Meditation practice, dispositional mindfulness, personality and program outcomes in mindfulness training for medical students

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Abstract

Introduction: Medical students experience high levels of psychological distress and are at risk for depression, burnout and suicidal ideation. To address these issues, the mindfulness-based Health Enhancement Program (HEP) forms part of the MBBS (Bachelor of Medicine) at Monash University. This pilot study investigated the relationship between amount of mindfulness practice and measures of mental health, study engagement and dispositional mindfulness. We also sought to understand how "Big Five" personality traits predicted engagement with the intervention.

Methods: From an eligible cohort of 322 MBBS students, 37 (24 females, 13 males; aged 17 to 20) provided pre- and post-intervention responses. Participants completed the International Personality Item Pool (IPIP-100) pre-intervention and the Freiburg Mindfulness Inventory (FMI), Depression and Anxiety Scale Stress Scale (DASS-21) and the student version of the Utrecht Work Engagement Scale (UWES-S) pre- and post-intervention.

Evaluation: Results indicated that both dispositional mindfulness and study engagement increased from pre- to post-intervention. Results also indicated no increase in depression, anxiety and stress from mid-semester to exam periods. Amount of mindfulness meditation was positively related to agreeableness.

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Conclusions: These results suggest that individuals who score higher in agreeableness may engage most with mindfulness programs, which may be protective for mental health. However, the conclusions of the study are limited by a small sample size and lack of control group.

Keywords: mindfulness; medical students; well-being; study engagement; meditation.

Introduction

Psychological distress is a well-documented experience of medical students, and the stress inherent in medical school can continue into the workplace with adverse ramifications for students, doctors and patients (Chang, Eddins-Folensbee, & Coverdale, 2012; Henning, Hawken, & Hill, 2009). Research on resident medical staff indicate that up to 20% meet criteria for depression at any point in time (Fahrenkopf et al., 2008). Other studies have shown high rates of burnout. For instance, Willcock and colleagues (2004) assessed new medical graduates every 3 months using diagnostic rating scales for mental illness and burnout. They found that 75% qualified as having burnout at 8 months and 73% qualified as having had a mental illness on at least one occasion in their first year of working life. A recent meta-analysis of studies of medical student burnout reported prevalence rates of 7.0% to 75.2% depending on the country, the instrument used to measure burnout and the cut-off criteria for burnout symptomatology (Erschens et al., 2018).

Medical students and doctors also have higher rates of substance abuse (Kumar & Basu, 2000) and suicidal ideation than the general population (Dyrbye et al., 2008; Tyssen, Vaglum, Grønvold, & Ekeberg, 2001). The psychological distress of medical doctors has implications for patient outcomes, including prescribing errors and less compassionate care (Bellini & Shea, 2005; Spencer, 2004). This distress begins during the first year of medical training, with students showing larger reductions in psychological wellbeing than other disciplines (Aktekin et al., 2001; Dyrbye, Thomas, & Shanafelt, 2005).

Mindfulness programs for medical students

Mindfulness-based programs represent one strategy to reduce medical student and doctor distress. Mindfulness refers to the ability to focus on the present moment, with an attitude of openness and acceptance (Kabat-Zinn, 1982). Mindfulness is both a trait (or disposition) and also something that can be enhanced through training. Recent studies have demonstrated support for the efficacy of mindfulness-based programs, and programs for medical students are being implemented in university contexts (Baer, 2003; Dobkin & Hutchinson, 2013; Grossman, Niemann, Schmidt, & Walach, 2004). Embedding mindfulness-based programs into the core curriculum for medical students ensures the potential benefits of these programs are applied to all students and that modern graduates know more about the clinical applications of mindfulness-based interventions.

Despite the promise of mindfulness interventions for medical students, relatively few studies have focused on medical student populations (Astin, 1997; de Vibe et al., 2013; Hassed, de Lisle, Sullivan, & Pier, 2009; Jain et al., 2007; Rosenzweig, Reibel, Greeson,

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Brainard, & Hojat, 2003; Shapiro, Schwartz, & Bonner, 1998; Warnecke, Quinn, Ogden, Towle, & Nelson, 2011). Furthermore, relatively little research has investigated the relationships between personality factors, mindfulness meditation (MM), changes in dispositional (or trait) mindfulness and program outcomes (Vettese, Toneatto, Stea, Nguyen, & Wang, 2009).

