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The Relationship Between Mindfulness and Life Stress in Student-Athletes: The Mediating
Role of Coping Effectiveness and Decision Rumination

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Abstract

The role of dispositional mindfulness on stress in student-athletes and factors that mediate this relationship has yet to be examined. Accordingly, the purpose of this study was to investigate the relationships between the facets of mindfulness and life stress in student-athletes and whether these relationships are mediated through coping effectiveness and decision rumination. Participants were 202 student-athletes who completed validated measures of dispositional mindfulness, student-athlete life stress, decision rumination and coping effectiveness in sport. Results indicated that the acting with awareness and non-judging facets of mindfulness were negative predictors of life stress, whereas the observe facet was a positive predictor of life stress. Mediation analyses revealed that these relationships were mediated through coping effectiveness and decision rumination. Findings provide new insight into the role dispositional mindfulness plays on student-athlete perceptions of life stress and implications for practitioners are discussed.

Keywords: Coping effectiveness, Mindfulness, Rumination, Stress-management

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The Relationship Between Mindfulness and Life Stress in Student-Athletes: The Mediating Role of Coping Effectiveness and Decision Rumination

University student-athletes are a unique population who are required to balance a myriad of demands and challenges associated with their academic and sporting life compared to their non-athlete counterparts. In addition to the academic and personal challenges faced by university students following the transition from secondary to tertiary education (e.g., being away from home), student-athletes can also face weighty demands such as frequent and exhaustive training, frequent travelling and competitions as well as face a range of competitive pressures (e.g., Brown et al., 2015; Cosh & Tully, 2015). From the ages of 18 to 21 years, athletes are likely to experience an athletic transition from youth to senior sports competitor (Stambulova, 1994) trying to transit into the mastery or perfection stage of performance (Wylleman, Alferman, & Lavallee, 2004). Despite the scope and the intensity of the demands placed on university student-athletes, sport science research has tended to focus on the impact of stressors associated directly with the sport context (common organizational or competitive stressors), whilst neglecting the other demands faced by this population. Alternatively, research investigating stress in university students has failed to account for the additional demands faced by the student-athlete population. Due to the potential consequences of chronic stress on sport performance as well as mental and physical health, it is important to take a holistic perspective to support the well-being of student-athletes. Therefore, identifying correlates that can potentially buffer stress is a significant research endeavor.

One stress-regulation approach that has received burgeoning interest across a range of contexts, including education, is mindfulness (e.g., Bruin, Meppelink, & Bögels, 2014; Weinstein, Brown, & Ryan, 2009). However, no study has investigated the role that facets of mindfulness play on life stress in student-athletes and neglected identifying factors that

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mediate the mindfulness - stress relationship. To this end, this study aimed to investigate the relationship between the five facets of mindfulness and life stress in student-athletes, as well as examine whether coping effectiveness and decision rumination mediate this relationship.

Mindfulness refers to the capacity to be aware of moment by moment experiences (e.g., thoughts, perceptions, affective states and physical sensations) in a non-judgmental and non-reactive manner (Kabat-Zinn, 1990, 2005). Mindfulness has its roots in contemplative Buddhist practices and philosophy (Kalupahana, 1987) and can be conceptualized as a state practiced in meditation or mindfulness training (e.g., Lau et al., 2006) or as a psychological trait related with the tendency to be mindful in daily life (e.g., Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Evidence suggests that without intervention, trait mindfulness appears to be stable over time (e.g., Baer et al., 2006) and formal and informal mindfulness practice leads to a more mindful disposition. This mindfulness disposition has been denominated into five distinct facets namely; *observe*, *describe*, *act with awareness*, *non-judge*, and *non-reactivity* (Baer et al. 2006).

The *observe* facet includes attending to internal and external experiences that are not likely to be noticed by others such as sensations, cognitions, emotions, sights, sounds and smells. The *describe* facet refers to labelling internal experiences with words that describe feelings, beliefs, opinions and expectations. The *act with awareness* facet refers to attending to present moment activities without distraction. The *non-judge of inner experiences* facet refers to taking a non-evaluative approach towards thoughts and feelings. Finally, the *non-reactivity of inner experiences* facet refers to the tendency to allow thoughts and feelings to come and go and “step back” from them, without being caught in or carried away by them. In sum, dispositional mindfulness refers to an individual’s capability to maintain control in the context of problematic events, cognitions or feelings. It is understandable, therefore, that mindfulness has been associated with a number of adaptive outcomes including flow

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dispositions (e.g., high concentration), greater use of psychological skills (e.g., self-talk, attentional control) (Kee & Wang, 2008), improved psychological well-being as well as reduced self-report (e.g., Vidrine et al. 2015; Weinstein et al., 2009) and physiological (e.g., Zimmaro et al., 2016) indicators of psychological stress.

