CSSHE
SCÉES

Canadian Journal of Higher Education
Revue canadienne d'enseignement supérieur
Volume 47, No. 2, 2017, pages 121 - 134

Mindfulness Correlates with Stress and Coping in University Students

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Abstract

Mindfulness has received significant attention in the empirical literature during the past decade, but few studies have focused on mindfulness in university students and how it may influence problematic behaviours. This study examined the relationships among mindfulness, coping, and physiological reactivity in a sample of university students. Participants completed questionnaires, and skin conductance measurements were collected during an interview where they recalled a personally stressful event. Correlation analyses tested relationships among these variables. There was a negative correlation between substance use and mindfulness. Specifically, those using substances as a coping mechanism were less likely to be mindful and displayed higher physiological reactivity. More mindful individuals were less likely to report misusing substances and were able to calm themselves more quickly than their counterparts following a stressful event. Thus, poor outcomes for distressed students may be reduced with mindfulness-based interventions.

Résumé

Au cours des dernières décennies, la pleine conscience a été l'objet d'une attention importante dans la documentation empirique, mais peu d'études ont ciblé la pleine conscience chez les étudiants et sa façon d'influencer les comportements problématiques. Cette étude a étudié l'association entre la

pleine conscience, les mécanismes d'adaptation et la réactivité physiologique chez un échantillon d'étudiants. En plus de répondre à des questionnaires, les participants ont dû passer une entrevue où il leur fallait raconter un souvenir personnel particulièrement stressant pendant qu'on mesurait leur conductance cutanée. Des analyses de corrélation ont évalué les liens entre ces variables. Ainsi, on a dénoté une corrélation négative entre l'utilisation de substances nocives et la pleine conscience. Plus précisément, les participants qui avaient consommé des substances nocives comme mécanisme d'adaptation avaient moins tendance à posséder des traits conscients, et ont démontré une réactivité physiologique plus élevée que les autres étudiants. Les gens plus pleinement conscients avaient moins tendance à utiliser des substances nocives, et étaient capables de se calmer plus rapidement que leurs pairs après un événement stressant. Par conséquent, des interventions basées sur la pleine conscience pourraient aider les étudiants stressés à ne pas adopter de comportements problématiques.

As students enter university life and encounter all of the stressors, both positive and negative, that are part of that experience, they are also transitioning from adolescence into burgeoning adulthood. They are moving away from home and its many support systems. Academic demands, social challenges, and uncertainty about the future are linked to increased levels of stress (Deasy, Coughlan, Pironom, Jourdan, & McNamara, 2014). In addition to these pressures, financial burdens contribute to the strain likely to overwhelm students (Deasy et al., 2014). With respect to feeling overwhelmed, reports over the past several years have revealed consistently high levels of anxiety and depression in university students (Regehr, Glancy, & Pitts, 2013; Schmidt, Sieverding, Scheiter, & Obergfell, 2015). In the absence of a healthy means to cope or proper support networks, this increase in stress levels can be extremely taxing on the body. It is therefore not surprising that maladaptive coping strategies and unhealthy lifestyle choices are both prevalent and problematic in this population (Deasy et al., 2014; Schmidt et al., 2015).

Stress can be described as a state of being; the body perceives something outside itself as threatening and enters a heightened state of arousal (Frydenberg, 2014). There are several forms of stress—both beneficial and deleterious (Frydenberg, 2014). Healthy stress occurs when a stressor serves as a motivator to assist in accomplishing a task (Frydenberg, 2014). Stress is more commonly thought of in its negative form, when it is distressing and limiting to productivity and achievement. Although both forms ultimately use up energy resources, it is only adverse sources of stress that are unprofitable for the individual. Stress is a near constant across development and individuals. Early stress, and our response to it, predicts the impact of stress in young adulthood (Karatoreos & McEwan, 2013). Although many are able to adjust and develop highly adaptive functioning in the context of stress, others do not fare as well. Some coping styles—for example, avoidance and denial—may allow an individual to function in highly unfavourable living conditions, such as those of abuse or poverty (Wadsworth, 2015). However, these unhealthy forms of coping are no longer functional when applied to novel, less extreme environments. Having lost their adaptive effectiveness, such methods become dysfunctional and are linked to the development of physical and psychological distress in adulthood (Wadsworth, 2015).

