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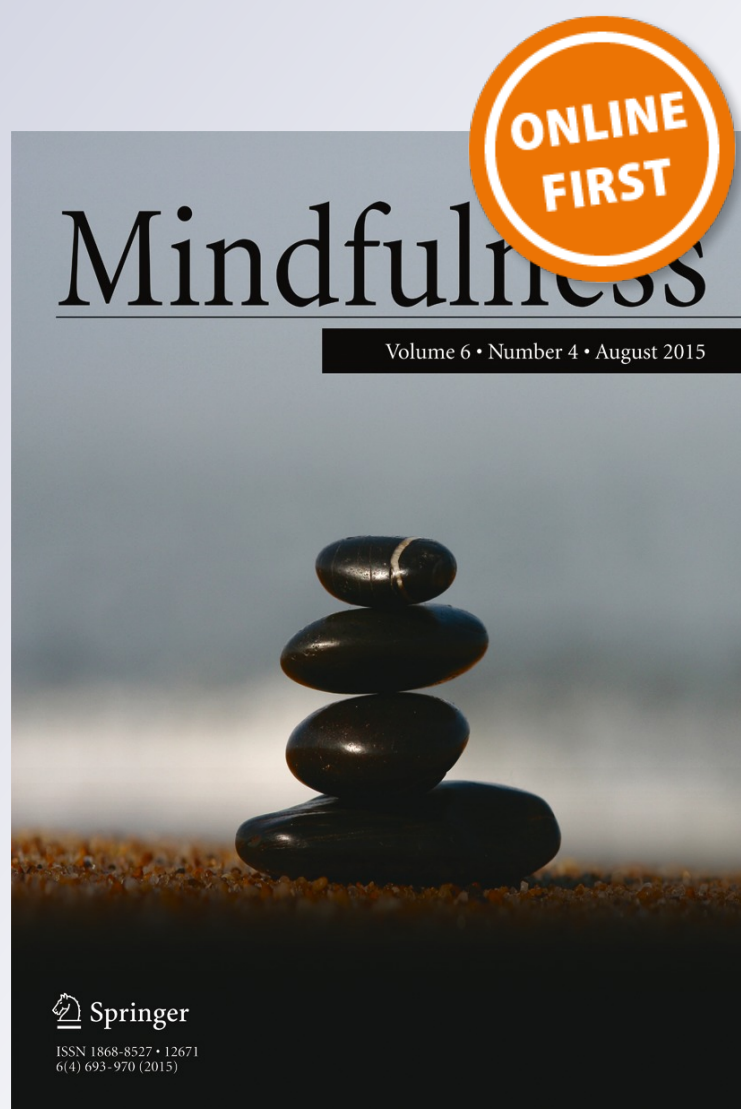
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The Impact of a Mindfulness-Based Stress Reduction Course (MBSR) on Well-Being and Academic Attainment of Sixth-form Students

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Abstract There is a growing interest in developing mindfulness skills in the context of education as a means to improve psychological well-being together with work-related skills and performance of children and adolescents. Here, we report findings from a feasibility pilot study exploring the acceptability and impact of a mindfulness-based stress reduction (MBSR) course with mixed-gender self-selected sixth-form students ($N=23$; age 16–18) studying for General Certificate of Education (GCE) examinations. The study followed a non-randomized controlled design with a 3-month follow-up. Participants (11 in the training group, 13 controls) reported on the acceptability of the course after its completion. In addition, they completed self-report measures assessing depression, anxiety, stress (DASS 21) and well-being (WHO-5) before the start of the MBSR training (Time 1), after its completion (Time 2) and at follow-up (Time 3). The impact of participation on academic attainment and medical absences was also evaluated. The MBSR course attendance rates were very high (94 %), attrition rate was very low (one participant) and 90 % of the course attendees said they would recommend the course to others. We have also found medium-size effect differences between the training and control groups on depression scores at T2 ($d=0.57$, $p=0.09$, one-tailed) and T3 ($d=0.57$, $p=0.08$, one-tailed), with the training group scoring lower. In addition, there was a medium-size effect on anxiety reduction from T2 to T3 ($d=0.74$, $p=0.07$, two-tailed) in the training group only. The results also revealed a medium-size effect difference in academic attainment between the two groups at T3 ($d=0.65$,

$p=0.08$, one-tailed), with students in the training group achieving better grades—a difference which equates to nearly one GCE grade per subject. Our findings suggest that the MBSR programme may be an acceptable and effective intervention for self-selected groups of sixth-form students, and participation in the MBSR course may benefit sixth-form students by improving their psychological health and supporting them in achieving their academic potential. Further larger scale studies are needed to provide conclusive evidence.