Stress has been generally identified as a unidimensional construct that represents the degree of external pressure and disturbed reaction associated with physiological arousal (Lazarus, 2000). By definition, stress can be experienced as either eustress or distress (Selye, 1974). In instances of chronic stress that is viewed as being aversive (i.e., distress) a student-athlete might find that their sport performance is hindered as well as their physical and mental health compromised (Kleinert, 2007). Student-athletes are typically developing young adults, but in addition to the education and daily life demands shared by their non-athletic student peers, they have to deal with a range of weighty demands from their involvement in sport (e.g., training, selection, matches, and travel). Indeed, studies have highlighted that student-athletes express concerns about their academic skills, time-management, emotional adjustments, interpersonal relationships and professional development or career searching, as well as difficulties with alcohol use and substance abuse, attributed to the pressure of balancing scholastic, personal and sport demands (Brown et al. 2015; Galambos, Terry, Moyle, & Locke, 2005; Johnson & Ivarsson, 2011). Hence, it seems crucial to investigate protective factors of stress among this population.

Mindfulness has been associated generally with improved mental health and well-being, and specifically with alleviating anxiety, depression and stress, and enhancing stress management skills (Kabat-Zinn, 1990; Zimmaro et al., 2016). These relationships have been found whether mindfulness is conceptualized as a state which refers to meditation based training, or a trait approach which refers to the tendency to be mindful in everyday life (e.g., Bao, Xue, & Kong 2015; Chiesa & Serretti, 2009; Harrington, Loffredo, & Perz, 2014;

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Hofmann, Sawyer, Witt, & Oh, 2010; Weinstein et al., 2009). Hölzel, Lazar, Gard, Schuman-Olivier, Vago, and Ott, (2011) proposed that the attenuating effect of mindfulness on stress is due to improved self-regulation of attention, thoughts, emotion, body awareness and a change in perspective of inner and outer experiences. Particularly, attentional aspects of mindfulness seem to enhance one's capability to detect and be aware of stress symptoms (Kabat-Zinn, 1990), an important antecedent of effective coping (Lazarus & Folkman's, 1984). In agreement with this idea Bränström, Duncan, and Moskowitz, (2011) proposed that higher dispositional mindfulness levels can lead to an increased awareness of stress symptoms at low levels, which may result in enhanced coping resources. In addition to this explanation, it was suggested that higher dispositional mindfulness levels may facilitate the ability to observe stressors as they arise, in a more receptive way, which buffers threat appraisals and improves coping (Bränström et al., 2011; Zimmaro et al., 2016). Further, Bishop et al. (2004) suggested that mindfulness comprises of a self-regulation component which includes the capacity to stay in the present moment and maintain focus on the immediate experience, including the ability to move attention flexibly, and reduce excessive or ruminative thinking (Meland, Fonne, Wagstaff, & Pensgaard, 2015).

Dispositional mindfulness has been associated with reduced stress in university students (e.g., Palmer & Rodger, 2009; Soysa & Wilcomb, 2015; Weinstein et al., 2009; Zimmaro et al., 2016). Particularly, the five facets of dispositional mindfulness have shown to play discrete roles on stress and psychological well-being (e.g., Baer et al., 2008; Bergin & Pakenham, 2016; Zimmaro et al., 2016). Accordingly, researchers have recommended that studies should use multifaceted measures of mindfulness to capture both attentional and attitudinal aspects of the concept (e.g., Keng & Tong, 2016). For instance, some studies have shown that four of the facets, namely *describe*, *act with awareness*, *non-judge* and *non-reactivity*, were positively associated with psychological well-being in psychology students

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and highly educated individuals (Baer et al., 2008) as well as negatively associated with perceived stress, depression and anxiety in law students (Bergin & Pakenham, 2016). However, the *observe* facet was negligibly associated with indicators of well-being in these populations across both studies, though was a positive predictor of anxiety in law students (Bergin & Pakenham, 2016). Moreover, Bergin and Pakenham (2016) also found that the *describe* and *observe* facets moderated the relationships between perceived stress and depression in university law students, thereby suggesting that these particular facets may play important roles in buffering the stress-depression relationship. Therefore, the discrete role each facet of mindfulness plays on stress may be dependent on the student population sampled and their unique context (i.e., common sources of stress experienced by the population) (Bergin & Pakenham, 2016). However, research has yet to examine variables that mediate the relationship between each facet of mindfulness and stress. To this end, a central aim of this study is to examine potential mediators of the relationships between the five facets of mindfulness and stress among student-athletes, a population who experience a range of unique training, travel, selection and competition demands. This knowledge will enhance our understanding about the potential utility of mindfulness as a tool to suppress stress in this population. Given that mindfulness may attenuate stress via improved self-regulation (e.g., Bishop et al., 2004; Hölzel et al., 2011), one potential factor that may account for this relationship is one's perception about being able to cope effectively with a stressor.

Coping is defined as all conscious cognitive and physical efforts aimed at managing the demands that are evaluated as taxing a person's resources. Coping effectiveness refers to the successfulness of a coping strategy in managing demands that are appraised as taxing (Lazarus & Folkman, 1984). Thus, although we may attempt to cope with a demand, only when we perceive that we are able to effectively cope will this reduce or eliminate stress, whereas coping that is perceived as ineffective will have little impact on alleviating stress

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(e.g., Lazarus, 1999). A plethora of studies have revealed that coping effectiveness is negatively associated with stress intensity experienced by athletes (e.g., Kaiseler, Polman, & Nicholls, 2012; Laborde, Dosseville, Guillén, & Chávez, 2014).