The ability to quickly respond to perceived stress was once critical for human survival. Due to an abundance of risks in the environment, our ancestors survived based on their ability to respond to immediate threats and accurately anticipate future ones (McKlveen, Myers, & Herman, 2015). As this response capacity was so adaptive for human survival, the efficiency of the stress response has been maintained in the gene pool. The conservation of this process can be seen through the actions of the central nervous system. When individuals are threatened, the sympathetic branch of their autonomic nervous system can activate a "fight-or-flight" response (McCorry, 2007). This process is most easily understood in terms of an externally perceived threat, such as a menacing person in the immediate environment. Internally perceived threats are more complicated to observe because the mind interprets a set of conditions as personally threatening, and the result is heightened nervous system activation (Karatoreos & McEwen, 2013). These internally perceived threats, though not necessarily physically dangerous, may signal a threat to a goal that the person has identified as important, such as social status, academic success, or career achievement (McKlveen et al., 2015).

Although these bodily responses are involuntary, the autonomic nervous system does not function independently of the rest of the nervous system. Admittedly, some reflexes are involuntary and occur at the level of the brain stem and spinal cord, but certain autonomic responses are regulated by higher-order brain structures such as the hypothalamus (Kreibig, 2010). In such cases, emotional stress responses can be consciously mediated, albeit with effort (McKlveen et al., 2015). When chronic stress causes sustained arousal, executive functions can be negatively impacted, including decision making, planning, and response inhibition (McKlveen et al., 2015). Perhaps more importantly, impairment in these functions causes further deterioration, as these are also the tools needed to adapt to a stressor in the environment (McKlveen et al., 2015).When we consider these factors, the challenges to healthy and productive forms of coping become evident, particularly in instances of daily elevated stress, such as those experienced by postsecondary students.

Regardless of when stress occurs or at what level, there is a significant body of research to suggest that individuals can learn to cope more effectively with life events. For some, healthy coping may be promoted through compassion-oriented practices, such as mindfulness-based therapies. Although mindfulness originates in the meditation practices of the Buddhist tradition, the contemplative practices of mindfulness have been adapted for use in secular therapeutic approaches, such as Mindfulness-Based Cognitive Therapy (MBCT; Segal, Williams, & Teasdale, 2002) and Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1982). With these interventions, the individual is taught to concentrate attention on immediate internal and external cues in the environment without becoming emotionally engaged (Grossman & Van Dam, 2011). Research suggests that mindful individuals are able reduce sympathetic nervous system arousal when distressed, resulting in a greater capacity for emotional regulation (Keng, Smoski, & Robins, 2011).

Trait mindfulness has been described as an inherent capacity for awareness of the present without judgement of that experience; all people have it to some degree (Kabat-Zinn, 1990). Although individuals without training in contemplative practices may possess latent mindfulness, most individuals improve their level of state mindfulness through habitual practice and training (Baer, 2003; Brown & Ryan, 2003; Bishop et al., 2004). The two components thought to be most essential in mindfulness are the ability

to (i) focus on the present and (ii) use non-judgmental appraisal of one's thoughts and actions (Baer, 2003; Bishop et al., 2004; Grossman, Niemann, Schmidt, & Walach, 2004; Holzel et al., 2011). Specifically, thoughts, feelings and sensations are observed and accepted as existing, without appraisal or classification (Baer, 2003; Bishop et al., 2004). These two conditions of mindfulness may act as a protective buffer against maladaptive coping mechanisms that arise under conditions of stress—for instance, avoidance, suppression, and obsessive thoughts (Keng et al., 2011). These components are also assumed to be part of both state and trait mindfulness. Trait mindfulness has been associated with positive life outcomes, including mental and physical health, social relationships, and life satisfaction (Brown et al., 2007; Grossman et al., 2004, Keng et al., 2011).

While mindfulness-based interventions are likely to improve overall functioning in distressed students (Palmer & Rodger, 2009; Warnecke, Quinn, Ogden, Towle, & Nelson, 2011), inherent trait mindfulness may also increase the likelihood of choosing positive forms of coping over more harmful strategies, such as consumption of alcohol. In non-clinical populations, higher levels of self-rated mindfulness have been linked to lower levels of perceived stress, as well as decreased alcohol and illicit drug use (Bowen & Enkema, 2014; Caldwell, Harrison, Adams, Quin, & Greeson, 2010; Christopher, Ramsey, & Antick, 2013; Warnecke et al., 2011). Furthermore, research suggests that trait mindfulness and mindfulness training may be inversely associated with substance use behaviours (Garland, Roberts-Lewis, Kelley, Tronnier, & Hanley, 2014; Hsin Hsu, Collins, & Marlatt, 2013; Karyadi, VanderVeen, & Cyders, 2014). What remains unclear is how stress, trait mindfulness, and coping behaviours may interact with each other in burgeoning adults. This study served as exploratory research to investigate the relations among self-reported mindfulness, self-reported coping, physiological reactivity, and substance use.

