This awareness is said to emerge through sustained attention, in the present moment, and non-judgmentally (Kabat-Zinn 2003). Mindfulness is understood to be both a state, usually accessed during mindfulness meditations, and a dispositional trait (Brown et al. 2007). Shapiro et al. (2011) reported the long-term benefits of mindfulness-based interventions with a significant increase in trait mindfulness up to 1 year later. While dispositional mindfulness can be increased through mindfulness-based training (Baer et al. 2008; Falkenström 2010), research has

also highlighted individual differences amongst those with no prior meditation experience (Brown et al. 2007; Cordon and Finney 2008; Walach et al. 2006). As a dispositional trait, mindfulness is believed to cultivate understanding and insight regarding the present moment, alongside a greater compassion for oneself and others (Brach 2003). Increasing dispositional mindfulness through specific training has been shown to lead to improvements in mental and emotional health functioning (Hofmann et al. 2010; Paul et al. 2013). Ryan and Deci (2000) posited that mindfulness serves as an important mechanism in allowing individuals to disengage from automatic thoughts and unhealthy behavior patterns, while simultaneously promoting informed and self-endorsed behavior regulation, which is associated with the enhancement of well-being.

A number of definitions of mindfulness have been put forward, which are relevant to describing this dispositional trait. Bishop et al. (2004) proposed a two-component definition of mindfulness: the first component focusing on the self-regulation of attention (including sustained attention and

✉ Jodie C. Stevenson
jodie.stevenson@sheffield.ac.uk

¹ Department of Psychology, The University of Sheffield, Cathedral Court, Sheffield S1 2LT, UK

non-elaborative awareness of thoughts, feelings, and sensations) while the second focuses on the ability to approach experiences with an orientation of acceptance. In a factor analysis of five previously developed mindfulness questionnaires, Baer et al. (2006) investigated the underlying structure that summarizes the operationalization of mindfulness across these measures. Baer et al. (2004, 2006, 2008) report five emerging facets (represented by five subscales): acting with awareness (attending fully to one's activities, not going into "autopilot"), observing (noticing internal and external stimuli), describing (the ability to label one's experiences), non-judging (refraining from immediately evaluating one's experiences), and non-reacting (the ability to experience thoughts and feelings without the need to immediately respond).

Common to these conceptualizations of mindfulness is a component that refers to acceptance or non-judging. Previous research has proposed that the attitude of acceptance cultivated through mindfulness reduces tendencies of aversion and attachment to internal and external experiences, which in turn facilitates the process of emotion regulation (Hayes and Feldman 2004; Kumar et al. 2008). There is a degree of overlap in the conceptual definitions of both of these constructs regarding the awareness and acceptance of emotions/emotional responses. Drawing distinct parallels to dispositional mindfulness, Gratz and Roemer (2004) defined emotion regulation as the ability to monitor, accept, and understand emotions and to continue with goal-directed behavior when emotionally activated. Emotion regulation is traditionally viewed as encompassing two alternative strategies: expressive suppression and cognitive reappraisal (Gross 1998). Expressive suppression attempts to limit, or exaggerate, the representation of emotion itself (Kim and Hamann 2007), whereas cognitive reappraisal seeks to alter the context in which the emotion-inducing stimulus is viewed and, in doing so, altering the emotional response (Ochsner et al. 2002). While clear parallels can be drawn between emotion regulation and mindfulness, they can also be distinguished by their approach to emotional experience. Whereas emotion regulation strategies seek to alter the emotional experience, mindfulness attempts to create psychological distance between the emotion in question and the individual by limiting the behavioral reactions (Kabat-Zinn et al. 1985). For example, the combined awareness and acceptance of the elements of mindfulness encourage the individual to observe emotions without reacting. In this way, mindfulness training is thought to increase metacognitive awareness, the ability to experience thoughts and feelings from a distanced and decentered perspective. Through this perspective, thoughts and emotions are considered "mental events" rather than accurate reflections of reality (Teasdale et al. 1995, 2002). Furthermore, mindfulness training has shown to significantly improve emotion regulation (Goldin and Gross 2010; Jermann et al. 2009; Modinos et al. 2010).

The individual differences in the capacity to alter, obstruct, or suppress the generation, activation, and expression of emotions using cognitive affect and behavioral techniques has long been postulated by attachment theorists to lie in the development of attachment orientations (Mikulincer et al. 2003). Attachment security (individuals exhibiting low levels of attachment anxiety and avoidance) is purported to facilitate security-based strategies of emotion regulation aimed to reduce distress, maintain intimate relationships, and increase personal adjustment through "constructive, flexible, and reality-attuned coping efforts" (Shaver and Mikulincer 2007, pp. 450). With repeated positive experiences, individuals internalize these emotion regulation strategies and develop confidence in the helpfulness of others. More specifically, effective adaptation in the context of secure attachment can be attributed to emotion regulation capacities, including turning to others for support when threats exceed the individual's capacity to cope alone (Cloitre et al. 2008).

Differences in adult attachment are generally conceptualized along two dimensions of attachment insecurity that are believed to underlie the universal patterns of thoughts, behaviors, and feelings that occur within the context of relationships. Such dimensions have been labeled attachment anxiety and avoidance (Brennan and Shaver 1995). These attachment dimensions are further characterized by the unique way in which they represent the organization of the attachment system. Attachment anxiety describes the tendency by which individuals worry about social rejection and the availability of support from others, thought to have developed as a result of the inconsistency of caregivers (Bowlby 1969, 1973). Individuals exhibiting higher attachment anxiety possess a heightened sensitivity towards signals of acceptance as well as rejection (Shaver and Mikulincer 2002). Attachment avoidance develops due to a lack of availability and sensitivity of caregivers. Therefore, these individuals have learned to expect neither availability nor sensitivity from others and, as a result, become insensitive to such signals (Shaver and Mikulincer 2002).

More recently, research has identified an additional dimension of childhood attachment—disorganized attachment, which is present in infants who do not demonstrate an organized secure, anxious, or avoidant strategy to deal with distress (Main and Solomon 1990). Attachment disorganization in infancy is purported to be predictive of maladaptive behaviors in childhood, adolescence, and early adulthood (Hesse and Main 2000). The disorganized category has also been successfully applied to adult attachment orientations (Hesse and Main 2000). In adult attachment dimensions, "fear" is used to refer to a fear of abandonment (attachment anxiety) and a fear of intimacy (attachment avoidance), both are believed to be normal components of organized attachment strategies (Paetzold et al. 2015). Paetzold et al. (2015) proposed that, in the context of romantic attachment, the central

characteristic of disorganized attachment in adulthood is a general fear of romantic attachment figures. More specifically, the fear associated with disorganized attachment is embedded in the individual's internal working model and is generalized across attachment figures, as well as remaining stable over time (Paetzold et al. 2015).