Although MM is a core component of mindfulness-based programs, self-directed practice has not been routinely measured in efficacy studies (Vettese et al., 2009). This is unfortunate, as neither program length nor number of guided sessions have been shown to predict outcomes in either clinical or non-clinical samples (Carmody & Baer, 2009), suggesting that it may be self-directed practice that leads to improved mental health. Vettese and colleagues (2009) found that 54% of 24 studies examined demonstrated at least partial support for a relationship between self-directed MM and program outcomes. This raises the possibility that the benefits observed following mindfulness training may be derived from mindfulness meditation (MM) conducted outside intervention sessions, making the amount of MM an important variable to assess.

Additionally, increased dispositional mindfulness is likely to be an important component in facilitating improvements in psychological wellbeing. Shapiro and colleagues (2007) found that significant increases in dispositional mindfulness as a result of a mindfulness intervention (so that participants demonstrated greater dispositional mindfulness at the end of the intervention than they had at the start of the intervention) predicted significant decreases in perceived stress, trait anxiety and rumination. Increases in mindfulness as a result of a mindfulness intervention have been shown to mediate both the effects of participating in a mindfulness program on perceived stress (Branstrom, Kvillemo, Brandberg, & Moskowitz, 2010; Nyklicek & Kuijpers, 2008; Shapiro, Oman, Thoresen, Plante, & Flinders, 2008) and the relationship between MM practice and perceived stress (Carmody & Baer, 2008). However, this relationship has not been explored in a medical student population.

One program for medical students is the Health Enhancement Program (HEP)—a mindfulness-based lifestyle medicine program that has been embedded in medical student core curriculum at Australia's Monash University since 2002. It comprises a series of eight introductory lectures on mindfulness, mind–body medicine and the other various lifestyle elements of the program, and tutorials of 1 hour per week over 5 weeks focused on lifestyle components such as stress management, spirituality, exercise, nutrition and connectedness. A second hour in each weekly tutorial is dedicated to mindfulness. Adherence to formal meditation practice tends to be poor in such programs, where motivation, time and personality may negatively impact upon home practice. Therefore, from its outset, the HEP has put an emphasis on brief formal meditation practices at home and informal mindfulness practice (being mindful while engaged in activities), in addition to cognitive practices such as cultivating acceptance, being in the present moment and non-attachment. Students are taught the underlying science and are encouraged to personally apply the principles to help them manage stress and improve study performance and communication skills. Program content focuses on developing awareness of processes underlying stress and poor performance

ISSN 1442-1100

(Hassed et al., 2009). The content is delivered as part of the core curriculum. Students are examined on the underlying science, and it was found that 90.5% then report personally applying the principles (Hassed et al., 2009). Delivering it as part of the core curriculum means mindfulness training is delivered early, to a cohort that needs it. This is potentially an excellent way of preventing mental illness and enhancing learning in medical students. However, from a research perspective, this prevents the use of control groups from within the same cohort.

In a study of the HEP's 2006 cohort (n = 148), participants' pre-intervention depression scores were higher than normative data for adolescents; however, at post-intervention, they were comparable (Hassed et al., 2009). A significant decrease in overall psychological distress (comprising of depression, hostility and anxiety) was reported after the HEP even during the pre-exam period, when psychological distress typically increases. All scales and subscales improved, including the WHO Quality of Life Scales (psychological: pre-intervention mean = 62.42, post-intervention mean = 65.62; $p < 0.001$ and physical: pre-intervention mean = 69.11, post-intervention mean = 70.90; $p = 0.07$) and the Symptom Checklist-90 (Global severity index of the Symptom Checklist-90-R pre-intervention mean = 0.73, post-intervention mean = 0.64; $p = 0.02$), although not all were statistically significant (Hassed et al., 2009). The fact that there was an improvement in mental health measures from the low-stress period in early semester compared to the usually high-stress pre-exam period is notable and had not been previously reported.

Personality traits and engagement with mindfulness programs

In addition to the questions regarding MM and dispositional mindfulness, personality factors are likely to predict engagement with MM but have not been thoroughly examined (van den Hurk et al., 2011). The trait theory of personality suggests individuals can be characterised using five broad personality domains: neuroticism (susceptibility to psychological distress), extraversion (activity, sociability), openness to experience (receptivity, interest in novel experiences), agreeableness (care, cooperation and trust) and conscientiousness (organisation, self-discipline, reliability).