Dispositional mindfulness has also been associated with coping among university students (e.g., Palmer & Rodger, 2009, Weinstein et al., 2009). Specifically, research suggests that dispositional mindfulness is associated with a predisposition to appraise future stressors in a non-threatening way and use lower avoidant coping strategies (Weinstein et al., 2009). Further, dispositional mindfulness has been positively associated with problem-focused coping and negatively associated with avoidant coping (Palmer & Rodger, 2009). Although these findings provide insight into the link between mindfulness and coping ‘usage’ (i.e., how much a certain coping strategy was used), it is yet to be determined whether mindfulness is associated with an individuals’ perception that they can cope effectively when faced with a demanding stressor. Lazarus and Folkman (1984) proposed that coping strategies are not inherently effective or ineffective, a particular coping strategy or a combination of strategies may be effective in one situation and not in another. Hence, although much of the literature suggests that mindfulness improves well-being through enhancing the use of effective coping and decreasing the use of ineffective coping (Bishop et al., 2004; Keng & Tong, 2016; Palmer & Rodger, 2009; Weinstein et al. 2009), empirical research is still required to test this assumption. Moreover, research has yet to determine which facets of mindfulness are associated with coping effectiveness and whether coping effectiveness mediates the mindfulness – stress relationship. The current paper will provide insight using a university student-athlete population.

Another dispositional variable that may influence the level of stress experienced by student-athletes is *ruminatio*n. Although, rumination has been conceptualised in many ways, it is typically associated with thinking repeatedly about negative feelings, thoughts or

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behavior (see Smith & Alloy, 2009). For this study, we adopt the goal-progress theory perspective of rumination (Martin & Tesser, 1996) which centres rumination on goal attainment. This is particularly relevant to student-athletes who are focused on performing in at least two achievement contexts; namely education and sport. Specifically, from this perspective rumination is a response to failure to progress satisfactorily towards a goal, which can result in emotional (e.g., negative affect, stress) and cognitive (e.g., consuming cognitive resources) consequences. Indeed, studies have consistently reported that rumination is a positive predictor of stress across various contexts (e.g., Morrison & O'Connor, 2005; Samaie & Farahani, 2011). Moreover, those who ruminate in response to stress have also been associated with increased vulnerability of depression and substance misuse (Skitch & Abela, 2008). An important type of rumination is one associated with repeated reflection on past poor decisions, which Kinrade Jackson, Ashford, and Bishop (2010) termed as decision rumination. Thinking repeatedly about previous unsuccessful decisions could result in increased negative emotional consequences, and in turn increased experience of stress.

Mindfulness has the potential to reduce stress through regulating ruminative modes of thinking (e.g., Bishop et al., 2004). Mindful qualities of staying in the present and viewing moment by moment experiences in a non-judgmental and non-reactive manner seem likely to detract ruminative thinking. In line with this suggestion, studies have revealed that dispositional mindfulness (e.g., Raes & Williams, 2010) and mindfulness based stress reduction training (Shapiro, Brown, & Biegel, 2007) have been negatively associated with rumination. However, the role of different facets of mindfulness on ruminative thinking has yet to be determined. Given the proposed routes to which mindfulness can reduce rumination, it is possible that student-athletes that are more able to attend to present moment activities (*act with awareness*) and less likely to judge (*non-judge facet*) their inner experiences will be less inclined to reflect on past poor decisions (decision rumination). To date, no research has

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specifically investigated the links between the five facets of mindfulness on decision rumination or between decision rumination and stress. Given that mindfulness is proposed to reduce stress through self-regulation capacities which can include regulating ruminative modes of thinking (Bishop et al., 2004), it is plausible that the relationship between mindfulness and stress could be mediated by decision rumination.

The Present Study

Mindfulness has been identified as a potential suppressor of stress (e.g., Kabat-Zinn, 1990), however the role of dispositional mindfulness and each of its facets on life stress in student-athletes and variables that mediate these relationships has yet to be investigated. To this end, the primary aim of this paper is to investigate the relationship between the five facets of mindfulness and life stress in student-athletes and whether coping effectiveness and decision rumination mediate these relationships. Informed by previous research investigating the relationship between the five facets of mindfulness and psychological symptoms among non-athlete university students, it is hypothesized that four mindfulness facets (e.g., *describe*, *non-reactivity*, *non-judge* and *act with awareness*) will negatively predict life stress, and this will be mediated via mindfulness being positively related with coping effectiveness and negatively related with decision rumination. In contrast, it is expected that the *observe* facet of mindfulness will be negligibly or perhaps positively associated with life stress.