Within the context of adult attachment, fear in more anxious individuals encourages approaching behaviors and in more avoidant individuals encourages distancing behaviors as a means to protect against abandonment and rejection (Paetzold et al. 2015). However, individuals exhibiting disorganized attachment patterns face a unique situation as their fear of their attachment figure results in confused and contradictory behavior. On the one hand, they attempt to seek to approach the attachment figure as a source of comfort but, as their attachment figure is also their main source of fear, these approaches remain incomplete and appear chaotic (Paetzold et al. 2015). In children, this disorganization has been linked to dissociation and externalizing behavioral problems such as aggression (Hesse and Main 2000; Ogawa et al. 1997). If these behavioral issues remain constant into adulthood, negative impacts would occur on individual's mental health functioning and, ultimately, their psychological well-being (Paetzold et al. 2015).

While there is still uncertainty as to how mindfulness and attachment are related, a recent meta-analysis reported that attachment anxiety and avoidance were significantly associated with lower overall dispositional mindfulness (Stevenson et al. 2017). Secure adult attachment and mindfulness have been linked to the same positive outcomes regarding one's mental health and functioning (Ryan et al. 2007; Shaver et al. 2007), such as increased emotion regulation capacities (cognitive reappraisal), adaptive coping strategies, lower levels of perceived stress, trait anxiety, depression, and increased mental well-being (Baer et al. 2012; Cordon et al. 2009; Walsh et al. 2009; Weinstein et al. 2009). Conversely, insecure attachment, low dispositional mindfulness, and the implementation of, and reliance on, expressive suppression are associated with increased levels of depression, anxiety, maladaptive coping strategies, and decreased levels of mental well-being (Gross and John 2003; Kashdan et al. 2006; Shaver et al. 2007; Sperberg and Stabb 1998). According to Folkman et al. (1986), in an effort to confront stressful situations, individuals rely on a range of cognitive, emotional, and/or behavioral strategies. Research has highlighted the important role these strategies play in our psychological well-being (Mosley Jr et al. 1994; Parsons et al. 1996). More specifically, insecure adult attachment orientations and lower dispositional mindfulness have all been shown to influence the utilization of maladaptive coping behaviors (McNally et al. 2003; Palmer and Rodger 2009). Therefore, it could be argued that maladaptive emotion regulation strategies (such as expressive suppression) are, in themselves, maladaptive emotional coping behaviors.

Goodall et al. (2012) demonstrated the relationship between dispositional mindfulness, emotion regulation difficulties, and adult attachment orientations by using exploratory factor analysis, which illustrated the independent and underlying relationships between all three constructs. The authors analyzed cross-sectional data collected using the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al. 2006), Difficulties in Emotion Regulation Scale (DERS; Gratz and Roemer 2004), and the Experiences in Close Relationship-Revised scale (ECR-R; Fraley et al. 2000). The resultant two-factor model accounted for 52% of the variance across participant scores on the included measures. The authors labeled the first factor (which accounted for 36% of variance) as meta-cognition of emotional states; this included loadings from mindfulness subscales of acting with awareness, non-judging of experience, and non-reactivity to inner experience, and emotion regulation subscales of nonacceptance of emotional responses, difficulties engaging in goal-directed behavior, and impulse control difficulties. The second factor was labeled conscious awareness of emotional states (accounted for 16% of variance) with loadings from mindfulness subscales of describing/labeling experiences with words and acting with awareness, DERS subscales of lack of emotional awareness and lack of emotional clarity, and also with attachment-related anxiety. The authors concluded that attachment security and emotion regulation are both related to mindfulness. The method utilized by Goodall et al. begins to elucidate how these concepts are linked; however, the measure utilized to assess emotion regulation is limited to considering only difficulties and fails to consider the strategies employed by individuals to regulate their emotions. In addition, since this research was conducted, a measure of adult disorganized attachment has been published (Paetzold et al. 2015), which allows for further extension of our understanding of how attachment relates to mindfulness and emotion regulation. The utility of any underlying factor structure should also be considered in relation to the impact of these cognitive/regulation styles on coping and psychological well-being.

The present study aims to extend previous research on the relationships between mindfulness, attachment, and emotion regulation by assessing the contribution of emotion regulation strategies (Emotion Regulation Questionnaire; Gross and John 2003) and adult disorganized attachment (Adult Disorganized Attachment, Paetzold et al. 2015). Following Goodall et al. (2012), we employ exploratory factor analysis to determine the underlying relationships between these constructs. Additionally, we apply the resulting factors in subsequent mediation analysis to explore their value in predicting psychological well-being, via coping behaviors. Given that maladaptive coping has been shown to predict poor well-being, we hypothesized that insecure attachment orientations will be associated with, if not predictive of, a greater reliance on maladaptive coping behaviors. Given that maladaptive coping has been

associated with psychological distress (Nielsen and Knardahl 2014), we predict that this relationship would be replicated in the mediation model. Furthermore, insecure attachment orientations have been previously associated with maladaptive coping (Mikulincer and Florian 1998); therefore, we hypothesized that this relationship would also be observed within the mediation model. Further to these predictions, the mediation model was exploratory based on the factors extracted from the exploratory factor analysis.

Method

Participants

Participants were 219 undergraduate students recruited to complete an online questionnaire through a university Online Research Participation System (ORPS) as well as from a university-wide email distribution list. Study requirements asked that all individuals be registered as undergraduate students and no age cutoffs were imposed. After incomplete entries were discarded, 174 completed entries were kept for analysis. This represents a response rate of 79%. Participants ranged in age from 18 to 65 years old ($M = 21.18$, $SD = 7.77$, 82.2% British, 74% female). The program G*Power (Faul et al. 2009) was used to determine the minimum number of participants required for the effect size to yield an acceptable level of power. The suggested number of participants for bivariate correlation analyses was 138 and 46 for mediation analyses with one DV with a moderate effect size of .3 and a power level of .95. Therefore, the present sample of total of 174 was of adequate size given these guidelines.

Procedures

This study was approved by the University of Sheffield Ethics Committee (Psychology). Participants were invited to take part in the study and given access to the questionnaire via a link to the web-based survey hosted via Qualtrics, which was live for a period of 6 weeks. Participants were presented with an online information sheet and provided informed consent electronically before being eligible to take part in the study. Participants then completed a questionnaire containing both demographic items and validated self-report scales (as detailed below). Upon completion of the survey, participants were presented with a debrief page and additional information detailing the aims of the study.

Measures

Adult Attachment Orientations Adult attachment was assessed using two measures, the Experiences in Close Relationships Revised (ECR-R; Fraley et al. 2000) and

the Adult Disorganized Attachment Scale (ADA; Paetzold et al. 2015).

The ECR-R is a 36-item self-report measure which assesses adult attachment. The scale is divided into two 18-item subscales that represent the two hypothesized underlying dimensions of the attachment construct: attachment-related anxiety and attachment-related avoidance. Participants were instructed to indicate how they generally experience relationships. Respondents used a 7-point Likert-scale ranging from 1 (Disagree strongly) to 7 (Agree strongly), with higher scores reflecting a higher endorsement of the construct. An example of an item representing anxiety is “I worry a lot about my relationships.” An example of an item representing avoidance is “I don’t feel comfortable opening up to others.” Test-retest reliability has been reported as .93 and .94 for the anxiety subscale and as .95 and .95 for the avoidance subscale (Fraley et al. 2000). Both the anxiety and avoidance subscales of the ECR-R have high internal reliabilities (Cronbach’s alpha = .93 and .94 respectively; Sibley et al. 2005). The Cronbach’s alpha coefficient for the current sample was .93 for the anxiety dimension and .89 for the avoidance dimension.