Keywords Mindfulness-based stress reduction · Sixth-formers · Adolescents · Academic attainment · Well-being · Education

Introduction

There is an ever growing awareness of social, emotional and behavioural problems faced by school-age students which can lead to concomitant difficulties in both social and academic performance (Schonert-Reichel and Lawlor 2010). Surveys show worsening of childhood and adolescent mental health, with around 13 % of boys and 10 % of girls aged 11–16 having mental health problems (Hagell 2012; Hagell et al. 2013). There is also evidence for a substantial increase in adolescent emotional problems in the UK, especially amongst girls (Collishaw et al. 2010). Such psychological health issues have been identified as a salient concern for health professionals and educators as students may struggle to access the education system, disrupt the academic and social ethos in the classroom and in the school community (Department of Education 2014). This may in turn impact on their potential to evolve into competent adults. These alarming trends highlight the need to find effective school-based programmes which would decrease the risk and occurrence of mental health

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problems in young people and enable them to develop social and emotional competency. Such programmes may also enhance coping skills in children and adolescents, helping them to face stressful situations, including examinations, with resilience, and thereby support development of their full potential (National Research Council and Institute of Medicine of the National Academies 2009; Masten and Motti-Stefanidi 2009).

As the importance of implementing well-being programmes as an integral part of education increases, mindfulness-based courses are rapidly becoming popular, with many developed over the past decade. A recent review of mindfulness-based programmes for education (Meiklejohn et al. 2012) supported the positive potential of mindfulness in this context while acknowledging that the available evidence base is fairly limited. The review also identified some of the challenges of implementation which include adaptation of established mindfulness-based interventions for children and adolescents and the difficulty in identifying and incorporating the 'active mindfulness component(s)' in such adapted programmes (Grossman and Van Dam 2011). A number of mindfulness-based courses for education have been influenced by the well-established mindfulness-based stress reduction programme (MBSR: Kabat-Zinn 1990) which follows a standardised format, is feasible for a wide variety of adult populations (Kabat-Zinn 2011) and has a strong research evidence support (Chiesa and Serretti 2009; Grossman et al. 2004; Hofmann et al. 2010; Khoury et al. 2013). There is currently a move towards mindfulness-based programmes for students, which are shorter than the standard MBSR because such interventions appear more feasible in school systems. It is not yet clear how such adaptations may impact on the self-experiential foundations and development potential inherent in an MBSR course.

Preliminary research exploring the effectiveness of both standard and adapted versions of MBSR with adolescents and children experiencing a variety of psychological and academic difficulties showed a range of promising improvements in academic performance and well-being (Biegel et al. 2009; Semple et al. 2010; Wall 2005). These positive initial outcomes are understandable given the versatility and adaptability of MBSR to a range of physical, social and psychological problems (Grossman et al. 2004). And importantly, the experiential emphasis of MBSR appears to be well tolerated by adolescents (Barnes et al. 2004). In addition, the benefits for students can be considered as a means to enhance their whole education rather than an end in themselves, such as supporting students during examinations or improving their concentration. MBSR may offer students a chance to develop self-regulation skills, including more adaptive ways to deal with rumination and emotional difficulties, which can be sustained with regular post-course support. Some objections to MBSR for this population concern the length of

the sessions and the language used which can be viewed as not age appropriate. As a result, the MBSR programme may not be able to fully engage a conscript audience, but there is the possibility of it being suitable for self-selected groups of students, provided that minor adaptations to the course are made (in terms of language, examples and metaphors used).

The purpose of this feasibility pilot study was to investigate whether the standard MBSR programme could be an acceptable and beneficial intervention for a group of adolescents with an interest in reducing stress levels. In this context, questions about feasibility of delivering standard MBSR training within the school environment were examined, together with attendance and attrition rates. We have also evaluated the impact of the intervention on well-being self-report measures, medical absence rates and academic performance of the students. Following participation in the MBSR course, it was expected that self-report scores would show decreases in depression, anxiety and stress levels and enhanced well-being as evidenced from adult studies. Furthermore, it was predicted that such beneficial changes would result in improvements of academic attainment and reduction in medical absences.

Method

Participants

To reduce socio-economic variance, all participants were recruited from a single local authority sixth-form college based within a community school in north-west England. The college population is drawn from a wide catchment area covering both rural and town developments, representing a diverse range of social groups.

Following college management permission, the research project, including an outline of the MBSR programme, was presented to the sixth-form tutors and administrative staff during a brief information session. After staff approval, the project was outlined to the complete sixth form (years 12–13, 160+) in a half hour presentation including a question and answer session. Adolescents aged between 16–18 years at the start of the academic year and studying three or more General Certificate of Education (GCE) subjects (AS/A2), having achieved 5 plus A-C GCSEs, were eligible to participate in the study. Those studying National Vocational Qualification or Baccalaureate followed a different curriculum and assessment format and so were ineligible. Following MBSR guidelines, (Blacker et al. 2009) anyone currently receiving medication or counselling for mental health issues, addiction or psychosis was excluded. Those who had experienced life traumas such as close family bereavement, suicidal ideation or major health issues were advised not to volunteer. Informed consent was obtained from all eligible students who

volunteered for the study. Parental consent was obtained for any student under 18 years of age at the start of the academic year, and both individual assent and school consent were obtained for all participants to partake and to access student data on academic performance, attainment and attendance.