Giluk (2009) found that trait mindfulness was positively correlated with extraversion and conscientiousness and negatively correlated with neuroticism. Others (Baer, Smith, & Allen, 2004; Brown & Ryan, 2003; Giluk, 2009) have found positive relationships between extraversion and trait mindfulness (assessed by the Kentucky Inventory of Mindfulness Skills, the Mindful Attention and Awareness Scale and by meta-analysis of studies of trait mindfulness). Openness to experience has also been positively associated with dispositional mindfulness and predicted greater use of mindfulness practice in psychology students, cancer patients, outpatients with borderline personality disorder and older adults (Baer et al., 2004; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Barkan et al., 2016; Brown & Ryan, 2003; Giluk, 2009). A positive relationship has been demonstrated between agreeableness and dispositional mindfulness, and agreeableness predicted greater use of mindfulness practice in both older adults and across meta-analysis of multiple populations (Barkan et al., 2016; Giluk, 2009). A better

ISSN 1442-1100

understanding of personality features and how they interact with MM, dispositional mindfulness and outcomes of a mindfulness intervention could help guide the structure of mindfulness interventions and, perhaps, in future research even lead to predictors of whether a mindfulness intervention would be effective for specific individuals.

Due to the lack of possibility for a valid control group, the primary focus of the current study was on relationships between measures. As such, the primary aim of this study was to explore the relationship between MM, changes in dispositional (trait) mindfulness measured by the short form Freiburg Mindfulness Inventory (FMI-14) (Walach, Buchheld, Buttenmuller, Kleinknecht, & Schmidt, 2006) and psychological wellbeing outcomes. A secondary aim was to examine how personality factors predict engagement with mindfulness programs. This was intended as a pilot study to further examine the effectiveness of delivering mindfulness as part of core curriculum for medical students.

It was hypothesised that dispositional mindfulness would increase from pre-intervention to post-intervention. Secondly, it was hypothesised that the students who participated (defined by the completion of self-report measures at both time points) would not show the expected increase in levels of stress, anxiety and depression during exam periods. Thirdly, improvement in pre-intervention to post-intervention study engagement was hypothesised. We also hypothesised that the amount of MM (defined by frequency and duration of MM practice each week) would be associated with improvements in these outcome measures. Finally, we hypothesised that greater agreeableness, extraversion, openness to experience and conscientiousness measured pre-course would be associated with greater engagement with MM, and greater neuroticism would be associated with less engagement with MM.

Methods

Participants

All students enrolled in the Monash University first-year undergraduate Bachelor of Medicine (MBBS) were invited to participate throughout their HEP course.

Intervention

First-year MBBS students at Monash University in Melbourne, Australia, completed the Health Enhancement Program (HEP) as part of their core curriculum. The mindfulness component of the HEP involved a 5-week mindfulness-based stress release program (SRP), taught in 5-weekly tutorials of 60 minutes each. There were 20 tutorial groups overall, led by 15 tutors, with approximately 16 students in each. Tutors were health practitioners (doctors and psychologists) with a personal commitment to practising mindfulness in their own lives as well as professional experience with delivering mindfulness-based strategies in practice (Hassed et al., 2009). Any prospective tutors spend the first year on the HEP as an observer or assistant in order to receive mentoring from experienced tutors and observe the HEP being delivered. Students were taught the underlying science behind mindfulness and mindful stress reduction and encouraged to establish a daily MM practice (beginning with 5 minutes twice daily and increasing over the subsequent weeks

ISSN 1442-1100

to a total of 20 minutes per day). Sessions also involved a conceptual cognitive exploration of four core themes: perception, letting go (non-attachment), acceptance and presence of mind (being in the present moment), which students were encouraged to personally apply in their daily lives. Students were required to submit a brief journal entry outlining their experiences with the formal and informal practices each week.

Materials

Participants provided basic demographic information, including gender and age. Dispositional mindfulness was assessed using the short form Freiburg Mindfulness Inventory (FMI-14) (Walach et al., 2006). This measures mindfulness as a general construct, encompassing non-judgemental present-moment observation. Each of the 14 items is scored on a 4-point Likert-type scale ranging from 1 "rarely" to 4 "almost always". Items include statements such as: "I watch my feelings without getting lost in them" and "I accept unpleasant experiences". The FMI-14 correlates strongly with the 30-item version, r = .95 and reliability is α = .86 (Walach et al., 2006). Cronbach's alpha in the current sample was .90.