The ECR-R has been used extensively among university student samples with Shaver and Fraley (2004) recommending its use in research. As per previous research, a more global attachment style was assessed in the current study by replacing the terms “romantic partner/partner” with “other people/close others” (see Fraley et al. 2000).

The ADA is a 9-item self-report measure used to assess the level of adult disorganized attachment. Participants were asked to rate their agreement with each statement using a 7-point Likert-scale, from 1 (Strongly disagree) to 7 (Strongly agree). Sample items include “I never know who I am with romantic partners” and “Fear is a common feeling in close relationships.” The ADA has been shown to have high internal consistency (Cronbach’s alpha = .91). The Cronbach’s alpha coefficient for the current sample was .89.

Mindfulness Dispositional mindfulness was assessed using the Five Facet Mindfulness Questionnaire, short form (FFMQ-SF; Bohlmeijer et al. 2011). The FFMQ-SF contains a total of 24-items (12 of which were reverse coded) across five subscales: act with awareness (5 items, e.g., “I rush through activities without being really attentive to them”), describing (5 items, e.g., “I’m good at finding words to describe my feelings”), observing (4 items, e.g., “I notice the smell and aromas of things”), non-judging (5 items, e.g., “I tell myself that I shouldn’t be feeling the way I’m feeling”), and non-reacting (5 items, e.g., “I watch my feelings without getting carried away by them”) (Baer et al. 2008). Respondents were asked to rate the extent to which each statement is true for them using a 5-point Likert-scale ranging from 1 (Never or very rarely true) to 5 (Very often or always true). The

subscales of the FFMQ have been shown to have good internal consistencies with Cronbach's alphas exceeding the defined criterion of .70 (Bohlmeijer et al. 2011). The Cronbach's alpha coefficient for the current sample for total mindfulness was .85 and as follows for the mindfulness subscales: act with awareness (.82), describing (.84), observing (.79), non-judging (.80), and non-reacting (.82).

Emotion Regulation The Emotion Regulation Questionnaire (ERQ; Gross and John 2003) was used to assess emotion regulation strategies using two subscales: cognitive reappraisal (6 items, e.g. "When I want to feel less negative emotion, I change the way I'm thinking about the situation") and expressive suppression (6 items, e.g. "I keep my emotions to myself"). Respondents were asked to rate items using a 7-point Likert-scale ranging from 1 (Strongly disagree) to 7 (Strongly agree). This measure has been shown to have good internal consistency with Cronbach's alpha coefficient values greater than .80 for both subscales (Gratz and Roemer 2004) with a test retest reliability of .69 for both subscales over 3 months (Gross and John 2003). The Cronbach's alpha coefficients of the reappraisal and suppression dimensions for the current sample were .89 and .66, respectively. Previous studies have shown acceptable internal consistencies that are slightly higher for the reappraisal than for the suppression subscale (Gross and John 2003).

Coping Behaviors Coping was measured using the BriefCOPE (Carver 1997), a 28-item self-report measure designed to assess 14 dimensions of coping: self-distraction, active coping, denial, substance abuse, using emotional support, use of instrumental support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, and self-blame. Each dimension of coping is measured using two items. Respondents were asked to rate the extent to which they engage in each of the behaviors using a 4-point Likert-scale ranging from 1 (I have not been doing this at all) to 4 (I have been doing this a lot). No total scores of coping are given; however, the coping dimensions have previously been combined into two subscales, "activity" and "defeatism" (see Mohr et al. 2014). Subscale scores were calculated for "activity coping" from 17 items and for "defeatism coping" from 11 items. Psychometric information was not reported in the original development of this scale. The Cronbach's alpha coefficients for the current sample were .85 for the activity subscale and .80 for the defeatism subscale.

Psychological Well-being Psychological well-being was measured using an abbreviated version of the Scales of Psychological Well-being (SPWB; Ryff 1989). This 42-item scale assesses six dimensions of psychological well-being: autonomy ("I tend to worry about what other people think of

me,") environmental mastery ("My decisions are not usually influenced by what everyone else is doing,") personal growth ("I am not interested in activities that will expand my horizons,") self-acceptance ("In general, I feel confident and positive about myself,") positive relations with others ("Most people see me as loving and affectionate,") purpose in life ("My daily activities often seem trivial and unimportant to me,") and self-acceptance ("In general, I feel confident and positive about myself"). The original 84-item measure has been shown to have high test-retest reliability (ranging between .81 and .88 for each of the 6 subscales) and high internal consistency (with Cronbach's alpha coefficients from each subscale ranging between .86 and .93) (Ryff 1989). This 42-item measure has been used as a reliable measure of well-being with high internal consistencies (Mack et al. 2012). Respondents were asked to rate each item using a 6-point Likert-scale ranging from 1 (Strongly disagree) to 6 (Strongly agree). In the current sample, the Cronbach's alpha coefficients for all of the six dimensions were as follows: autonomy, .79; environmental mastery, .57; personal growth, .81; positive relations; .83; purpose in life, .78; and self-acceptance, .90.

Data Analyses

SPSS 24.0 was used for the descriptive analysis of raw data, first order correlations between subscales of the FFMQ-SF, ERQ, ECR-R, and ADA, and exploratory factor analysis. In order to explore the relationships between adult attachment, mindfulness, and emotion regulation, the subscales for each measure were entered into an exploratory factor analysis. As the factors were likely to be correlated with one another, oblique rotation was used. Extraction of factors was based on maximum likelihood, and a direct oblimin rotation was used to interpret the factors. Composite scores were then calculated for each of the extracted factors using the regression method. These factor scores were then used as independent variables in mediation analysis using the PROCESS macro (Hayes 2013). Mediation examined the relationship between these extracted factors and Ryff's six scales of psychological well-being (SPWB; Ryff 1989) via activity and defeatism coping behaviors (BriefCOPE; Carver 1997). To accomplish this, a bootstrapping approach was used (e.g., Hayes 2009; Preacher and Hayes 2004, 2008). Bootstrapping involves creating a repeated series of representations of the population by resampling from the current sample in an attempt to recreate the original sampling procedure. For the present study, the number of bootstrapping samples was set at 5000. These 5000 bootstrapping samples were used to generate the 95% confidence interval for each indirect effect we examined. The confidence interval generated using this method is considered statistically significant if it does not contain the value of zero.

Results

Means and standard deviations of variables are reported in Table 1. The assumption of normality was tested for all subscales of adult attachment, mindfulness, and emotion regulation. Results for the Kolmogorov-Smirnov test for normality indicated that all subscales did not significantly deviate from a normal distribution, with the exception of adult disorganized attachment ($D = .079$, $p = .011$). These results appear to be inline with our theoretical understanding of this construct as attachment disorganization is thought to coexist alongside attachment anxiety and avoidance and not act as an independent attachment orientation (see Main and Solomon 1990). This deviation from normality, reported in the current sample, reflects the polarizing nature of this maladaptive categorization and its interaction with high attachment anxiety and avoidance rather than spread across both attachment dimensions. For this reason, this scale was included in further analyses as-is.