Students volunteered to participate in the study in line with the intrinsically invitational nature of MBSR (Kabat-Zinn 2011) and Center for Mindfulness guidelines (Santorelli and Kabat-Zinn 2013). Once arrangements were finalised, some students due to prior timetabling commitments were unable to participate in the study and were assigned to the control group. Students in the intervention group completed a comprehensive self-assessment questionnaire and attended an interview with the course teacher (the first author of this study). This was to ensure that participants were fully aware of their commitments throughout the 6 months of the research and felt comfortable to work with the teacher and the group. This pre-training stage has been identified as important for participant safety, can enhance commitment and group functioning and also reduce attrition (Lustyk et al. 2009). All 12 students screened for the intervention were eligible, had no previous experience of meditation-type practices and elected to proceed with the training. One participant was advised to withdraw from the intervention group after the start due to mental health concerns and suicidal ideation. Following the disclosure, the student was encouraged (but reluctant/unwilling) to speak with her parents. The mindfulness teacher and student identified a member of school staff the student was comfortable discussing the problems with. The staff member followed protocol and informed other school staff member responsible for child protection. The student was then supported to schedule an appointment with her GP, and subsequently, counselling was arranged. Data from this participant was omitted leaving 11 students in the training group (M/F 9/2) and 13 students (M/F 5/8) in the control group. The mean age of students was 17.7 years ($SD=0.73$), and a t -test confirmed that the groups were not statistically different with respect to age ($t(1,22)=1.17, p=0.25$).

Procedure

The study followed a longitudinal non-equivalent group design. Scores on the measures of well-being, academic attainment and attendance were collected at three time points—pre-intervention (T1), post-intervention (T2) and 3-month follow-up (T3). At each time point, academic attainment scores and attendance records were also collected. Data was gathered during the week preceding the start of the intervention (T1), the week of the final intervention session (T2) and during the first week of examinations (T3). School staff accessing academic and attendance data were blind to the participant's group assignment. In addition, qualitative data was gathered through student narratives at T2 in response to a question

‘How do you feel you have benefited from participation in the MBSR course?’.

The MBSR course (Blacker et al. 2009) was delivered weekly over 8 weeks at the end of a school day in 2-h sessions and in a group format. Sessions closely followed the Centre for Mindfulness (CFM) syllabus with minor adjustments. An empirical understanding of adolescent development and well-being, plus the processes that promote mindful awareness and the rationale behind the MBSR course, provided a framework for these small adjustments which included ensuring that the vocabulary used was age appropriate and images, metaphors and discussions were sculpted from participants' social and educational environments. The course was facilitated by the first author, an experienced school teacher and MBSR teacher, trained through the Centre for Mindfulness Research and Practice (CMRP), Bangor University in the UK and CFM, Massachusetts, USA.

During sessions, students received guidance in the three main MBSR practices designed to enhance mind/body awareness—body scan, mindful movement and sitting practice. Students were provided with computer discs of these mindfulness practices plus weekly handouts to support each session. They were encouraged to undertake 45-min home practice every day. Participants in the control group were not offered the intervention due to timetabling constraints. They were instead invited to a 2-h ‘mindfulness workshop’ following the study.

Additional Ethical Considerations

There is evidence that participation in an MBSR group may enhance psychological issues and students may have a sense of being ‘overwhelmed’ (Shaw 2000; Teasdale and Chaskalson 2011). Thus, it was important for the course teacher to be fully aware of the school's child protection procedure and to have professional pathways and support in place for both the course teacher and students, in order to deal effectively and sensitively with potential disclosures such as suicidality, self-harm or abuse. All the staff involved in student pastoral care were encouraged to be sensitive to the possible impact of the intervention and offer appropriate support and reassurance. Provision to access professional support was in place and useful resources, helpline and website information were made available. The course teacher was available, initially by email, to support students with their mindfulness practice during the intervention. All reasonable measures were taken to ensure confidentiality and data protection.

Measures

To assess psychological stress and well-being, two well-validated self-report scales were used.