Method

Participants

Participants for this study (N = 51) were recruited using an advertisement in an undergraduate psychology participant pool. In exchange for their participation, students received extra credit in eligible psychology courses. Participant characteristics are detailed in Table 1, including a majority of females (45 females, 88.2% of the sample) with a mean age of 22.02 years (*SD* = 2.98; range = 18–30 years). Participants self-identified in the following ethnic/racial groups: 58.8% Caucasian, 15.7% Other or Mixed Race, 13.7% Asian or of Asian Descent, 7.8% Black/Caribbean/African, 2.0% Aboriginal; 2.0% elected not to answer. These demographics are representative of individuals enrolled in the research pool. Students with a history of allergies to medical equipment (e.g., latex allergy) or with cardiovascular or respiratory disease were excluded through the screening criteria. Students were also screened for hypertension during the experimental protocol, but no participant reached the 140/90 cut-off for hypertension. No participants met exclusionary criteria. Most of the participants had no meditation experience, but three participants indicated that they had at some point practiced meditation for a period of six months or more.

Table 1. *Summary of Participant Characteristics*

		N	%
Gender			
	Female	45	88.2
	Male	6	11.8
Age (years)			
	18–25	44	86.3
	26–30	7	13.7
Ethnicity			
	Aboriginal	1	2.0
	Asian or of Asian Descent	7	13.7
	Black/Caribbean/African	4	7.8
	Caucasian	30	58.8
	Other/Mixed Race	8	15.7
	Prefer Not to Answer	1	2.0

Note: N = 51

Measures

As part of a larger test battery validating self-reported mindfulness with psychophysiological measurement, participants completed self-report measures of demographic and health information, as well as mindfulness and coping traits. These measures were completed as pencil-and-paper tasks.

Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003). The MAAS was used to measure mindful awareness, or the latent ability to remain anchored in the present. The MAAS operates on a six-point scale that asks participants to rate their attentional involvement during 15 everyday experiences (1 = almost always to 6 = almost never)—for example, "I rush through activities without being really attentive to them." The MAAS has documented adequate psychometric processes (Brown & Ryan, 2003). For the present study, the mean MAAS score, obtained by calculating an average score across all items, was 4.00 (SD = .73; range = 2.33–5.53). This variable was demonstrated to have a normal distribution.

Brief COPE inventory (Brief COPE; Carver, 1997). The Brief COPE was used to gather information about commonly employed coping strategies. Participants were asked to describe personal coping strategies on a four-point scale (1 = *I haven't been doing this at all* to 4 = *I've been doing this a lot*) for 28 items—for example, "I've been using alcohol or other drugs to make myself feel better." The Brief COPE is a frequently used measure with this population, with documented psychometric properties. Although the Brief COPE provides scores on multiple subscales, only the Substance Use subscale was used in the present study (Mean Substance Use score = 2.49; *SD* = 1.01; range = 2.00–7.00). The Substance Use subscale is based on two items, which capture the degree to which alcohol and other drugs have been used as a coping strategy.

Procedure

Data collection took place across two separate sessions. During the initial session, participants were oriented to the physiological equipment and study procedures, and then completed self-report measures. At that time, participants were requested to refrain from consuming alcoholic or caffeinated beverages for approximately 12 hours prior to the second session.

At the second session, galvanic skin response (GSR) electrodes were attached to each participant's ring and index fingers on the dominant hand. The change in amplitude of each participant's GSR waveform yielded a value for overall galvanic skin response (Boucsein et al., 2012), and data were tabulated using LabChart software.