Methods

Participants

Participants were 202 UK student-athletes (male $n = 150$; female $n = 52$) with an average age of 19.83 ($SD = 1.74$) years, who were completing a sport and exercise related undergraduate degree at the time of data collection. Participants competed in their respective sports at international/ national (19%), county (41%), and club/university (40%) levels (1%

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did not report their playing standard) with an average of 9.51 ($SD = 4.02$) years of experience.

Measures

Dispositional mindfulness. Mindfulness was assessed using the 39-item Five Facets of Mindfulness Questionnaire (Baer et al., 2006). This instrument measures the tendency of an individual to use each of the five facets of mindfulness in daily life: *observe*, *describe*, *act with awareness*, *non-reactivity*, and *non-judge* of the inner experience. The items are rated on a 5-point Likert-type scale anchored from 1 (*never or very rarely true*) to 5 (*very often or always true*). The multifaceted instrument includes eight *observe* items (e.g., “I pay attention to the sensations, such as the wind in my hair or sun on my face”), seven *non-reactivity* items (e.g., “I watch my feelings without getting lost on them”), eight *describe* items (e.g., “Even when I am feeling terribly upset, I can find a way to put it in into words”), eight *act with awareness* items (e.g., “I find myself doing things without paying attention” [reverse scored]), and eight *non-judge* items (e.g., “I think some of my emotions are bad or inappropriate and I shouldn’t feel them” [reverse scored]). Baer et al. (2006, 2008) provided psychometric support for the measure including the internal consistency ($\alpha = .72$ to $.92$) and the validity of its subscales.

Stress. Student-athletes life stress was measured using the The College Student-Athletes’ Life Stress Scale (Lu, Hsu, Chan, Cheen, & Kao, 2012). This measure was developed to assess college student-athletes’ life stress which includes relational, academic and sport demands. Participants were asked to rate the frequency of each demand on a 6 point Likert-type scale which ranged from 1 (*never*) to 6 (*always*). We used six of the measure’s eight subscales. Specifically, we included the three items of each of the following subscales: performance demands (e.g., “*I worry about my unstable competitive performance*”), coach relationship (e.g., “*I am annoyed by my disappointing relationship with my coach*”), training

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adaption (e.g., “*I worry that my training is not beneficial to my performance*”), interpersonal relationships (e.g., “*I am bothered about my poor skills in handling interpersonal relationships*”), family relationships (e.g., “*I am annoyed by my parents high expectations*”), and academic requirements (e.g., “*I worry about my academic skills because I do not know how to learn efficiently*”). We did not include the sport injury or the romantic relationships subscales because it is possible that not all participants would have been injured or in a romantic relationship at the time of data collection. Accordingly, this could lead to some ambiguity in terms of the interpretation of stress based on these demands for some participants. For instance, a score of “never” could either mean the demand is not relevant to the participant, or that if faced with it the student-athlete is neither bothered nor annoyed by it. Therefore, we decided to include only the six demands for which participants are likely to have recent experience of.

The coach relationships, interpersonal relationships and academic requirement subscales represented very good internal consistency (α 's = .71 to .79) in our sample. However, the alpha coefficient for the other three subscales were below the satisfactory $\alpha = .7$ (α 's = .59 to .65) which can be a concern with subscales that comprise of a small amount of items. Acknowledging these inconsistencies, as all subscales were moderately to highly correlated with each other ($r = .39$ to $.69$) and for the reason that we were interested in overall athlete life stress, consistent with previous research (Lu et al., 2016) we averaged all the items to provide an overall life stress score.

Coping effectiveness. Coping effectiveness was assessed using the coping effectiveness scale (Gottlieb & Rooney, 2004). This instrument assessed how effectively the athletes were coping with a recent notable sport-related stressor. Items in this questionnaire include “*The ways I try to cope with this problem are not working too well these days*” [reverse scored], “*I am dealing with this stressor better than I used to*” and “*I don't have any*

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control over this stressor” [reverse scored]). The coping effectiveness scale is a 7-item scale, in which participants were asked to report the effectiveness of their coping with the reported stressor on a 5-point Likert-type scale, anchored from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The psychometric properties of the measure have been supported in previous research, including its internal consistency (α 's = .69 to .80) (Gottlieb & Rooney, 2004; Nicholls, Levy, & Perry, 2015).

Decision rumination. Rumination was measured using the 7-item decision rumination subscale from the Decision-Specific Reinvestment Scale (Kinrade et al., 2010). Participants were asked the extent to which each item characterizes them on a 5-point Likert-type scale anchored from 0 (*extremely uncharacteristic*) to 4 (*extremely characteristic*). An example item is (e.g., “*I often find myself thinking over and over about poor decisions that I have made in the past*”). Kinrade et al. (2010) provided psychometric support for the construct validity and internal consistency of this measure ($\alpha = .89$ to $.91$).

Procedure

The research was approved by the University's Research Ethics Committee and participants provided informed consent prior to participating. Experienced researchers administered the questionnaires to all participants in the second semester which followed an exam period, and where students were involved with completing assessments as well as balancing out academic study with sporting commitments. Instructions about how to complete the questionnaire were provided orally and in written format, and participants were encouraged to ask questions about the study. Questionnaires were completed anonymously and took approximately 15-20 minutes to complete. Following completion, participants returned the questionnaire directly back to the researcher and were thanked for their participation and debriefed.