The Depression, Anxiety and Stress Scale (DASS-21), a short form of the DASS-42, was used to measure levels of depression, anxiety and stress (Lovibond & Lovibond, 1995). Respondents rate the extent to which they have experienced symptoms over the previous week on a 4-point Likert-type scale ranging from 0 "not at all" to 3 "very much/most of the time". Items include statements such as: "I felt down-hearted and blue", "I felt scared without any good reason" and "I found it hard to wind down". DASS-21 scores are multiplied by 2 to apply the severity ratings of normal, mild, moderate, severe and extremely severe. Reported internal consistency is satisfactory with α = .91 for depression, α = .73 for anxiety and α = .81 for stress. Good construct validity has been reported in factor analytic studies of the DASS-21, also showing that items from the DASS-21 can be reliably grouped into the three subscales for depression, anxiety and stress (Gloster et al., 2008). Cronbach's alpha measures for these scales in the current sample were: depression = .94, anxiety = .82, stress = .85.

The student version of the Utrecht Work Engagement Scale (UWES-S) was used to measure study engagement (Schaufeli, Martinez, Pinto, Salanova, & Bakker, 2002). It is comprised of 14 items measured on a 6-point Likert-type scale ranging from 1 "almost never/a few times a year or less" to 6 "always/every day". There are three subscales—vigour, dedication and absorption—consisting of five, five and four items, respectively. Vigour is characterised by mental resilience and high energy levels while studying and one's willingness to put effort into one's work, assessed by items such as "When I get up in the morning I feel like going to class". Dedication is characterised by a sense of involvement, significance, inspiration, challenge, enthusiasm and pride, for example, "I find my studies to be full of meaning and purpose". Absorption is characterised by high engagement with study, e.g., "I get carried away when I'm studying". Satisfactory internal consistency has been demonstrated with α = .74 for vigour, α = .87 for dedication and α = .84 for absorption (Casuso-Holgado et al., 2013). Cronbach's alphas in the current sample were: vigour = .89, dedication = .84, absorption = .88 and .95 for the total scale.

ISSN 1442-1100

The International Personality Item Pool 100-item (IPIP-100) measured the "Big Five" factors of personality: extraversion, agreeableness, conscientiousness, emotional stability (contrasts with neuroticism) and intellect/imagination (openness to experience) (Goldberg, 1992). It consists of 100 self-referencing statements. Participants respond according to how they see themselves in relation to each statement, using a 5-point Likert-type scale ranging from 1 "very inaccurate" to 5 "very accurate" with a random arrangement of positively and negatively scored items. Separate scores are calculated for each trait, with higher scores indicating more identification with that trait. Cronbach's alphas in the current sample were: extraversion = .95, agreeableness = .88, conscientiousness = .90, emotional stability = .94 and intellect/imagination = .85.

Participants also completed a practice record form (PRF), which asked for the frequency and duration of meditation practice undertaken each day of the week. It included an option for reflections and comments. It was designed to help participants keep track of their own practice, while providing a measure of actual meditation practice completed. Average frequency and duration of practice per week was calculated for each participant.

Recruitment and procedure

Ethics approval was obtained from Monash University Human Research Ethics Committee. Additional permission was gained from the Monash School of Medicine to conduct research with MBBS students. Participation in the mindfulness course was a compulsory part of the medical curriculum, but participation in the study was voluntary. An incentive of two music retail store vouchers worth $50 each was offered, the winners of which were selected using a random number generator. Participants provided an informed consent form prior to participating.

Pre-intervention (Time 1; T1) was during the middle of the students' first semester, approximately 6 weeks after their transition to university and immediately prior to the HEP tutorials. Post-intervention (Time 2; T2) was approximately 7 weeks later at the end of the fifth and final HEP tutorial, a few days prior to the mid-year examination period. Respondents who scored in the moderate–severe range on each subscale of the DASS (T1, n = 17; T2, n = 20) were immediately contacted by a member of the Monash University Counselling Service, who conducted a risk assessment with the participant and informed the participant of assistance available to them.

Statistical analysis

Paired-sample t-tests with an α level set at .05 were conducted to evaluate the impact of the intervention on students' dispositional mindfulness, depression, anxiety, stress and study engagement. If t-tests for total study engagement scores were significant, exploratory t-tests were conducted to determine whether the specific subscales of study engagement were changed. Change scores were calculated for the FMI, DASS scales and UWES-S scales in order to conduct correlations. Change scores calculated by subtracting pre-scores from post-scores tend to produce misleading results (Cohen, West, & Aiken, 2014) so a linear regression analysis was used to derive a standardised residual score for each dependent variable to represent the change in that variable over the intervention period.

ISSN 1442-1100

Pearson correlations were used to assess relationships between each participant's average MM per week (duration) and the three variables that were found to have changed significantly (FMI score, total study engagement and study dedication). Pearson correlations were also conducted to assess relationships between average MM duration and the personality traits of extraversion, agreeableness, conscientiousness, emotional stability and intellect/imagination as measured by the IPIP-100.