After each participant had been set up, physiological data were collected across two baselines (17 minutes in total). An initial seven-minute baseline allowed participants to become accustomed to the testing environment and the sensation of the physiological equipment. Physiological measurements were then collected for 10 minutes during the second baseline, prior to the stressor task. This second baseline was used for statistical analyses contrasting with post-stressor physiological measurements. During the baselines, participants viewed a slideshow containing nature scenes on the computer monitor in front of them as a neutral stimulus. In the next 20 minutes, participants were taken through a stressor task (described below). Following the stressor task, participants experienced a two-minute calming phase wherein the interviewer engaged each participant in neutral conversation. Then, physiological data were gathered for an additional seven minutes during the post-interview phase; again, the same neutral stimulus was used. To validate the stressor interview, participants were asked to rate the intensity of the experience using a scale from 1 to 7 (1 = *not at all stressed* to 7 = *extremely stressed*). Following their participation, all participants were debriefed and given a list of outreach services should they feel any residual stress from their participation.

The stressor task used was the Social Competence Interview (SCI; Ewart & Kolodner, 1991). The goal with the SCI is to recreate the physiological responses surrounding a personally stressful event using an emotional recall interview approximately 20 minutes in length. During the SCI, participants are instructed to select a personally stressful event that is both recent and persistent, but that is also comfortable enough to discuss. Once the topic is selected, the interviewer takes the participant through the interview using verbal prompts to encourage the participant to elaborate on the emotional and physical sensations of the chosen event. After recalling the situation for 10 to 15 minutes, each participant is brought through two guided imagery tasks, one non-verbal and one verbal. Again, the interviewer uses cues to encourage the participant to describe or imagine the details of the chosen event. Each guided imagery phase is approximately two minutes in length. The order of the baselines and phases of the SCI are summarized in Figure 1.

Data Preparation

Prior to any analyses, data were checked for normality and influential outliers. The Substance Use coping subscale was non-normally distributed, with skewness of 1.98 (*SE* = .33), and kurtosis of 3.34 (*SE* = .66). This variable underwent log transformation to reduce this effect. The raw GSR variables included: (i) the baseline phase (mean score =

2.09; *SD* = 1.63; range = .00 to 6.37), with kurtosis of .23 and skewness of .80 (*SE* = .33); (ii) the stress task (mean score = 9.12; *SD* = 3.87; range = .00 to 18.36), with kurtosis of .46 and skewness of .06 (*SE* = .33); and (iii) the recovery phase (mean score = 2.22; *SD* = 1.67; range = 0.00 to 7.00), with kurtosis of .96 and skewness of .97 (*SE* = .33). The baseline and recovery phase variables were found to be positively skewed and were square root transformed rather than log transformed because of negative values in the raw data.