Depression, Anxiety, Stress Scale-21 (DASS 21; Lovibond and Lovibond 1995) is considered an effective screening tool

for identifying, differentiating and assessing depression, anxiety and stress. The shortened version of DASS contains 21 items, 7 for each of three dimensions. This measure assessed students' emotional states during the previous week, for example 'I tended to overreact to situations', and each statement was scored on a 4-point scale (0=Did not apply, 3=Applied to me very much). Studies based on a large non-clinical adult sample showed excellent/good overall reliability of the scale (UK: $N=1794$, $\alpha=0.93$, Henry and Crawford 2005; USA: $N=503$, $\alpha=0.85$, Sinclair et al 2012). Similar studies assessing reliability with undergraduate populations indicated good internal consistency and concurrent validity with other depression/anxiety measures (Osman et al. 2012). There is also evidence for internal consistency and concurrent validity within acceptable to excellent ranges and acceptability to a student population, combined with adequate reliability and stability (Antony et al. 1998). A set of cut-off scores has been developed for categorising mild/moderate/severe/extremely scores for each DASS subscale.

World Health Organisation Five-Item Well-Being Index (WHO-5, World Health Organization Regional Office for Europe and the International Diabetes Federation, Europe 1990) is a quick, reliable and valid self-report measure based on five positive statements used to assess psychological well-being during the previous 2 weeks, for example 'I have felt active and vigorous'. Each statement is scored on a 6-point Likert scale (5=All the time, 0=Did not apply). A cut-off of $>50\%$ (>13) indicates poor well-being. This measure has an adequate external and internal validity based on a large adult sample ($N=1974$) (Heun et al. 1999), and excellent internal consistency ($\alpha=0.85$) reported on a sample size of 501 adult outpatients (Lowe et al. 2004). These levels of validity and consistency were replicated in a study with adolescents where the WHO-5 showed a moderate to strong correlation with the following psychological measures: the Center for Epidemiologic Studies Depression Scale (CES-D) ($r=-0.67$), the Diabetes Family Conflict Scale (DFCS) ($r=-0.34$) and the mental health ($r=0.60$) and self-esteem ($r=0.43$) subscales of the Child Health Questionnaire (CHQ-CF87) ($N=91$, De Wit et al. 2007).

Given that validated mindfulness scales for this age group are still being developed (Brown et al. 2011; Lawlor et al. 2013) combined with the underlying difficulty of defining mindfulness, the construct of mindfulness was not measured.

Body barometer measure was designed by the first author of this study to assess whether the same school time/experience of 2–3 days was perceived as more or less stressful by students before and after the MBSR training and at follow-up. The measure is a graph similar to a vertical clinical thermometer with a 1–100 linear scale. Students' quantified their 'stress level' during the previous few days and marked the scale accordingly with a single arrow. Higher scores indicated higher perceived stress levels. This measure was used in

preference to more commonly used stress questionnaires (Perceived Stress Scale, Cohen et al 1983; Stress Appraisal Measure, Peacock and Wong 1990) because it was quick and simple, facilitated comparison between the groups and did not duplicate questions from DASS 21.

A pilot study was conducted to assess the suitability of using the three measures with a 16–18 student population. Twenty students, who met the study criteria but did not take part in the training and control group assessments, completed the measures under conditions similar to the study. They took an average 5 min to fill in and the students confirmed that all measures were understandable, easy to complete and used age-appropriate language—scoring 2–3 on a 5-point Likert Scale (1=easy, 5=too difficult). The body barometer measure showed good test-retest reliability over a week and the body barometer scores positively correlated with scores on the stress subscale of DASS 21 ($r=0.62$).

To measure academic attainment, the following data were obtained:

Fischer Family Trust (FFT) Performance Data. The Fischer Family Trust (FFT) (Fisher Family Trust 2011) is an independent, non-profit organisation established in 2001 providing performance data to support educational progression in the UK. The FFT manages the National Pupil Database in England processing and matching national data, national assessment, test and exam information across all key stages (K1–K12) to provide an estimate of academic attainment (grade) for each individual student for specific subjects. The latest student and school data is used to provide estimates of the 'most likely grade' a student will attain in subjects if current performance is maintained. These estimates are based on the grades achieved by more than 50% of students in the previous year's national results at each key stage. Overall, FFT uses a 'fine level' approach to analysing national student progress from K1 through to K12 when calculating average scores and therefore has a high level of accuracy and predictive validity.

Half-Term Assessments Tests (HATs) are school-based nationally standardised assessments undertaken every 6–8 weeks during the school year. They provide on-going academic attainment data for each student in each subject studied. Subject HAT tests are compiled, marked and graded by subject teachers using Examination Board 'past papers' data and marking criteria (Assessment and Qualifications Alliance AQA 2013a) and compared on a test-retest basis between groups and over time. Mark schemes and cross-marking standardisation also help reduce possible individual teacher bias. These tests have a degree of inherent subjectivity, but the assessment system has been developed and refined over the past 8 years and shows in-built reliability, rigour and content-related validity. The HAT data was used at pre and post time points (T1, T2).

General Certificate of Education (GCE) examinations. All students sat GCE examinations in their chosen subjects 3 months post intervention, providing objective data of academic attainment at time point 3 (T3). To enable comparison between the academic measures, grades were converted and recorded using the GCE grade scoring system (Assessment and Qualifications Alliance AQA 2013b) (see Table 1). At each time point, the average score for a student's three main subjects was recorded.