Results

Data Screening

Prior to the main analyses, preliminary analyses were conducted to explore the data for missing values, outliers, and to evaluate the assumptions underlying correlation and regression analyses. Data screening revealed no missing data and no extreme outliers (i.e., values greater than 3 *SDs* from the mean). Normality of the data was checked by examining univariate skewness and kurtosis scores which revealed no significant deviation from normality with scores between -1.96 and 1.96 . We also examined normality, linearity and homoscedasticity by inspecting residual scatter plots. These assumptions were all met. Finally, we found no evidence of multicollinearity (Tolerance $> .70$, Variance Inflation Factor < 2).

Descriptive Statistics, Correlations and Internal Consistency

Scale reliabilities, descriptive statistics and correlation coefficients are presented in Table 1. Cronbach's (1951) alpha coefficients demonstrated that all scales represented good internal consistency, apart from the coping effectiveness ($\alpha = .64$) and *non-reactivity* facet of mindfulness scale, which reflected reasonable internal consistency. In terms of the coping effectiveness scale, when we deleted Item 6 "I can find more or different ways of trying to cope with this stressor", the remaining composite 6-item coping effectiveness scale was good ($\alpha = .71$). The removal of this item is consistent with the approach used in previous research (e.g., Nicholls et al., 2015). Preliminary analyses also revealed gender differences were only found for stress, whereby females ($M = 2.67$, $SD = 0.85$) reported experiencing more stress than males ($M = 2.42$, $SD = 0.76$), $t(200) = 2.00$, $p = .047$.

The correlations between the facets of mindfulness ranged from very weak to moderate supporting the notion that each facet of mindfulness is an independent construct. Correlations revealed that *act with awareness* and *non-judge facets* were positively related, and the *observe* facet negatively related, with coping effectiveness. In contrast, *act with*

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awareness and *non-judge facets* were negatively related, and the *observe* facet was positively linked, with decision rumination. As expected, coping effectiveness was negatively associated with stress and decision rumination, and decision rumination was positively associated with stress.

Mindfulness on Stress

Correlation coefficients revealed that the *observe* facet of mindfulness was positively linked with stress, whereas *describe*, *act with awareness* and *non-judge facets* were all negatively associated with stress. Multiple regression analyses yielded that the facets of mindfulness accounted for 39% of variance in life stress, $F(5, 196) = 25.44, R^2 = .39, p < .001$. Specifically, the *observe* facet ($b = .20, p = .01$) was a positive predictor of life stress. In contrast, *act with awareness* ($b = -.37, p < .001$) and *non-judge* ($b = -.28, p < .001$) facets were negative predictors of life stress. The *describe* ($b = -.13, p = .07$) and *non-reactivity* ($b = .04, p = .64$) facets were not significant predictors of life stress in the model.

Coping Effectiveness and Rumination as Mediators

To test for mediation, bootstrapping was performed using the PROCESS macro for regression analyses using the Statistical Package for the Social Sciences (SPSS) v2.13 (Hayes, 2013). Bootstrapping is a resampling method that constructs confidence intervals around the point estimate of the indirect effect from multiple bootstrap samples (Preacher & Hayes, 2008). When the confidence interval for an indirect effect does not cross zero, there is evidence of mediation. Each model was run as multiple mediator models with 5,000 bootstrapped samples testing the indirect effect of coping effectiveness and decision rumination. We report the unstandardized coefficients as well as the 95% confidence intervals (CIs) of the indirect effects.

As shown in Figures 1A to 1C, the relationships between *observe*, *act with awareness* and *non-judge* facets with stress were attenuated when controlling for coping effectiveness

and decision rumination in the regression models. As expected, coping effectiveness was a negative predictor of stress, whereas decision rumination was a positive predictor of stress. The *observe*, *act with awareness* and *non-judge* facets were all significant predictors of coping effectiveness and decision rumination. These suggested that higher levels of the *observe* facet was associated with lower coping effectiveness and higher decision rumination. In contrast, higher levels of *act with awareness* and *non-judge facets* were associated with higher coping effectiveness and lower decision rumination. As shown in Table 2, mediation analysis revealed that the indirect effect of both coping effectiveness and decision rumination were only significant for the effects of the *observe*, *act with awareness* and *non-judge* facets of mindfulness on stress. The indirect effects remained consistent when controlling for participants' gender, age and years of experience in sport. Taken together, these findings reflect that the *observe* facet of mindfulness was a positive predictor of stress via being negatively associated with coping effectiveness and positively associated with decision rumination. In contrast, the *act with awareness* and *non-judge facets* were negative predictors of stress via being positively associated with coping effectiveness and negatively associated with decision rumination.