Relationship Between Attachment, Mindfulness, and Emotion Regulation

Bivariate correlations between dimensions of adult attachment (ECR-R; ADA), and subscales of the measures of mindfulness (FFMQ-SF), and emotion regulation (ERQ) are reported in Table 1 in detail. There were also moderate negative correlations between total mindfulness scores and attachment dimensions (anxiety, $r = -.61$; avoidance, $r = -.37$; disorganized, $r = -.30$).

Initially, the factorability of the 10 subscales was examined. Firstly, the Kaiser-Meyer-Olkin measure of sampling adequacy was .77, above the recommended value of .6 (Kaiser 1974). Secondly, the Bartlett's test of sphericity was

significant ($\chi^2(45) = 379.95$, $p < .001$) and no multicollinearity was detected (correlation matrix determinant = .105). The EFA yielded a two-factor solution and each factor was then interpreted by examining item content and pattern of coefficients. These two factors accounted for a total of 47% of variance.

Factor 1 accounting for 33% of the variance had loadings on act with awareness, non-judging of inner experience, and non-reacting subscales of the FFMQ-SF, as well as the ERQ subscale cognitive reappraisal and loaded negatively onto attachment-related anxiety from the ECR-R. We labeled this factor "resilient mental functioning."

Factor 2 accounting for 14% of the variance, loaded negatively on act with awareness and describe of the FFMQ-SF, as well as expressive suppression of the ERQ, attachment-related avoidance from the ECR-R, and disorganized attachment measured by the ADA. Very high loadings were noted for expressive suppression and attachment-related avoidance. We labeled this factor "disorganized emotional functioning."

A third factor exceeded Kaiser's criterion (accounting for 10% of the variance) and loaded strongly onto the observe subscale (.876) from the FFMQ-SF and less strongly onto disorganized attachment (.332). Considering the caution of Fabrigar et al. (1999) against the inclusion of single-item factors, EFA was rerun with a factor loading cutoff of .40. Although the third factor only had a single high loading on a scale, further examination of eigenvalues and inspecting the scree plot suggested a two-factor solution, factors 1 and 2 reported above. Therefore, a two-factor solution was retained for further analyses (factor 3 excluded). Table 2 summarizes the factor-loading pattern of the two extracted factors with eigenvalues exceeding 1 (Kaiser's criterion), after rotation. These two factors were only moderately related with a correlation of $r = -.27$.

Table 1 Descriptive statistics and correlation matrix of the FFMQ-SF, ERQ, ECR-R, and ADA measures

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
FFMQ act with awareness	15.37	3.59	1	-.093	.415**	.317**	.208**	.658**	.272**	-.214**	-.478**	-.289**	-.350**
FFMQ observe/notice/attend	13.69	3.34	2	–	.016	.032	.182*	.393**	.101	.008	-.045	.037	.069
FFMQ describe/label experience	15.44	4.07	3	–	–	.244**	.250**	.648**	.146	-.231**	-.378**	-.454**	-.245**
FFMQ non-judging of experience	13.73	3.99	4	–	–	–	.405**	.671**	.142	-.008	-.521**	-.274**	-.288**
FFMQ non-reactivity	14.98	3.93	5	–	–	–	–	.680**	.227**	.027	-.424**	-.108	-.068
FFMQ total score	73.21	11.67	6	–	–	–	–	–	.289**	-.138	-.613**	-.367**	-.295**
ERQ cognitive reappraisal	26.45	7.66	7	–	–	–	–	–	–	.006	-.310**	-.191*	-.200**
ERQ expressive suppression	15.72	4.73	8	–	–	–	–	–	–	–	.075	.334**	.228**
ECR-R anxiety	3.85	1.16	9	–	–	–	–	–	–	–	–	.358**	.432**
ECR-R avoidance	3.56	0.95	10	–	–	–	–	–	–	–	–	–	.517**
ADA disorganized	26.50	11.47	11	–	–	–	–	–	–	–	–	–	–

*significant at the 0.05 level; **significant at the 0.01 level

Table 2 Factors emerging from the exploratory factor analysis

	Factor 1	Factor 2
FFMQ		
Act with awareness		-.470
Observe/notice/attend		
Describe/label experience		-.562
Non-judging of experience	.759	
Non-reactivity	.747	
ERQ		
Cognitive reappraisal	.436	
Expressive suppression		.808
ECR-R		
Attachment-related anxiety	-.749	
Attachment-related avoidance		.726
ADA		
Disorganized attachment		.564

Factor loadings < .4 are suppressed. Factor 1; *resilient mental functioning*. Factor 2; *disorganized emotional functioning*

Coping as a Mediator Between Mental and Emotional Functioning and Psychological Well-being

Participant scores for factors 1 (resilient mental functioning) and 2 (disorganized emotional functioning) from the EFA were extracted and entered into the PROCESS macro as independent variables (IV) in the mediation model to test the mediating effects of coping behaviors in the relationship between the extracted factors and psychological well-being outcomes. The results from the mediation analyses for the effect of both coping subscales (activity and defeatism) on the relationship between the IV (factors extracted from EFA) and the dependent variable of psychological well-being (the six dimensions of the SPWB) are summarized in Table 3.

As illustrated in Table 3, significant direct effects were reported between both factor 1 (resilient mental functioning) and factor 2 (disorganized emotional functioning) and all six of the scales of psychological well-being (autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance). These direct effects indicate that both resilient mental functioning and disorganized emotional functioning are significant predictors of psychological well-being. Resilient mental functioning was associated with increased scores of psychological well-being variables while disorganized emotional functioning was negatively associated with the same outcomes.

No significant indirect effects via activity coping were reported for the relationships between factor 1 or factor 2 and the six scales of psychological well-being, meaning that activity coping was not a significant mediator in these models. However, the indirect effect of factor 1 (resilient mental functioning) on five of the six scales of psychological well-being

(environmental mastery, personal growth, positive relations, purpose in life, and self-acceptance), via defeatism coping, was significant. That is to say, defeatism coping partially mediated the effect of resilient mental functioning on most of the subscales of psychological well-being. Coefficients for the relationships comprising these models can be seen in Fig. 1. Factor 2 (disorganized emotional functioning) had a significant indirect effect on all six scales of psychological well-being via defeatism coping. That is to say, defeatism coping also partially mediated the relationship between disorganized emotional functioning and psychological well-being. Coefficients for the relationships comprising these models can be seen in Fig. 2.

Discussion

This study aimed to extend our current understanding of the relationship between attachment, mindfulness, and emotion regulation taking into account recent developments in the measurement of adult attachment, as well as specifically focusing on emotion regulation strategies. The present study assessed individual differences in the use of emotion regulation strategies and was the first study to examine the construct of adult disorganized attachment and its possible role in the relationship between adult attachment and dispositional mindfulness.