Attendance. The school computer system recorded attendance twice daily and categorised the reason for absence. Student attendance data was collected and analysed over 8 weeks before, during and post intervention and any absences due to medical reasons, e.g. illness, were recorded. To account for any minor variance due to school training/closure at each time point, medical absence/attendance was calculated as a percentage.

Data Analyses

To investigate any changes on the measures after the training, between group comparisons were conducted at T2 (post-training) and T3 (follow-up) using one-tailed non-equivalent groups *t*-tests for predicted differences. Both groups exceeded the sample size of nine, estimated using data from a power analysis in a study investigating the effects of mindfulness-based cognitive therapy which reported a significant group difference at $\alpha=0.05$ and a power of 80 % with a similar-aged population ($d=0.59$) (Semple et al. 2010). The effect sizes were the focus of our analyses since it has been recommended that effect sizes are better estimates of effects than significance levels (Cumming 2012). We have reported effect sizes (Cohen's *d*) for all findings with $p<0.10$, one-tailed. Where appropriate, observed differences were followed up by longitudinal two-tailed pairwise-test comparisons and effect size reports. Descriptive statistics for all the measures are reported in Table 2. There were no significant differences between the groups on any of the measures before the start of the training (p 's >0.098 , two-tailed) with the exception of the WHO-5 Index, $t(22)=2.32$, $p=0.03$, two-tailed—the intervention group reported a higher perception of well-being at the baseline.

Table 1 AQA GCE examination grade boundaries

| Max mark | A | A | B | C | D | E | U |
|----------|-----|-----|-----|-----|-----|-----|----|
| 300 | 270 | 240 | 210 | 180 | 150 | 120 | 90 |

Results

Programme attendance by the intervention group was 94.3 % ($N=11$).

DASS 21

Between group comparisons on the total DASS 21 scores did not show any significant differences at both T2 and T3 (both p 's >0.21). However, the Depression subscale differences at T2 showed a medium-size effect ($t(22)=1.38$, $p=0.09$, 95 % CI $[-5.62, 1.07]$, $d=0.57$), with the intervention group scoring lower than the control group. The same effect was again evident at T3 ($t(22)=1.41$, $p=0.08$, 95 % CI $[-5.44, 0.99]$, $d=0.58$). Analyses of the Anxiety and Stress subscales at T2 and T3 did not reveal any significant between group differences (all p 's >0.16), but examination of the descriptive statistics showed that mean anxiety scores for both groups decreased over time with the training group showing larger drops. There was no significant difference for anxiety between T1 and T2 for either group, however comparisons between T2 and T3 scores revealed a medium-size effect for reduction in anxiety scores in the intervention group only ($t(10)=2.04$, $p=0.07$, two-tailed, 95 % CI $[-0.29, 5.75]$, $d=0.74$). This shift was on average associated with a 2.73 points reduction in anxiety scores. The control group showed no statistical differences in anxiety scores between time points (all p 's >0.10) and an average score reduction of 1.23 points. There were also fewer students self-reporting 'moderate/severe levels' on DASS-21 scoring (10+) in the intervention group at T3 (six at T1 and two at T3) than in the control group (six at T1 and five at T3).

Body Barometer

Comparisons of group differences for the perceived stress measure did not reveal any significant differences (both p 's >0.12).

WHO-5

The analyses of differences on the measure of well-being showed a significant difference at T2 ($p<0.01$) with the intervention group scoring higher. However, there was a pre-existing difference between the groups ($p<0.05$, two-tailed) and a longitudinal within group comparisons did not reveal any significant shifts in either group from T1 to T2, T1 to T3 and T2 to T3 (all p 's >0.15). The between group differences at T3 were not significant either ($p>0.12$).

Medical Absences

The comparisons of medical absence percentages between the intervention and control groups revealed significant effects at

Table 2 Descriptive statistics showing training group ($N=11$) and control group ($N=13$) mean scores and standard deviations