Results

The total sample consisted of 52 Monash University first-year undergraduate Bachelor of Medicine (MBBS) students (35 female, 16 male and one participant who did not specify) out of an eligible cohort of 322 invited to participate in the study. This low engagement reflects issues with the recruitment process. We invited students to complete the measures in their own time each week throughout the intervention and bring them to tutorials, rather than providing time for them to complete them *during* tutorials, which has been done in other studies and obtained much greater rates of engagement (e.g., Hassed, de Lisle, Sullivan, & Pier, 2009).

Ages ranged from 17 to 20 (M = 18.36, SD = 0.72). One participant did not provide demographic information. Thirty-seven participants completed post-intervention measures (24 females, 13 males; ages ranging from 17 to 20, M = 18.41, SD = 0.73). See Figure 1 for a summary.

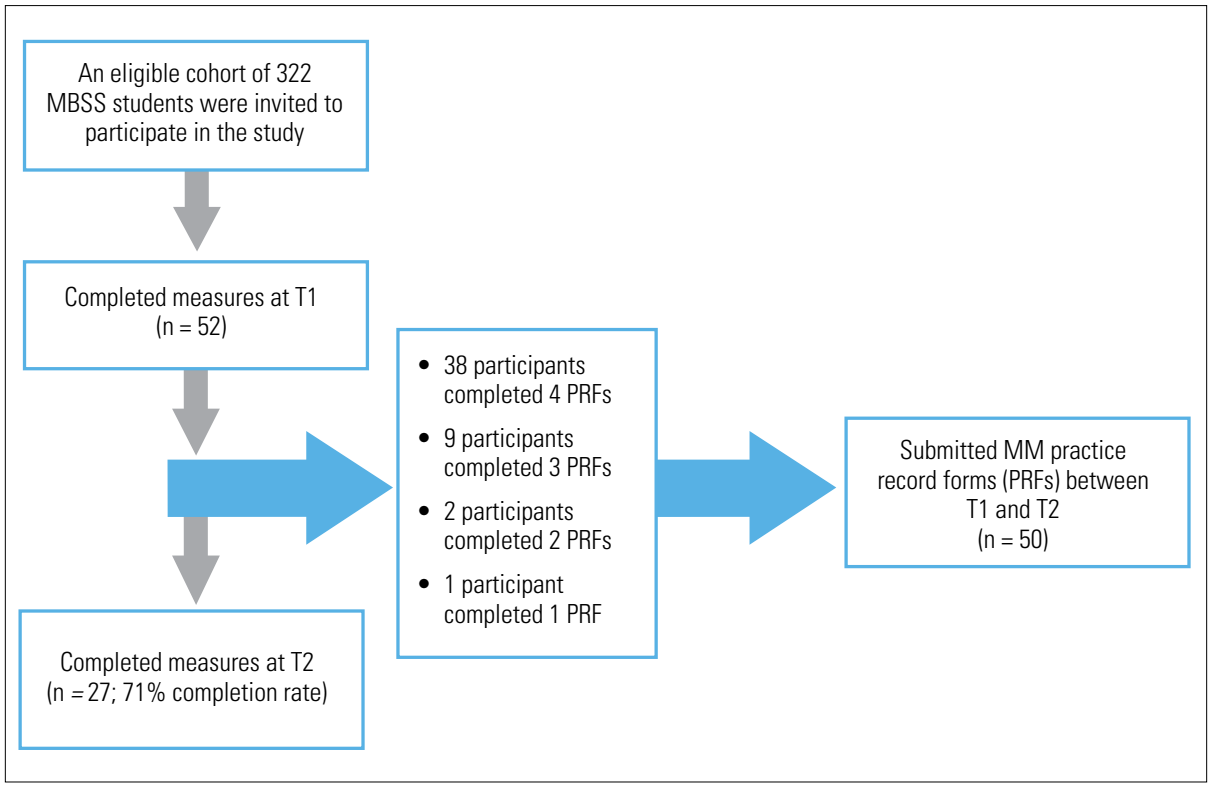

Figure 1. Participant recruitment flow diagram.

ISSN 1442-1100

Of the total sample of 52, 15 participants were excluded from t-test analyses due to missing data at T2, leaving 37 participants. Data was analysed using Statistical Package for the Social Sciences (SPSS version 20). Univariate outliers were defined as any value beyond $Z = \pm 3.29$ and were replaced with the value from the participant one lower than the outlier (when values from all participants were ranked from lowest to highest) plus one unit of the highest precision of the measured scale (for example, two decimal places, so if the participant score one rank lower than the outlier was 7.83, the outlier would be changed to 7.84) (Tabachnick & Fidell, 2007).