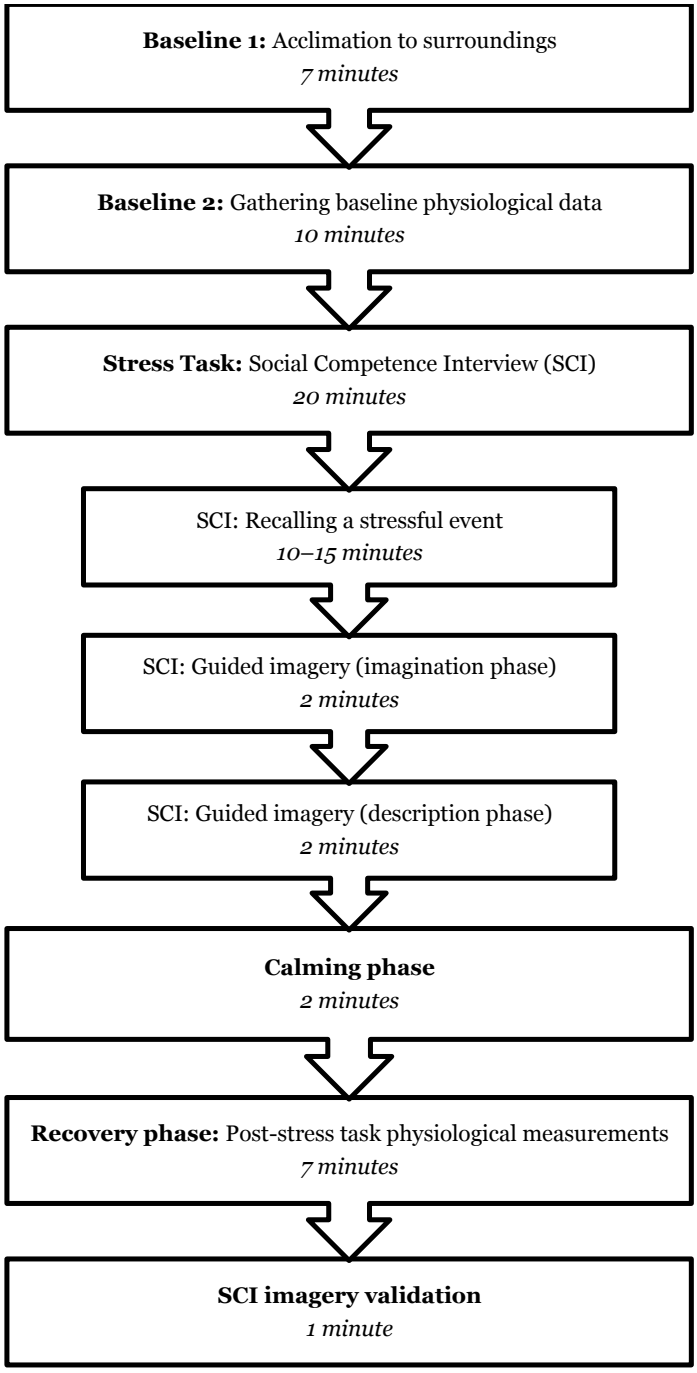

Figure 1. Order of baselines and phases of the Social Competence Interview, as used in the stress task.

Results

Mindfulness and Coping Mechanisms

Following data transformations, Pearson's correlational analyses were used to assess the data relations. Results for the first set of significant analyses are summarized in Table 2. Results indicated a negative association between mean MAAS score and substance use as a means of coping, $r(49) = -.36$, $p = .01$, $\boldsymbol{R^2} = 0.13$.

Table 2. *Correlation between Mindfulness (MAAS) and Coping (Brief COPE)*

	MAAS	Brief COPE
Brief COPE		
Substance Use	−.36*	
Mean	3.99	2.49
SD	.73	1.01

Note: N = 51, *p < .01.

Pearson's correlational analyses were again used to assess the relation between physiological reactivity—specifically, galvanic skin response—and substance use as a coping mechanism (Table 3). Significant positive correlations were found between substance use as a means of coping and increases in sympathetic reactivity during the stress task portion of the SCI interview, $r(49) = .34$, $p = .01$, $\boldsymbol{R^2} = 0.12$.

We conducted a third group of analyses to assess the correlation between sympathetic reactivity and substance use as a means of coping, using data gathered during the post-interview phase. Sympathetic reactivity during the post-interview phase was positively correlated with substance use as a means of coping, $r(49) = .33$, $p = .02$, $\boldsymbol{R^2} = 0.11$, where those who deliberately used substances as a coping mechanism experienced greater physiological variability during and following a personally stressful event.

Table 3. *Correlation between Change in GSR and Substance Use as a Coping Mechanism*

	Pre-interview Baseline 1 (Δ GSR)	Pre-interview Baseline 2 (Δ GSR)	Stressor Task (Δ GSR)	Post-interview Recovery Phase (Δ GSR)
Brief COPE				
Substance Use	.09	.07	.34*	.33*

Note: N = 51, p < .05.

Discussion

The goal of the current study was to explore relations among self-reported mindfulness, self-reported coping through substance use, and physiological reactivity. Cumulatively, the findings suggest that university students who use drugs or alcohol to cope are more autonomically reactive, take longer to calm themselves, and report lower levels of native trait mindfulness. Thus, trait mindfulness is related to coping on a physiological level as well as a cognitive-emotional level.

It has previously been observed that addiction behaviours are more often exhibited by those with low scores on mindfulness measures (Bowen & Enkema, 2014; Karyadi et al., 2014). Prior research with undergraduate samples has shown a negative association between mindful traits and maladaptive coping strategies (Palmer & Rodger, 2009). Furthermore, Deasy et al. (2014) found that undergraduate students who engaged in substance use behaviours were more at risk for other problematic behaviours. The findings of the current study are in line with prior observations, as participants with low self-ratings of mindfulness more often reported using illicit drugs or alcohol as a coping mechanism.

Less expected was the finding that individuals displaying greater autonomic variability were also more likely to use substances as a coping mechanism. In fact, those who employed substance-related coping strategies not only showed elevated reactivity during the stress task, but also took longer to recuperate afterwards and maintained higher physiological values during recovery from stress. This finding is consistent with previous literature suggesting that those with elevated sympathetic activation often show impairment in modulatory limbic structures—which are necessary for stress response adaptations (McKlveen et al., 2015). Research has shown that the regulatory capacity of these components of the limbic system can be altered by chronic stress (Herman, Ostrander, Mueller, & Figueiredo, 2005). In addition, actions counterproductive to mindfulness, such as substance use, rumination, and self-judgement, are associated with delayed physiological recovery from emotionally induced stress (Low, Stanton, & Bower, 2008). Given the limited effectiveness of their self-regulatory capacities, it follows that those with greater sympathetic reactivity would use less functional means to cope. When considering the additional bias toward fewer mindful traits, coping with day-to-day stressors would present severe difficulties. In this context, the relations among coping, mindfulness, and physiological reactivity begin to form a more cohesive picture.