| Measure | | T1 | | T2 | | T3 | |
|---------------------|----|----------|---------|----------|---------|----------|---------|
| | | Training | Control | Training | Control | Training | Control |
| Depression | M | 6.00 | 8.00 | 6.18 | 8.46 | 4.55 | 6.77 |
| | SD | 4.73 | 6.27 | 3.40 | 4.48 | 3.48 | 4.13 |
| Anxiety | M | 9.09 | 10.31 | 8.73 | 8.15 | 6.00 | 6.92 |
| | SD | 7.77 | 7.43 | 3.38 | 6.35 | 4.00 | 5.27 |
| Stress | M | 11.6 | 13.23 | 11.82 | 14.0 | 14.00 | 13.08 |
| | SD | 5.78 | 6.03 | 4.51 | 6.06 | 4.82 | 6.41 |
| DASS total | M | 26.73 | 31.69 | 26.73 | 30.62 | 24.55 | 26.77 |
| | SD | 13.57 | 15.75 | 7.50 | 15.48 | 6.76 | 12.50 |
| WHO-5 | M | 64.7 | 54.46 | 69.09 | 57.54 | 62.55 | 55.38 |
| | SD | 9.60 | 11.72 | 9.81 | 11.84 | 14.34 | 14.03 |
| Body barometer | M | 36.70 | 50.38 | 36.18 | 46.77 | 36.91 | 44.31 |
| | SD | 23.18 | 22.80 | 22.75 | 19.66 | 23.67 | 26.91 |
| Attendance | M | 93.85 | 94.05 | 89.50 | 91.61 | 88.35 | 92.30 |
| | SD | 5.95 | 5.29 | 8.17 | 5.39 | 6.23 | 7.46 |
| Medical absence | M | 0.62 | 2.04 | 1.28 | 2.96 | 0.18 | 1.25 |
| | SD | 1.41 | 2.51 | 2.36 | 2.59 | 0.60 | 1.91 |
| Academic attainment | M | 201.36 | 190.58 | 201.82 | 195.38 | 207.95 | 184.42 |
| | SD | 39.44 | 34.36 | 38.86 | 18.11 | 44.28 | 31.23 |

T1 before the intervention, T2 after the intervention, T3 3-month follow-up

T2 ($p=0.05$) and T3 ($p<0.05$) with students in the intervention group showing lower percentages of medical absences than those in the control group. However, there was a pre-existing difference between the groups at T1 ($p=0.10$, two-tailed).

The patterns of medical absences between the two groups were further examined by comparing the number of sessions recorded as medical absence at each time point as a percentage of the total absence recorded for each group at each time point (see Table 3). This analysis indicated that at T1 and T2, both groups showed similar trends with the control group experiencing three times higher medical absence percentage than the intervention group. The attendance ratio for T3 in the build up to the examinations shows a noticeable change, with both groups experiencing a decrease in medical absence. However, the intervention group showed a greater decrease in the percentage of time lost due to medical reasons than the control group, resulting in a changed ratio comparison from 1:3 to 1:10.

Academic Attainment

While there was no significant difference in academic attainment between the groups at T2 ($p=0.31$), a medium-size effect emerged at T3, in comparisons of the actual/final GCE scores ($t(22)=1.52$, $p=0.08$, 95 % CI [-8.52, 55.58], $d=0.61$), with the intervention group improving on mean academic scores by

6.13 points while the control group recorded a decrease in mean academic scores by 10.96 points. At T2, the difference between the groups was 6.44 points, equivalent to 0.25 GCE grade variations per subject, but this trend increased to 23.53 points at T3—equalling a difference of nearly one GCE grade score per subject studied between the groups (see Fig. 1). Graphing the data pointed to an interesting divergent trend warranting further analysis. A pairwise t -test for the control group identified a difference between T2 scores (school-based (HAT) GCE attainment scores ($M=195.38$, $SD=18.11$)) and actual GCE scores at T3 ($M=184.42$, $SD=31.23$) with a marginally significant decrease in academic performance ($t(12)=2.10$, $p=0.057$, two-tailed, 95 % CI [-22.31, 0.39]).

Post Intervention Student Comments

To gather the experience of the students who did the practices and to evaluate the acceptability of the MBSR course for sixth-form students, participants were offered an opportunity to complete a confidential feedback evaluation. The majority of students (90 %) indicated that they would recommend MBSR (or a similar mindfulness course) to fellow students. The average response for course structure and content was 4 on a 5-point Likert scale (1=poor, 5=excellent). Below is a sample of student narratives to the question: 'How do you feel you have benefited from participation in the MBSR course?'

Table 3 Ratio of medical absence to total absence at each time point

| Ratio | T1 Training:control | T2 Training:control | T3 Training:control |
|-----------------------------------|------------------------|------------------------|------------------------|
| Medical absence/Total absence (%) | 10.08:34.11 | 12.19:35.28 | 1.54:16.23 |
| Ratio | 1:3 | 1:3 | 1:10 |

T1 before the intervention, T2 after the intervention, T3 3-month follow-up

These range from short to more developed expressions of the perceived benefits.

- 'Learnt to make time for myself in order to slow life down.'
- 'Being more able to calm myself down.'
- 'Not getting ahead of myself.'
- 'I see when my mind is wandering and it wanders a bit less.'
- 'I think it has helped me stay focused in lessons.'
- 'I can concentrate in school better as I am more able to block out distractions.'
- 'Makes me reflect more, like on my habits.'
- 'Made me more aware of my actions.'
- 'I feel less overwhelmed and give my head time to settle.'