Discussion

The purpose of the current study was to investigate variables that mediate the relationship between the five facets of mindfulness and life stress among student-athletes. Previous research suggests that student-athletes face unique demands related with their sporting academic lives (e.g., Brown et al., 2015). In addition, although theoretically the literature proposes that the use of mindfulness acceptance-commitment protocols should be a model to work with athletes to enhance psychological and general well-being (Gardner & Moore, 2004), to our knowledge there are no published studies that have investigated the relationship between the facets of mindfulness and life stress in student-athletes. To this end,

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this study aimed to investigate the relationship between the five facets of mindfulness and life stress among a student-athlete population, and whether coping effectiveness and decision rumination mediated these relationships. Overall, the findings show that the *act with awareness* and *non-judge* facets of mindfulness negatively predicted life stress in student-athletes, whereas the *observe* facet was a positive predictor of life stress. Moreover, these relationships were mediated through coping effectiveness and decision rumination.

Three out of the five facets (i.e., *observe*, *non-judge* and *act with awareness*) of mindfulness significantly contributed to life stress suggesting these particular facets have a role to play on life stress among student-athletes. Specifically, the *non-judge* and *act with awareness* facets were found to be negative predictors of life stress, whereas the *observe* facet was a positive predictor of life stress. These relationships reflected medium to large effect sizes. Our findings partly support previous research conducted among university psychology (Baer et al., 2008) and law (Bergin & Pakenham, 2016) student populations investigating the different facets of dispositional mindfulness and their role on psychological well-being (e.g., Baer et al., 2008). Particularly, Baer et al. (2008) found that psychological well-being in psychology students was positively predicted by the *non-judge* and *act with awareness* facets, along with the *describe* and *non-reactivity* facets, whereas *observe* was a negative predictor of psychological well-being. Therefore, our findings provide further support for the need to consider the discrete role of each facet of mindfulness on well-being. It also highlighted the distinct effects of each facet of mindfulness, with *non-judge* and *act with awareness* appearing the strongest negative predictors of the facets of mindfulness on life stress among student-athletes.

As expected, coping effectiveness was a negative predictor, whereas decision rumination was a positive predictor, of life stress. The correlations for both coping effectiveness and decision rumination with stress represented medium to large effect sizes.

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These findings add support to previous research that has shown that coping effectiveness is associated with improved emotional well-being (Folkman & Moskowitz, 2004) and enhanced performance in sport (e.g., Haney & Long, 1995). Findings also corroborate previous studies showing rumination as a key factor that can enhance stress (e.g., Morrison & O'Connor, 2005; Samaie & Farahani, 2011). Therefore, student-athletes who believe they have the resources to cope effectively when faced with a stressor in their sport and/or ruminate less over past poor decisions that have hindered progress towards a goal are associated with being less likely to experience high levels of life stress.

Interestingly, certain facets of mindfulness (e.g., *observe*, *act with awareness* and *non-judge*) predicted life stress among student-athletes through coping effectiveness and decision rumination. Specifically, the negative relationship between *non-judge* and *act with awareness* with stress was mediated through being positively associated with coping effectiveness and negatively associated with decision rumination. These findings make conceptual and theoretical sense. Having a tendency to attend to the present moment in a non-distractive way (i.e., *act with awareness*) and not evaluating thoughts and feelings (i.e., *non-judging*) helps student-athletes to; a) feel that they have the resources to deal with life stressors (cope more effectively), and b), suppress reflection on past poor decisions (ruminate). An alternative explanation for the findings is that higher levels of *act with awareness* and *non-judge* may reduce the level of stress experienced, resulting in less use of coping resources and the individual feeling more capable to deal with the situation (Bränström et al. 2011). Since coping resources was not assessed in the current study, future research is warranted to test this possibility.

Our findings suggest that *the act with awareness* and *non-judge* facets may be useful to develop through training in order to improve effective coping, reduce ruminative modes of thinking, and in turn, alleviate or manage stress in student-athletes. On the other hand, the

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observe facet was a positive predictor of student-athlete life stress through being negatively associated with perceived coping effectiveness and positively associated with decision rumination. Such findings are consistent with previous research that has found the *observe* facet to positively correlate with maladaptive constructs (e.g., Baer et al., 2008; Tomfohr, Pung, Mills, & Edwards, 2015). Positive associations between the *observe* facet and psychological well-being have been limited to experienced meditators (Baer et al., 2008); implying that it is not enough to be in tune with sensations and experiences, you need to understand how to interpret this specific information in a positive way (Bränström et al., 2011). Without meditation training, observation of the present moment experiences may be biased (Eisenlohr-Moul, Walsh, Charnigo, Lynam, & Baer, 2012). Eisenlohr-Moul et al. (2012) proposed that it is only when you train to be accepting and nonreactive that can a heightened *observe* disposition be beneficial. Future research is required to explore the moderating role of meditation experience between the *observe* facet and life stress in student-athletes.

The current study found that *describe and non-reactivity* facets did not predict life stress, coping effectiveness or decision rumination among student-athletes. Bishop et al. (2004) acknowledged that one's ability to describe thoughts and feelings is important. However, both the *describe* facet and the ability to allow sensations, cognitions and emotions to come and go, without getting caught up in them (*non-reactivity* facet) may likely be better predictors of an individual's cognitive attributes, such as flexible cognitive control (see Anicha, Ode, Moeller, & Robinson, 2012) than variables that explain general life stress.