Consistent with previous research (Goodall et al. 2012), we applied exploratory factor analysis to measures of attachment (ECR-R, ADA), mindfulness (FFMQ-SF), and emotion regulation strategies (ERQ) in order to explore the relationships between constructs. A two-factor model was extracted. Factor 1 (accounting for 33% of the variance) consisted of positive loadings from the non-judging, and non-reacting of the FFMQ-SF, cognitive reappraisal of the ERQ, and a negative loading from attachment-related anxiety of the ECR-R. We suggest that this factor represents resilient mental functioning, which reflects an individual's ability to protect themselves from the harmful effects of negative and maladaptive thought processes associated with an anxious insecure attachment and maladaptive emotion regulation strategies. More specifically, this extracted factor of resilient mental functioning highlights the possible influence emotion regulation, the ability to successfully reappraise negative emotions, has on the relationship between adult attachment and dispositional mindfulness. From resilient mental functioning, as well as from the associations between constructs reported in the correlation matrix (Table 1), we can suggest that low levels of attachment anxiety are associated with the execution of cognitive reappraisal strategies as a means to approach and resolve negative emotions and situations, which is further associated with an individual's ability to remain in a non-judging and non-reactive state. The cross-sectional nature of the data precludes

Table 3 Multiple mediation of the effects of extracted factors on mental health outcomes through facets of coping behaviors (5000 bootstrap samples)

IV	Mediator	DV	Total effect (c path)	Direct effect (c' path)	Total Indirect effect	
					Point est.	95% CI
Resilient mental functioning	Activity coping	PWB Autonomy	3.1886***	3.2262***	-.0376	-.2505, .0493
		PWB Environmental mastery	2.9098***	2.9572***	-.0475	-.2183, .0865
		PWB Personal growth	2.5112***	2.5952***	-.0840	-.3673, .1573
		PWB Positive relations with others	2.7518***	2.8754***	-.1235	-.4838, .2351
		PWB Purpose in life	2.4858***	2.5728***	-.0870	-.3747, .1552
		PWB Self-acceptance	4.5139***	4.5659***	-.0520	-.2772, .0709
	Defeatism coping	PWB Autonomy	3.1886***	3.0675***	.1211	-.4756, .7141
		PWB Environmental mastery	2.9098***	2.1780***	.7318***	.3237, 1.1940
		PWB Personal growth	2.5112***	1.8189***	.6923*	.0998, 1.3009
		PWB Positive relations with others	2.7518***	1.9018***	.8501*	.2782, 1.5031
		PWB Purpose in life	2.4848***	1.1767*	1.3091***	.7726, 1.9401
		PWB Self-acceptance	4.5139***	3.3025***	1.2115***	.5357, 1.9262
Disorganized emotional functioning	Activity coping	PWB Autonomy	-1.6236***	-1.6325***	.0089	-.3585, .3173
		PWB Environmental mastery	-2.2361***	-2.2446***	.0085	-.2433, .2372
		PWB Personal growth	-2.1446***	-1.9253***	-.2194	-.6079, .0116
		PWB Positive relations with others	-4.0379***	-3.7864***	-.2514	-.6796, -.0120
		PWB Purpose in life	-2.6822***	-2.4994***	-.1828	-.6059, .0700
		PWB Self-acceptance	-3.1579***	-3.2643***	.1064	-.2989, .5090
	Defeatism coping	PWB Autonomy	-1.6236***	-.9908*	-.6328*	-1.1367, -.2417
		PWB Environmental mastery	-2.2361***	-1.4582***	-.7779***	-1.2323, -.4575
		PWB Personal growth	-2.1446***	-1.4806***	-.6640**	-1.1849, -.2674
		PWB Positive relations with others	-4.0379***	-3.5828***	-.4551*	-.9004, -.1185
		PWB Purpose in life	-2.6822***	-1.7857***	-.8965***	-1.4487, -.4951
		PWB Self-acceptance	-3.1579***	-1.8492***	-1.3087***	-2.0334, -.7752

*** $p < .001$; ** $p < .01$; * $p < .05$

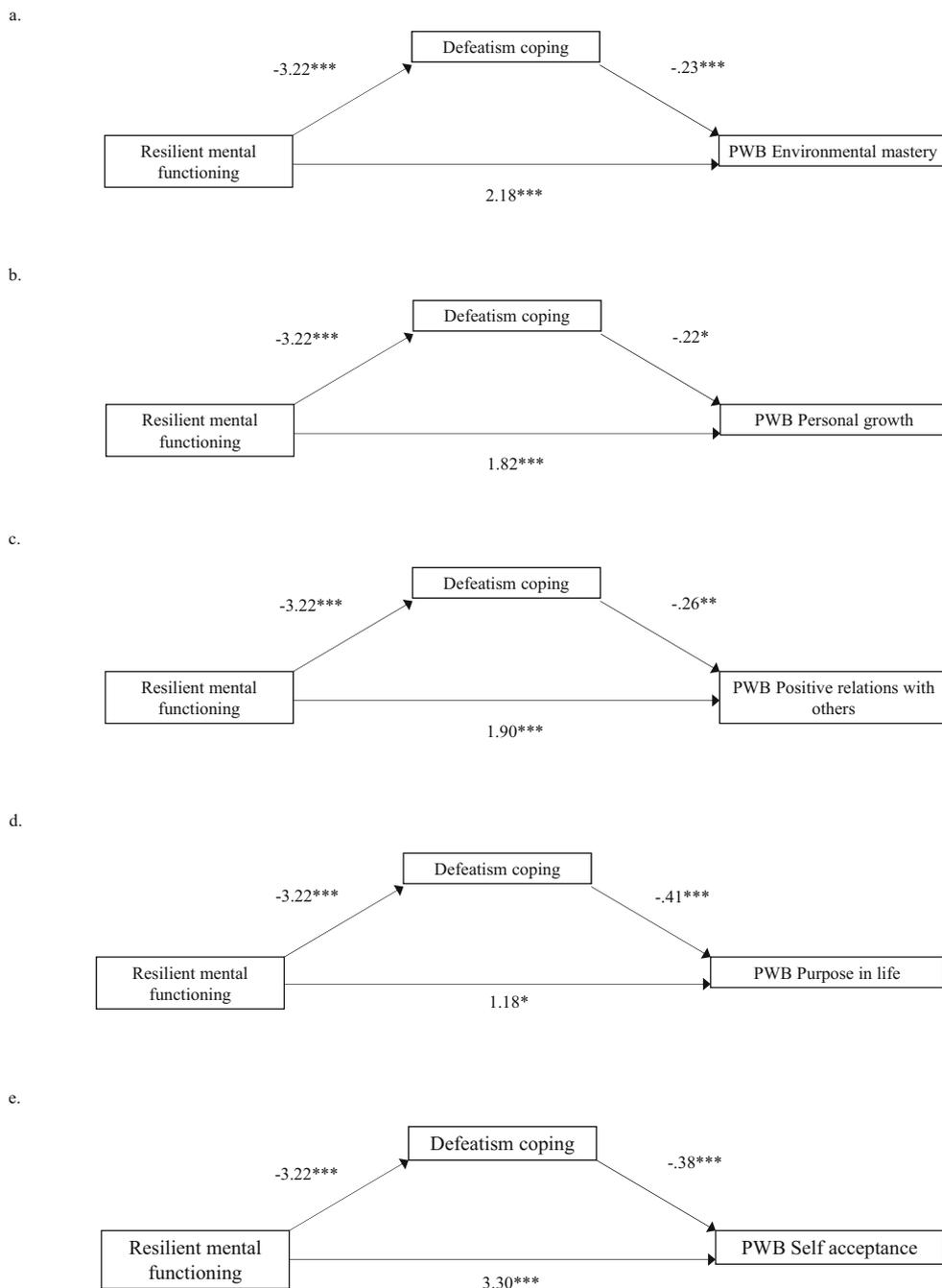
inferences about causality; however, the positive relationships observed imply that it is specifically the attitudinal component of mindfulness (acting with awareness, non-judgment and non-reactivity) that is associated with the use of adaptive emotion regulation. It may be that an attitude of non-judgment and non-reactivity may facilitate subsequent reappraisal of difficult emotions; alternatively, the reappraisal strategies may cultivate this attitude towards inner experiences.