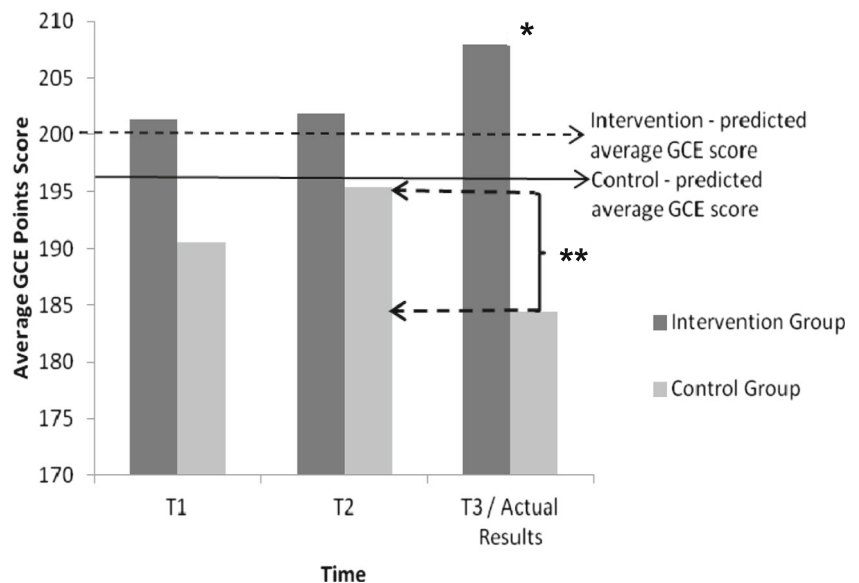
Discussion

Even though there is a fast growing interest in introducing mindfulness into education, there are, as yet, relatively few research studies that looked at the efficacy of mindfulness interventions within a school setting (Burke 2009; Felver, Celis-de Hoyos, Tezanos, and Singh 2015; Meiklejohn et al. 2012). Results from this feasibility pilot study provide promising evidence that the MBSR course is an acceptable intervention for self-selected groups of 16-to 18-year-old students

and can be delivered within a school environment with high attendance and retention rates. This is in line with previous research reporting the MBSR programme as 'acceptable to adolescents' (Barnes et al. 2004; Burke 2009; Meiklejohn et al. 2012). We have also found initial evidence suggesting that participating in an MBSR course may reduce self-reported levels of depression and anxiety and improve academic attainment of students. These findings are aligned with previous research which has shown reductions in psychological distress in adults after MBSR (e.g., Carmody and Baer 2008) and documented enhanced well-being and academic attainment in school-aged participants after mindfulness training (Zenner et al. 2014; Zoogman et al. 2014).

Our study identified 50 % of the students in the sample having 'moderate-severe anxiety levels' (DASS scores 10+) before the start of the training. Mental health clinicians advise that individuals with such moderate/high levels of anxiety undertake some form of professional intervention. Neither the students, nor school, were aware that such anxiety levels warranted support, and therefore, no professional support was in place. Statistics show that whilst effective professional support is available, it appears that only around 25 % of those in need of such treatment actually receive it (Centre for Economic Performance Mental Health Policy Group 2012). Importantly, anxiety not only impairs functioning but is also a risk

Fig 1 Differences in academic attainment (average GCE scores) across the three time points including the predicted academic scores for the training and control groups. T1 before the intervention, T2 after the intervention, T3 3-month follow-up (* $p < 0.1$ one-tailed, ** $p < 0.05$ one-tailed)



factor for developing adult mental health problems. The effect on reducing anxiety levels in our study was evident following completion of the course (T2–T3) despite this time period often being described as stressful in the lead up to GCE examinations. This suggests that participation in the programme may confer some form of resilience at times of increased stress, thus allowing students to face and recover more quickly from stressful situations. Given the acceptability of MBSR to students in our study, this intervention (and other mindfulness-based approaches) may help provide the support needed in a non-stigmatising and approachable way within the school environment. For many students, it might be preferable to self-select to attend a group MBSR programme, than seeking counselling help. Indeed, in the post course comments, student narratives indicated that the MBSR course was favourably perceived as useful and beneficial to supporting life both in and out of school.

The medium-size effect findings of changes in the levels of depression are aligned with the shift in anxiety scores in the training group and suggest that the MBSR training may have improved mood levels in the intervention group. This effect was sustained into the examination period. Kuyken et al. (2013) study, which evaluated a school-based mindfulness intervention, also found improvements in depression scores in the training group. Further research is needed to investigate possible mediating role of the reductions in anxiety and depression levels on attendance, academic attainment and underlying mechanisms such as improved coping and emotion regulation.

The recorded decrease in medical absence in both groups as students approached the stressful examination period (T2–T3) was more marked in the intervention group relative to the control when the ratio of the medical absences in comparison to overall absences was considered. This suggests that participation in an MBSR course may help reduce absences on medical grounds resulting in less school/classroom time being missed, thus supporting academic learning. It may be that through development of mindfulness skills, students are more able to be aware of their own mental and physical signals and respond appropriately to prevent reaching the point of 'unwell' or overwhelmed.