The findings from this study provide some potential practical implications for athletes, coaches, and practitioners in higher education, as well as sport psychologists aiming to help student-athletes manage life stress associated with the multiple demands that they face. Specifically, practitioners may wish to target the *act with awareness* and *non-judge* facets of

mindfulness to facilitate stress-management in student-athletes. Such mindfulness strategies may include taking a non-evaluative approach to previous decisions, encourage more respective thoughts and feelings as well as train student-athletes to pay attention to actions in the present moment.

Limitations and Future Research

Though this study provided novel insight into the role of mindfulness on stress in student-athletes, it is important to acknowledge the findings in light of the study's limitations. First, the study was cross-sectional in nature, therefore we can only infer with reference to theory and previous empirical research the temporal direction of the relationship between mindfulness and stress, and the mechanisms accounting for this relationship. Theoretically, it has been proposed that mindfulness helps to alleviate stress through enhancing self-regulation of thoughts, attention and emotion (e.g., Hölzel et al., 2011). Moreover, although the cross-sectional nature of the study cannot infer the temporal direction of effects, arguing the opposite direction of effects whereby current or recent stress would affect dispositional mindfulness (a trait variable) would hold less empirical (e.g., Soysa & Wilcomb, 2015), theoretical (e.g., Bishop et al., 2004; Hölzel et al., 2011) and practical grounding. Future research should adopt experimental, longitudinal or intervention based designs to help further establish the direction of these relationships and determine the unique role that each facet of mindfulness has on stress and its mediators. Some researchers have also considered mindfulness as a state construct (e.g., Tanay & Bernstein, 2013). Given that mindfulness requires cognition to facilitate self-regulation (e.g., Bishop et al., 2004; Hölzel et al., 2011) and high stress can potentially affect cognitive functioning (e.g., Sandi, 2013), it is possible that in a situational context when one is under high stress this could disrupt state mindfulness. Similarly, stress could also result in higher use of state mindfulness to manage and counteract such demands and thereby reduce the stress experienced. Given that dispositional

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mindfulness helps to detect, and buffer, stress as it arises (e.g., Bränström et al., 2011; Zimmaro et al., 2016), it is possible that relationships between state mindfulness and stress could be moderated by dispositional mindfulness. Research investigating the relationships amongst state mindfulness and stress in athletes, and testing variables that may moderate any relationship would provide an interesting avenue for future research.

Second, all participants completed the questionnaires in a fixed order because we were concerned that asking participants to switch back and forth between dispositional and sport-specific scales could potentially confuse participants and compromise the validity of the measures; however, we acknowledge that not counterbalancing the questionnaires may open up the possibility of order effects.

Third, coping effectiveness was only measured in relation to one selected sport stressor, therefore it is not possible to determine whether the effectiveness reported for this one stressor is true when dealing with a range of other sport, academic or general life stressors. Fourth, the focus of this study was on decision rumination, and as such, it did not consider other aspects of rumination (e.g., on negative affect). Future research may wish to investigate other dimensions of rumination, as well as other potential mediators on the link between facets of mindfulness and stress. Moreover, researchers may wish to identify potential moderators (such as meditation experience, Baer et al., 2008) on the mindfulness - stress relationship that will help inform whether mindfulness interventions need to be tailored for different populations.

Conclusion

The results of the present study suggest that mindfulness is associated with student-athlete's experience of life stress. In particular, the facets *act with awareness* and *non-judge* were found to negatively predict life-stress in student athletes, through being associated with higher coping effectiveness and lower decision rumination. In contrast, the *observe* facet was

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found to positively predict stress potentially via lower coping effectiveness and higher decision rumination. The findings suggest that mindfulness might be useful to help student-athletes manage life stress and improve key self-regulation skills, and it appears important for both practitioners and researchers to consider each facet of mindfulness independently.

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Table 1. Descriptive statistics, correlations for mindfulness, coping effectiveness and stress.

	1	2	3	4	5	6	7	8
1. Observe	(.72)							
2. Describe	.22**	(.82)						
3. Act awareness	-.15*	.21**	(.84)					
4. Non-judge	-.40***	.10	.32***	(.88)				
5. Non-reactivity	.33***	.24***	.04	-.16*	(.67)			
6. Coping effect.	-.19**	.02	.38***	.27***	.02	(.71)		
7. Rumination	.27***	-.10	-.36***	-.56***	-.04	-.37***	(.90)	
8. Stress	.32***	-.17*	-.51***	-.48***	.08	-.46***	.54***	(.89)
9. Gender	-.13	-.08	.10	.11	-.01	.06	-.12	-.14*
<i>M</i>	2.96	3.32	3.06	3.40	2.95	3.44	2.17	2.48
<i>SD</i>	0.66	0.68	0.68	0.77	0.57	0.75	0.96	0.79

Internal consistencies are presented in parentheses. Note, * $p < .05$, ** $p < .01$, *** $p < .001$

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Table 2. The indirect effect of coping effectiveness and rumination on the relationship between mindfulness facets and stress.