Factor 2 (accounting for 14% of the variance) consisted of negative loadings from act with awareness and describe/label experience of the FFMQ-SF and positive loadings from expressive suppression of the ERQ, attachment-related avoidance of the ECR-R, and disorganized attachment of the ADA. This pattern reflects disorganized emotional functioning. To be more specific, we posit that this extracted factor highlights a possible interaction of the reliance on expressive suppression/the inability to reappraise negative emotions on the relationship between adult attachment and dispositional mindfulness. In this factor, the presence of both increased attachment avoidance, more specifically a

deactivation of the attachment system, and disorganization are associated with a diminished ability to employ adaptive emotion regulation strategies (cognitive reappraisal), and negatively related to the act with awareness and describe facets of mindfulness (these associations are also present in the correlation matrix, Table 1). These findings suggest that there is considerable overlap between dispositional mindfulness and emotion regulation strategies with regard to the awareness and acceptance of emotions and experiences in the context of a disorganized avoidant attachment.

In drawing comparison to the model reported by Goodall et al. (2012), the current study presents factor 1 as resilient mental functioning, a proactive and adaptive pattern of behavior consisting of several subscales as a result of the assessment of emotion regulation strategies. Goodall et al. reported findings on the basis of emotion regulation difficulties, whereas the current study assessed specific strategies used to regulate emotions. Despite these differences, several commonalities should be noted. The present study replicated the loadings of the FFMQ subscales initially reported by Goodall et al. (non-judging, and non-reacting loading onto factor 1, describe

Fig. 1 a–e Mediation models of the effects of *resilient mental functioning* on mental health outcomes through defeatism coping behaviors (5000 bootstrap samples)

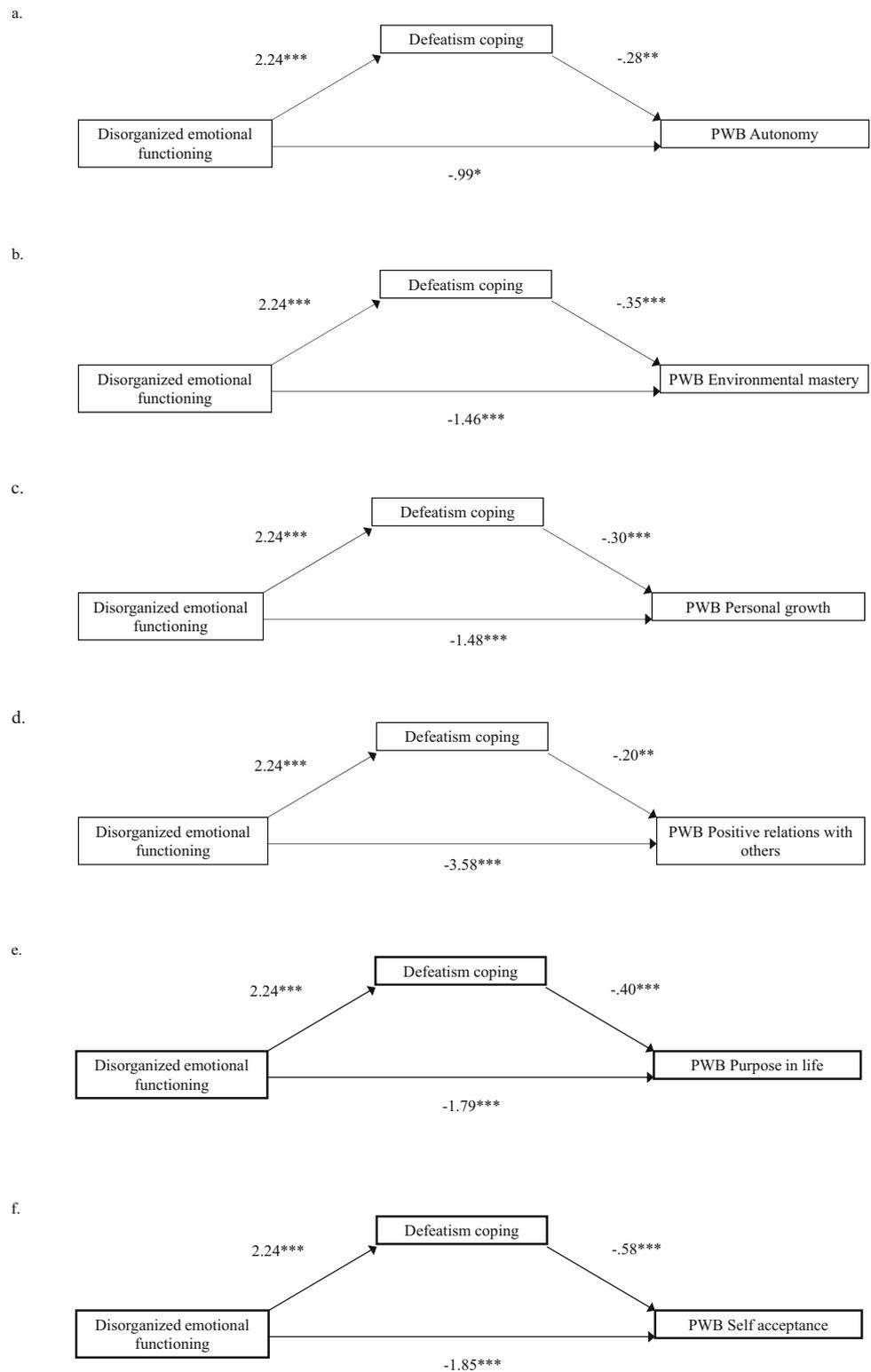


* $p < .05$; ** $p < .01$; *** $p < .001$.

loading onto factor 2, cross-loading of act with awareness, and the independent loading of the observe subscale on factor 3). Taken together, these results illustrate the seemingly clustered relationships between the FFMQ subscales and how their specific interactions relate to the constructs of adult attachment and emotion regulation. Goodall et al. explored emotion regulation using the DERS, measuring six subscales of emotion regulation difficulty. This measure included a subscale of

limited access to emotion regulation strategies (which loaded onto factor 1 of their model) and demonstrated an interaction between constructs (with non-judging, and non-reacting scores negatively associated with a limited access to emotion regulation strategies). While placing a focus on adequately measuring emotion regulation strategies rather than difficulties, the present study successfully expands on the previous findings by reporting a positive relationship between the same

Fig. 2 a–f Mediation models of the effects of *disorganized emotional functioning* on mental health outcomes through defeatism coping behaviors (5000 bootstrap samples)



* $p < .05$; ** $p < .01$; *** $p < .001$.

mindfulness facets and cognitive reappraisal as a specific emotion regulation strategy, thus suggesting that these facets of mindfulness, and their interactions, are related to more effective emotion regulation due to the employment of adaptive emotion regulation strategies. Furthermore, the results from the current study expand our understanding of how less adaptive emotion regulation strategies relate to mindfulness: factor 2 of the present model demonstrates the negative relationship between expressive suppression as an emotion regulation strategy, and the mindfulness facets of act with awareness and describe.