A total of four outliers were detected, one from each of the following scales: DASS depression at T2, DASS anxiety at T1, DASS stress at T1 and the agreeableness subscale of the IPIP-100. Means and standard deviations for the DASS-21 depression, anxiety and stress scores at T1 were found to be slightly higher than normative data for Australian adolescents (Crawford, Cayley, Lovibond, Wilson, & Hartley, 2011), but at T2, the depression score was slightly lower (Table 1).

Table 1
Means and Standard Deviations of DASS-21 Scores for the Present Study (n = 37) and Normative Reference Scores for Australian Adolescents (n = 102)

Variable	Pre-intervention		Post-intervention		Normative	Data
	M	SD	M	SD	M	SD
Depression	4.03	3.87	3.84	4.49	3.96	4.52
Anxiety	3.43	3.25	4.08	3.31	2.76	3.25
Stress	6.62	3.68	6.05	3.37	4.78	4.71

Note: Normative data for DASS-21 scales, based on a sample of n = 102, ages 18 to 24 (Crawford et al., 2011).

Program outcomes

At T2, a statistically significant difference was found in dispositional mindfulness $t(36) = 3.85$, $p < 0.01$, $\eta^2 = 0.29$. There was also a statistically significant increase in total study engagement $t(36) = 2.24$, $p = 0.03$, $\eta^2 = 0.12$. A statistically significant increase was also found in study dedication $t(36) = 2.54$, $p = 0.02$, $\eta^2 = 0.09$. No significant changes were noted in depression, anxiety or stress. Results are summarised in Table 2.

Frequency and duration of MM

PRFs were collated and each participant's average frequency and duration of MM per week was calculated. Results are summarised in Table 3. No differences were found across weeks in frequency of practice $F(36,3) = 2.564$, $p > 0.06$, nor were any differences found for duration of practice across weeks $F(36,3) = 0.738$, $p > 0.06$.

ISSN 1442-1100

Table 2
Summary of Changes Between Pre-intervention and Post-intervention on Outcome Measures (n = 37)

	Pre-intervention		Post-intervention				
Measure	Mean	SD	Mean	SD	t	p	Effect size (η^2)
FMI	36.10	5.67	39.56	6.84	3.85	.00*	0.29
DASS Depression	8.05	7.74	7.62	8.80	.46	.65	0.01
DASS Anxiety	6.76	6.08	8.16	6.62	1.27	.21	0.04
DASS Stress	13.24	7.35	12.05	6.69	-1.15	.26	0.04
UWES-S Total	53.89	13.68	57.59	12.37	2.24	.03*	0.12
UWES-S Vigour	18.68	5.67	19.95	4.87	1.73	.09	0.08
UWES-S Dedication	19.68	4.69	21.10	4.25	2.54	.02*	0.15
UWES-S Absorption	15.54	4.39	16.54	4.25	1.91	.06	0.09

Note: FMI = Freiburg Mindfulness Inventory; DASS = Depression Anxiety Stress Scales; UWES-S = Utrecht Work Engagement Scale, student version.
*$p < .05$ (2-tailed); DASS-21 scores were multiplied by 2 prior to analysis (Lovibond & Lovibond, 1996).

Table 3
Summary of MM Frequency (sessions per week) and Duration (minutes per week) (n = 50)

	Minimum	Maximum	M	SD
Average weekly MM frequency	1.25	11.50	5.42	2.16
Average weekly MM duration	7.5	84.75	33.69	19.27

MM and program outcomes

There was a medium negative correlation between study dedication and average MM duration (in minutes) $r = -0.34$, $p = 0.042$, but all other correlations were non-significant ($p > 0.05$). Results are summarised in Table 4.

Table 4
Pearson Correlations Between Duration of MM per Week and Significant Outcome Measures (n = 37)

Minimum	MM Average Duration (in minutes)
FMI Change	$r = .10$ $p = .54$
UWES-S Total change	$r = -.27$ $p = .11$
UWES-S Dedication change	$r = -.34$* $p = .04$

Note: FMI = Freiburg Mindfulness Inventory; UWES-S = Utrecht Work Engagement Scale for Students.
*$p < .05$ (2-tailed)

ISSN 1442-1100

Personality and MM

Relationships between personality factors and MM were calculated for all available PRF data (n = 50). There was a medium positive correlation between agreeableness and participant's average MM duration (in minutes) $r = 0.33$, $p = 0.02$. All other correlations were not significant ($p > 0.05$). Results are summarised in Table 5.