Results of other studies suggest that participation in an MBSR course and developing mindfulness skills may help students academically (Biegel et al. 2009; Wall 2005). We have found that participants in the training group were able to meet (and numerically also exceeded) their predicted grades, while the control group scored below the predicted grades. The difference in the actual grades between the groups was nearing one grade at the follow-up. The small size of our study did not allow for investigating whether the difference was mediated by reductions in anxiety and depression, improvements in concentration and memory or a combination of both given the neurocognitive links between affective and

cognitive processing. It is worth highlighting that the students volunteered to participate in the study and the outcomes may have been influenced by their initial motivation to 'distress/do better'. Further larger scale research combining efficacy and effectiveness evaluations which would expand on our initial findings is needed.

This feasibility study had several strengths and limitations. A design was chosen that enabled the intervention students to be compared with controls matched on several key variables, such as school environment, age and academic progression. The timing of the study enabled the effects to be assessed both immediately following the intervention and also during the examination period; and measures were selected which were shown prior to the study to be acceptable to students. The study has also a number of limitations and the results should be therefore treated cautiously. The small sample size led to less stringent statistical significance analyses and the focus was on effect size analyses instead since they are not impacted by sample size (Cumming 2012). We have also highlighted the real-world meaningfulness of the findings as emphasised in recent discussions about the role of statistical analyses in psychological research (Cumming 2012). In our study, this is exemplified by considerations about clinical significance of four (out of six) participants in the training group shifting at follow-up out of the pre-intervention moderate/severe range in anxiety in comparison to only one in the control group. Similarly, a between group difference of nearly one grade at follow-up is meaningful in real-world impact terms, even though the statistical significance comparisons were not conservative. A balanced interpretation of the findings needs to take into account both the limitations in terms of sample size and statistical significance and the effect size results combined with meaningfulness of the findings.

In addition to the statistical limitations of the study, we were not able to randomly or pseudorandomly assign students into the training and control groups which resulted in some baseline imbalances (on well-being scores and medical absences), and the control group did not receive an active intervention, only training as usual. The groups were also not well balanced on gender, even though post hoc analyses did not show this factor to have impacted on the pattern of findings. It may be that the students who opted into the study were those keen to maximise every opportunity to improve grades and this contributed to the high attendance figures for the intervention group.

The MBSR course was facilitated by the first author, an experienced mindfulness teacher. While all reasonable measures were taken to limit the impact of the dual role as researcher/trainer in our study (acknowledgment of the dual role in the group and encouragement to respond without a bias) and the participant responses were confidential, it is still possible that the dual role impacted on some of the improvements in self-report

measures of anxiety and depression or perceived personal gain. However, this would not account for the differences in academic attainment. Fidelity of the intervention is an important factor to consider in future studies, and there is a need for adherence to the teaching and facilitator standards (Santorelli and Kabat-Zinn 2013) together with compliance with MBSR good practice guidelines (Crane et al. 2013). Future studies may consider incorporating assessments of mindfulness teacher competency (Crane et al. 2013; Kabat-Zinn 2011).

Finally, future studies could broaden the assessment scope beyond self-report measures and combine psychophysiological and neurocognitive measures which may be more sensitive to subtle changes in anxiety and depression-related markers with experiential sampling assessments of participant's experience. Specifically, investigating the impact of mindfulness training on mindfulness qualities (non-judgement, patience, concentration) and on cognitive variables such as stability of attention, working memory and meta-cognition and associated neural correlates seems particularly pertinent. This may be facilitated by undertaking more in-depth studies incorporating qualitative approaches, to allow the complexities of the construct of mindfulness to be explored from a developmental perspective and combined with neurocognitive measures. In this context, studies with longer follow-up periods are much needed, in order to identify the impact of mindfulness training delivered in education on long-term well-being and health outcomes.

Overall, the current study provided initial insights into the acceptability of MBSR training with adolescents in schools and also outlined several salient issues for future research on mindfulness interventions in education. A possible link between changes in well-being and improvements in academic attainment seems to be particularly pertinent to further explorations. With the keen interest to implement mindfulness in the school context, it is important not to slip into viewing mindfulness as a quick fix or fashionable addition to a curriculum. The growing enthusiasm and interest to incorporate mindfulness in education at all levels is to be actively encouraged, but it is also important to ensure that efforts to bring mindfulness programmes into schools are informed by 'best practice' and high standards of mindfulness teaching coupled with careful exploration of the pros and cons of different formats and curricula specifics.

Ethical Standards

The study has been approved by the Ethics Committee in the School of Psychology, Bangor University, North Wales in the UK, prior to start and has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

All persons gave their informed consent prior to their inclusion in the study.

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