	Coping effectiveness		Rumination	
	Indirect Effect	95% CI	Indirect Effect	95% CI
Observe	0.06	0.02, 0.13	0.12	0.06, 0.20
Describe	0.01	-0.05, 0.06	-0.05	-0.13, 0.03
Act with awareness	-0.10	-0.17, -0.04	-0.15	-0.23, -0.08
Non-judge	-0.08	-0.14, -0.04	-0.17	-0.27, -0.09
Non-reactivity	0.01	-0.05, 0.08	-0.02	-0.13, 0.08

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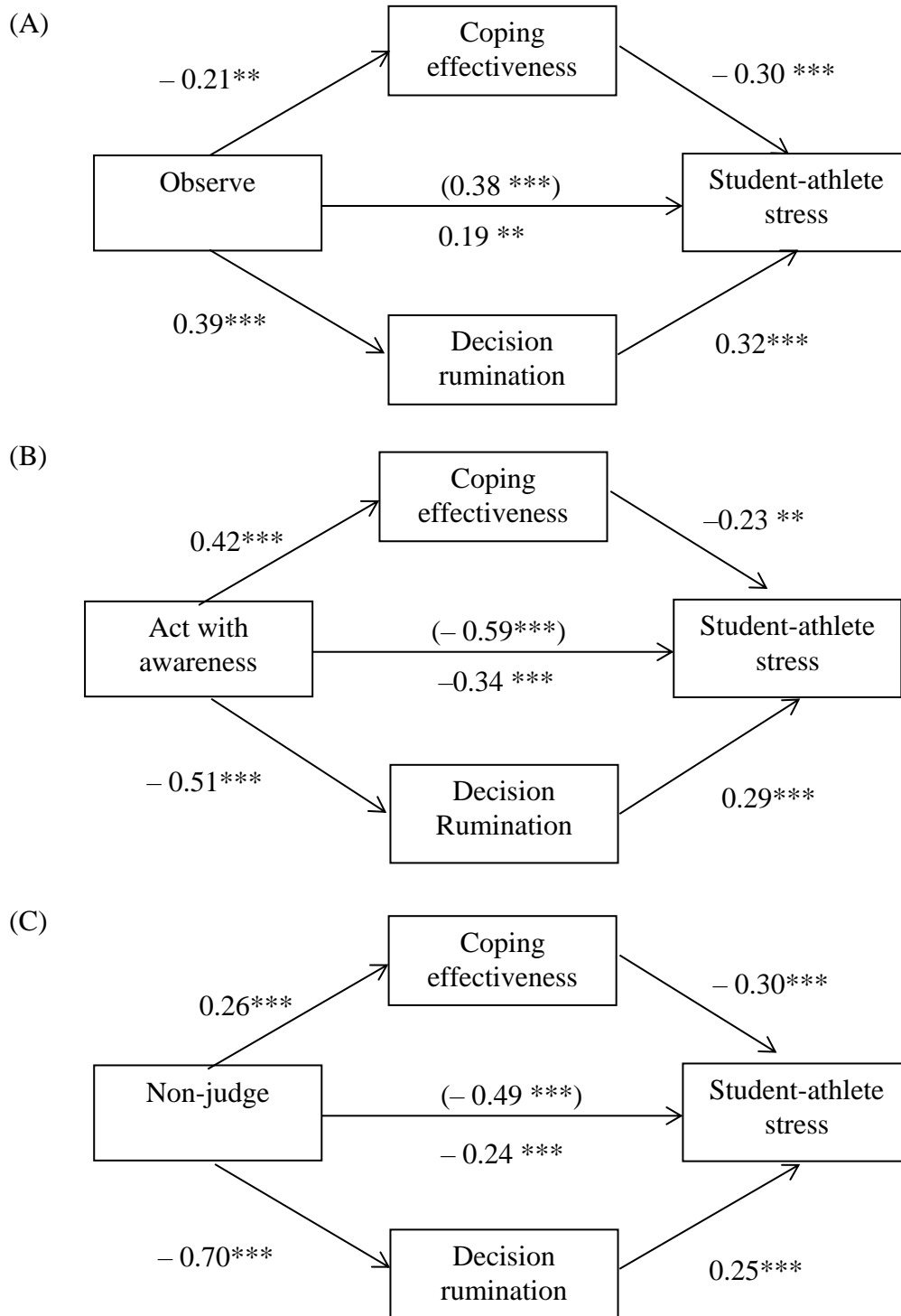


Figure 1. Multiple parallel mediation models for the indirect effects of coping effectiveness and decision rumination on the relationship between observe (A), act with awareness (B) and non-judge (C) facets and stress. Unstandardized regression coefficients are presented. The uncorrected coefficient for the link between each facet of mindfulness and student-athlete stress is in brackets. $*p < .05$, $**p < .01$, $***p < .001$