As with the findings of Goodall et al. (2012), the factor structures reported here support the view that the relationship between emotion regulation and mindfulness may be bi-directional, with individuals utilizing positive or adaptive emotion regulation strategies exhibiting increased dispositional mindfulness. The relationships observed between specific facets of mindfulness and emotion regulation are consistent with previous research on psychological well-being. Cash and Whittingham (2010) reported a higher degree of non-judging and acting with awareness aspects of mindfulness to be predictive of psychological well-being outcomes (including lower levels of depression, anxiety, and stress). Such findings could be attributed, in part, to the relationships and interactions between facets of mindfulness and emotion regulations, as observed in the present study (see Table 2). These findings further detail the relationships between both the act with awareness and non-judging facets of mindfulness and adaptive emotion regulation (increased cognitive reappraisal and decrease expressive suppression), which have previously been reported to influence psychological well-being (Gross and John 2003). Research has also highlighted the possible bi-directional relationship between attachment security and mindfulness: increased mindfulness has been found in those individuals exhibiting secure attachments, as well as mindfulness-based interventions leading to increased attachment security (Shaver et al. 2007).

A third factor was rejected from the final model as it loaded strongly on a single item only, the mindfulness subscale observe/notice/attend, replicating the findings of Goodall et al. (2012). Taken together, these results draw attention to the individual nature of the observe/notice/attend subscale of dispositional mindfulness, as measured by the FFMQ. Baer et al. (2006) reported inconsistencies of the observe subscale in their results, suggesting this to be a result of the skill-like nature of observing in comparison to the other facets (which are primarily concerned with cognitions and emotions). Subsequent research utilizing the FFMQ to assess dispositional mindfulness has reported significant differences between individuals with prior meditation experience and those without (Goodall et al. 2012; Macaulay et al. 2015). Furthermore, research that assesses how facets of mindfulness relate to cognitive and emotional experiences similarly report that the observe facet

behaves differently to other facets of mindfulness; for example, observe has been positively associated with negative cognitive experiences and distress (Emerson et al. 2018).

Both the present study and the work conducted by Goodall et al. (2012) employed the ECR-R to measure adult attachment, although the results differ from one another. Whereas Goodall et al. reported negative loadings from both attachment dimensions onto one factor in their model (factor 2/ conscious awareness of emotional states), the present study reported separate factor loadings of attachment dimensions. The final factor model reported a negative loading of attachment-related anxiety onto factor 1 (resilient mental functioning) and a positive loading of attachment-related avoidance onto factor 2 (disorganized emotional functioning). The results here suggest attachment-related anxiety to be negatively related to the mindfulness facets of non-judging and non-reactivity, while attachment-related avoidance is negatively related to the act with awareness and describe facets of dispositional mindfulness. For this reason, it is plausible to suggest that increased attachment-related anxiety inhibits the ability to engage in non-judging and non-reacting cognitive processes. Additionally, we posit that attachment-related avoidance not only results in behaviors of isolation regarding romantic relationships but more broadly throughout everyday life in response to individual experiences. Future research would be needed to test these ideas.

Although inconsistent with the previous findings, the separate loadings of the two primary attachment indices (anxiety and avoidance) in the present study lend support to the argument that they develop differently. The attachment literature proposes that insecurely attached individuals employ maladaptive cognitive strategies to process and manage emotional responses (Mikulincer and Florian 1995, 1998). More specifically, attachment-related avoidance has been linked to the suppression and denial of emotional states (Mikulincer et al. 2003), while attachment-related anxiety has been linked to rumination and the intensification of negative/harmful emotional responses (Mikulincer and Shaver 2007). The present research provides insight into the differences between attachment-related anxiety and avoidance in regard to emotion regulation and dispositional mindfulness. Additionally, this difference may be attributed to the inclusion of a measure of adult disorganized attachment. The relationship presented between attachment-related avoidance and disorganization in the factor model may be, in part, due to the similarities in characteristics of attachment avoidance and disorganization. To some degree, it could be argued that distancing and withdrawing behaviors in attachment avoidance are akin to the dissociative symptoms exhibited in adults with infant disorganized attachment (Ogawa et al. 1997). Widening the scope to include a measure of disorganized attachment provides further understanding of this attachment orientation in adulthood and also its relationship with emotion regulation and mindfulness.

While the model presented by Goodall et al. (2012) begins to examine the relationship between the three constructs, the current research presents a model that extends our understanding by presenting a fuller picture of adult attachment (inclusion of adult disorganized attachment) and emotion regulation (inclusion of strategies). In this way, the present study offers a representation of the diversity of attachment in the adult population and the recent developments in attachment research. The present research suggests how attachment orientations are related to emotion regulation strategies and may be instrumental in the development of dispositional mindfulness. Overall, these extensions to previous research have helped refine the assessment of the constructs of interest, as well as how they are related to and interact with one another.

Mediating Effects of Coping Behaviors

Researchers have previously reported the relationship between coping strategies and mental health outcomes. More specifically, studies have shown that attempting to avoid thoughts and feelings of stressors predicts an elevated level of distress (Rayburn et al. 2005; Stanton and Snider 1993). Taylor and Stanton (2007) suggested that avoidance oriented coping behaviors may preempt more effective coping behaviors, including detrimental behaviors (e.g., substance abuse), or even induce intrusion of stress-related thoughts. Findings of the present study illustrate the processes underlying the association between the extracted factors (resilient mental functioning and disorganized emotional functioning) and psychological well-being outcomes (SPWB; Ryff 1989) from the implementation of activity-based or defeatism-based coping behaviors.