Table 5
Pearson Correlations Between Duration of MM per Week and Personality Traits (n = 50)

Minimum	**MM Average Duration** (in minutes)
Extraversion	$r = .07$ $p = .65$
Agreeableness	$r = .33^*$ $p = .02$
Conscientiousness	$r = .17$ $p = .24$
Emotional stability	$r = .06$ $p = .67$
Intellect/imagination	$r = -.10$ $p = .48$

$^*p < .05$ (2-tailed)

Discussion

The current pilot study examined relationships between amount of mindfulness meditation (MM) and program outcomes, and associations between personality traits and amount of MM. As hypothesised, dispositional mindfulness and study engagement increased significantly pre/post and levels of stress, anxiety and depression remained constant (despite T2 being during the exam period). Interestingly, greater study dedication was associated with lower amounts of MM. The hypothesis that amount of MM would be associated with improvements in all outcome measures was supported. Finally, the hypotheses that less neuroticism, more openness to experience, extraversion and conscientiousness would each be associated with greater amounts of MM were not supported. However, there was a medium positive correlation between agreeableness and participant's average MM duration. An important caveat to conclusions drawn from these results is that the study had a small sample size and that no appropriate control group was possible.

Relationship between mindfulness meditation and dispositional mindfulness

The non-significant relationship between amount of MM and increase in dispositional mindfulness was unexpected but, perhaps, unsurprising considering the inconsistent findings in previous studies (Huppert & Johnson, 2010; Shapiro et al., 2008). It may be that the *quality* of practice rather than the frequency or duration is what determines changes in dispositional mindfulness. Quality of practice is difficult to measure quantitatively, which suggests a need for more qualitative research in this area.

ISSN 1442-1100

Alternatively, it is possible that increased amounts of informal practice amongst participants—that is, bringing mindfulness to everyday activities, e.g., studying, communicating, eating, etc.—may have accounted for the observed increases in trait mindfulness. In Brown and Ryan's (2003) study with Zen practitioners, amount of time spent meditating, on average, at time of assessment was unrelated to dispositional mindfulness scores. However, both the number of years of MM and the extent to which individuals perceived that they integrated their meditative practice into daily activities were positively related to dispositional mindfulness scores (Brown & Ryan, 2003). Informal practice was not measured in the present study. Lastly, the lack of a relationship between MM and change in dispositional mindfulness may be due to the low range of duration of practice per week—with a maximum of 85 minutes and a mean of just over half an hour. This range may not have provided sufficient variation to uncover a significant relationship.

The lack of relationship between MM and outcome measures may be the result of similar explanations as those provided above. Previous research has indicated that changes in dispositional mindfulness mediate the relationship between MM and outcomes (van der Velden et al., 2015). The small sample size is also a potential explanation for the null results—a larger sample with more statistical power may uncover significant relationships in future research.

Personality and mindfulness meditation

The significant positive relationship between agreeableness and amount of MM may relate to the facets of compliance and trust. These facets could engender a cooperative attitude towards practicing MM and a sense of trust in the value of MM as presented to students through the HEP lecture and SRP tutorial content. This finding aligns with previous research that has shown agreeableness to relate positively to dispositional mindfulness and to predict amount of practice during and following an MBSR course (Barkan et al., 2016; Giluk, 2009). Thus, participants high on agreeableness may be predisposed to being more mindful than others and, as a result, find it easier to practice MM for longer periods of time. However, these results require replication by future research with larger sample sizes before strong conclusions can be drawn.

Increased mindfulness

An increase in dispositional mindfulness was expected, as this has been found in other studies of mindfulness-based programs (Baer, Carmody, & Hunsinger, 2012; Branstrom et al., 2010; Carmody & Baer, 2008; Krasner et al., 2009; Nyklicek & Kuijpers, 2008; Shapiro et al., 2007; Shapiro et al., 2008). Importantly, this is only one of a few studies conducted with medical students to include a measure of mindfulness and to report a significant improvement (de Vibe et al., 2013). However, without an appropriate control group, changes to dispositional mindfulness as a result of the effect of the exam period in the semester cannot be ruled out as an explanation.