The current findings suggest that those who display low levels of mindfulness and who employ maladaptive coping strategies also exhibit prolonged autonomic activation. This process of prolonged reactivity to stress, if activated repeatedly in response to stressful life events, can have cumulative and deleterious effects on health, including hypertension, obesity, and cardiovascular disease (McEwen & Stellar, 1993). Poor health could pose an additional problem for those who strive to meet the increasing demands and high standards of the current workforce and academic climate without having sufficient coping strategies to fall back on.

From the student's perspective, the implications of high stress and poor coping are costly, given the potential for psychological distress, physical health risks, and interpersonal conflict. From an institutional point of view, the health of its attendees is a priority; students suffering from psychological distress have, on average, lower grades and lower graduation rates than their counterparts (Regehr et al., 2013). Considering the results of

this study and the evidence presented herein, it is reasonable to state that improved resources need to be made available to students in distress. Moreover, mindfulness training and practices are a reasonable method to combat stress by using healthy and productive coping strategies. Previous reports have indicated that stress interventions using mindfulness-based techniques have had success in reducing anxiety in university students (Regehr et al., 2013). Further research has shown that those with high self-ratings on mindfulness traits tend to have lower levels of perceived stress, indicating that mindfulness training may be a useful tool in healthy coping (Palmer & Rodger, 2009).

The results of this study are not conclusive, and the research has several limitations. Our participants were predominantly female. Prior research has indicated that males are more often affected by substance-related disorders, while females are more likely to seek treatment for substance use disorders (Foster & Kelly, 2012). Furthermore, women are more likely to benefit from the effects of mindfulness-based interventions than men (Katz & Toner, 2013). With these trends in mind, the demographics of our sample may underrepresent maladaptive substance-related coping, as well as lack generalizability to the larger population. A more balanced sample might shed light on these shortfalls and allow the opportunity to investigate gender differences within the mindfulness–substance use association. Additionally, although our relatively small sample was adequate for measuring medium-sized effects, the results may not generalize to other populations.

A further limitation of this study is the singular use of the Brief COPE inventory to measure substance use as a means of coping. Previous research has shown that the relation between trait mindfulness and substance use varies depending on the substance (Karyadi et al., 2014). More specifically, stronger negative associations have been found between mindfulness and alcohol use, compared to associations between mindfulness and cannabis use (Karyadi et al., 2014). Potential future research could involve inquiry into the associations discussed herein using a more comprehensive drug and alcohol use screener to further break down this relation.

As more evidence arises, research regarding stressors and stress-management techniques provides higher education professionals with resources to understand the demands postsecondary students face in the current academic climate. With comprehension comes the ability to suggest resources and treatment options specific to this population that have been explored and tested. For example, in line with our present results, higher education professionals—especially those working in clinical capacities—and student services staff may be able to improve the quality of their programming by beginning to offer students the opportunity to learn more about mindfulness, particularly through meditation training. Additionally, faculty members may be well advised to offer brief mindfulness interventions in the context of the courses they are teaching. For example, faculty who have some experience with mindfulness (e.g., those who regularly attend yoga classes) may wish to offer a very brief guided meditation before beginning class or distributing an exam.

The findings of the present study imply that mindfulness training would benefit nonclinical substance users by teaching self-regulation, thereby giving them the opportunity to engage in alternate, healthy coping strategies. Future research in this area has potential to ameliorate clinical practices surrounding stress management in postsecondary students and problematic substance use behaviours in this same population. In conclusion, the current findings suggest that those who employ substances as a means to cope are less likely to possess mindful traits and show greater physiological reactivity than their counterparts.

Acknowledgements

This study has benefited from the help and support of the following significant advisors and contributors: Christin Moeller, PhD, for her assistance in developing the study protocol and training; Dr. Greg Chung-Yan for making his lab space available; and Dr. Cheri McGowan and her research team for their expertise and use of their equipment.

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