The results here indicate that the relationships between resilient mental functioning and all six of the psychological well-being outcomes were not mediated by activity coping behaviors (such as expressing negative feelings and seeking emotional support). Such results support the theoretical interpretation of this factor as resilience. Higher levels of resilient mental functioning may indicate a capacity to assess and successfully cope with life stressors and issues with the constructs that all loaded onto this factor rather than through utilizing activity coping behaviors themselves. Whether or not these factors are associated with activity coping behaviors does not appear to significantly affect psychological well-being outcomes as resilient mental functioning already encompass the necessary mechanisms to ensure positive and healthy mental functioning. However, results suggest that defeatism coping behaviors (such as substance use and denial) may be an important mediator in the relationship between resilient mental functioning and five of the six psychological well-being outcomes (environmental mastery, personal growth, positive relations, purpose in life, and self-acceptance). These results support the findings of Moritz et al. (2016) who reported a

relationship between maladaptive coping behaviors and psychopathology. Moritz et al. also acknowledged that it is not only the increase of active coping behaviors that could benefit psychological well-being but also the decrease in maladaptive coping behaviors. Similarly, our results indicate that the relationship between disorganized emotional functioning and the six psychological well-being outcomes is not mediated by activity coping behaviors. Taken together, these results suggest that it is specifically defeatism coping behaviors that are significantly associated with psychological well-being, even in relation to resilient mental functioning. While researchers have previously reported dispositional mindfulness to be associated with lower psychological distress (Coffey and Hartman 2008), the present study highlights that defeatism coping might be the mechanism for this association. Perhaps poor coping behaviors are a behavioral manifestation of low levels of mindfulness, and one that detrimentally impacts psychological well-being.

Not only does the present study highlight how certain factors relate to psychological well-being but the results also provide further insight into the interactions and relationships between dispositional mindfulness, emotion regulation, and adult attachment orientations. Specifically examining emotion regulation strategies has aided in furthering our understanding of the role these strategies play in the relationship between adult attachment and the development of dispositional mindfulness. While dispositional mindfulness is considered an inherent human capacity (Brown and Ryan 2003), we have highlighted the similarities between dispositional mindfulness and the constructs of adult attachment and also emotion regulation. Accordingly, and unique to the present study, the role of dispositional mindfulness was examined as an important factor in a broader sense of mental functioning rather than isolating this construct and considering it to be, in itself, an overarching framework of mental health and well-being. Furthermore, the mediation analyses suggest that the effects of employing maladaptive coping behaviors negatively impact our psychological well-being even when used in conjunction with the mechanisms of resilient mental functioning. Such results reiterate the importance of the education and execution of adaptive and proactive coping strategies as a means to promote and maintain positive mental health and psychological well-being.

Limitations and Future Research

Issues may be raised with the reliability of the ERQ expressive suppression subscale (Cronbach's alpha in the present sample was .66) and the SPWB environmental mastery subscale (Cronbach's alpha in the present sample was .57). Although often cited as an acceptable standard, a reliability threshold of .70 is rule of thumb that is not without controversy (see Lance et al. 2006). Additionally, an alpha value below the .70

threshold may be due to a low number of items included in the measure itself (Tavakol and Dennick 2011). This explanation may be relevant for the expressive suppression scale, which only has 4 items. That said, further analyses of the present sample determined there to be unidimensionality across all expressive suppression items and while .66 is not far below the “acceptable standard” threshold, caution should be taken when interpreting the results. The low reliability score for the SPWB environmental mastery could be a result of the undergraduate student sample used in the present study. Environmental mastery is regarded as the ability to manage complex environments to suit personal needs—a skill which might be particularly diversely expressed in a student population due to variety in workplace experience. That being said, students face a unique set of challenges in both social and academic situations. In light of this undesirable reliability score, future research may wish to focus specifically on student-based measures of psychological well-being to take these unique experiences and stressors into account (e.g., Broglia et al. 2017) or exclude this subscale from analysis.

The present study relied on several self-report measures, including the FFMQ-SF to measure dispositional mindfulness. The scores reported in the present study reflect how participants scored on each of the five subscales. While the use of a self-report measure to assess predominantly internal mechanisms may increase the likelihood of biases within the present study, there are currently no observational methods for successfully measuring mindfulness (trait or state). Therefore, despite the inherent issues with self-report, the FFMQ (Baer et al. 2006) framework remains an appropriate way to tap the five individual facets of mindfulness. That being said, Van Dam et al. (2017) present arguments concerning the current conceptualization of mindfulness, the potential benefits of “contemplative neuroscience,” and the implications of successfully measuring constructs at the neural level. Notably, the paper draws attention to the current semantic variations and lack of consensus surrounding the descriptions of mindfulness. Not only does this pose as an issue for our conceptualization and understanding of this construct, but also for how it is effectively measured. The results of the present study, specifically the overlap between dispositional mindfulness, emotion regulation, and adult attachment orientations, further challenge the current conceptualization dispositional mindfulness. Additionally, from the presented results, it is possible to suggest that dispositional mindfulness is comparable, or even somewhat influential, in both coping behaviors and psychological well-being. Future research could usefully build upon the current study by attempting to map these constructs at the neural level.

Considering the conceptualization of mindfulness, and as we further develop our understanding, it would be beneficial to re-operationalize the definition of this construct

and refine its measurement. While this is beyond the scope of the present study, the relationships observed between the constructs of adult attachment and emotion regulation may help form clearer definitions of what dispositional mindfulness is. However, we are still unsure of how these constructs are specifically related to one another. Future research may wish to continue utilizing experimental design and behavioral indicators to successfully compliment the current self-report measures of mindfulness to further examine the relationships between constructs (see Arch and Craske 2006; Keng et al. 2017; Watford and Stafford 2015). A recent meta-analysis of mindfulness and emotion regulation showcases methodological developments in this research field, and confirms the relationship between these constructs through experimental manipulation (Leyland et al. 2018). Within the context of refinement and measurement, the present study aimed to further our understanding of coping and its relationship to the measured constructs by utilizing an alternative scoring of the BriefCOPE (Carver 1997) to produce two contrasting subscales (activity and defeatism; Mohr et al. 2014).

The findings from the present research are cross-sectional, and therefore, conclusions regarding causation cannot be drawn. Future research should examine these associations longitudinally and also assess the effect of mindfulness-based interventions to more accurately assess causation. At present, it is not known how generalizable the findings are to those individuals who are not currently enrolled in undergraduate education. As undergraduates face a set of very specific challenges and stressors, it would be beneficial for future research to concentrate on more representative samples. Both the present study (as a result of opportunity sampling) and the previous study conducted by Goodall et al. (2012) used university student samples within the UK; it would be beneficial to further expand this research further and assess the relationship between all three constructs in the general population in different cultures. Furthermore, the high attrition rate, while common in survey research with students, may have resulted in bias in our sample. Perhaps non-completers had different scores on some variable to completers. Future research would benefit from improved sampling to avoid this issue. Although opportunity sampling was used, it is apparent that the coping strategies utilized by students can have a detrimental impact on their psychological well-being. Future research may wish to explore the extent of this impact in the hopes of developing resources to promote positive mental health and well-being. As this was also the first study to examine the relationship between adult disorganized attachment and dispositional mindfulness, while the results point to a possible bi-directional relationship, future longitudinal and experimental research would be beneficial to explore this possibility.

Author Contributions JCS designed and executed the study, conducted all necessary data analyses, and wrote the paper. AM collaborated with the study design and writing of the paper. LME collaborated with the study design and writing of the paper.

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Compliance with Ethical Standards

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical approval for this study was granted by the University of Sheffield's University Research Ethics Committee (UREC).

Informed Consent Informed consent was obtained from all individual participants included in the study where applicable.

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