ISSN 1442-1100

Study engagement and mindfulness meditation

There were significant improvements in both total study engagement and the dedication subscale. This result might be explained by changes in attentional processes that are associated with improvements in mindfulness. Developing attentional function is likely to improve an individual's ability to direct attention to study and sustain that attention. This is the first known study of mindfulness with medical students to include a measure of study engagement. The results are encouraging, as study engagement has been shown to be negatively associated with student burnout (Schaufeli et al., 2002). Study engagement has also been shown to correlate positively with academic performance, which is unsurprising, as it would be expected that students who are immersed in their studies would perform well (Schaufeli et al., 2002). However, due to the lack of a control group, it cannot be determined that the mindfulness intervention was causal in the study engagement changes—it may be that study engagement increased due to the second measurement point's proximity to the exam period. Additionally, these results require replication by future research with larger sample sizes before strong conclusions can be drawn.

Unexpectedly, increased study dedication was negatively related to average duration of MM. This may be the result of students' perception of study and MM as competing demands, a distinct possibility in driven first-year medical students. The UWES-S dedication scale includes items such as "I am enthusiastic about my studies" and "I find my studies to be full of meaning and purpose". Rather than engaging with mindfulness experientially, participants with high levels of dedication to their studies may have engaged with mindfulness cognitively, for example, by focusing on understanding the basic principles in order to perform well in their examinations, which directly assess their understanding of mindfulness.

Depression, anxiety and stress outcomes

Although typically there is a decline in mental health as medical students approach exam periods, in this study depression, anxiety and stress were not significantly increased over the course of the intervention up to the immediate exam period. Interestingly, there was a non-significant reduction in depression and stress, which is notable given that T2 was during the pre-exam period when psychological distress is typically at its worst (Dyrbye, Thomas, & Shanafelt, 2006). Previous research has documented increases in depression for first-year medical students (Rosal et al., 1997), so a non-significant reduction in depression could be considered valuable. Previous research on the HEP by Hassed et al. (2009), with a larger sample size, found that the decline in depression was statistically significant. However, because the intervention was part of the core curriculum, no control group was possible, and as such, the effect of the intervention on outcomes remains uncertain.

Previous research has shown decreases in depression, anxiety and distress compared to control groups (Jain et al., 2007; Rosenzweig et al., 2003; Shapiro, Schwartz, & Bonner, 1998). However, all three of these mindfulness-based programs were offered as an elective, unlike the present study in which the program formed part of the core curriculum.

ISSN 1442-1100

Students in opt-in elective programs are likely to be highly motivated and have greater overall engagement with the program content. Further, it may be possible that this 5-week mindfulness intervention was not long enough for students to significantly master mindfulness practices to reduce anxiety and depression.

Limitations

The present study has several limitations. The most important limitation relates to the study sample being a cohort study of a core-curriculum program. While assessment of this type of program is important given the potential to ensure the potential benefits of the program are applied to all students, the universal application meant no appropriate control comparison group was possible. As noted by Hassed and colleagues (2009), one way around this for future research would be for medical schools to initially waitlist half the cohort.

The low recruitment level (15% of the cohort) raised questions about the generalisability of the findings. The low response rate in this study, compared to high response rates in previous studies on the Monash medical student cohort, was likely to be a result of the students being invited to enroll in the study and complete questionnaires in their own time rather than during class time. Attendance, in contrast, was high, as the tutorials were core curriculum and attendance is expected and marked.

The third limitation relates to the use of self-report measures to assess variables, which may have been influenced by social desirability, especially considering that tutors collected weekly practice record forms (PRFs) and T2 measures. Further, the use of a practice record introduces the possibility for recall bias among participants.

Finally, it is important to note that the benefits of a multifaceted program such as this cannot be purely attributed to the mindfulness component. As raised by Hassed, Sierpina and Kreitzer (2008), the benefits are likely attributable to a combination of lifestyle factors, such as nutrition, sleep and exercise, which are all explored in addition to mindfulness in the HEP. Without a control group, it is not possible to be sure that this outcome was the result of the intervention, although comparison with literature consistently showing a decline in student emotional wellbeing in the pre-exam period suggests that students had learned and applied strategies to mitigate against that outcome. A more rigorous RCT would be needed to confirm.

Conclusion

It is in the interest of universities, healthcare organisations and, ultimately, patients that medical students are provided with primary preventative strategies for mental health issues. The results of the current study suggest that mindfulness training may be particularly useful for those who score high on agreeableness, as these students may engage more with the intervention. Mindfulness interventions as part of the core curriculum may help maintain mental health during a period when mental health typically declines in medical students and, simultaneously, show a relationship with improved study engagement.

ISSN 1442-1100

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