

Exercise Compared to Mindfulness for Physical and Mental Wellbeing in Medical Students

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Abstract

Aim

Physical Activity (PA) and Mindfulness-Based Stress Reduction (MBSR) both have positive effects on medical student well-being. The 'MED-WELL' programme is a curricular intervention that combines PA and education on exercise as medicine. This trial evaluates whether there is a mean difference in outcomes of participants of an exercise intervention, the 'MED-WELL' programme, versus a control group which engages in a MBSR programme.

Methods

All second-year medical students were voluntarily allocated into the intervention or control group. Data on overall health and well-being, sleep quality, loneliness, current level of PA, and confidence in prescribing exercise as medicine was analysed from both groups at baseline and after eight weeks.

Results

Within groups the intervention and control groups showed statistically significant improvements in overall well-being ($p=0.010$, $p=0.005$ respectively) and in sleep quality ($p<0.001$, $p=0.007$ respectively).

The intervention group had statistically significant improvements in levels of PA ($p=0.003$) and confidence in prescribing exercise ($p<0.001$). However, there were no statistically significant differences in changes in outcome measures between groups.

Conclusion

This study has shown that participants in an exercise intervention, the 'MED-WELL' programme, had similar improvements in overall wellbeing and sleep quality to those in a control group who participated in a MBSR programme of the same duration.

Introduction

The life of a medical student is academically, mentally, and physically challenging. These challenges can strain the mental health and wellbeing of students and lead to increased anxiety and lower moods^{1,2}. When compared to the general population, medical students in particular have a high prevalence of depression and suicidal ideation^{3,4}. The challenges encountered by medical students are faced in both undergraduate and graduate-entry medical programmes. Despite having completed a first degree prior to admission graduate-entry students have comparable levels of stress, anxiety, and depression to undergraduate students^{5,6}. Although appropriate levels of stress can improve academic performance, excess stress results in decreased cognitive functioning which can negatively affect students academically¹.

Physical Activity (PA) offers a wealth of benefits both physiologically and psychologically. The Irish national PA guidelines recommend at least 30 minutes of moderate to vigorous PA five days per week, or 150 minutes over a week to support physical and mental health⁷. PA in general has been shown to improve anxiety, stress, depression, and overall mental wellbeing^{8,9}. These benefits are seen in medical student populations as well, including a lower risk of student burnout^{10,11}.

There is a growing student interest in education on PA and exercise as medicine however curricular-based modules are often optional, if existent in the medical school curriculum at all. The major barriers in implementing these modules often surround lack of curricular time and space¹². A previously conducted feasibility study of a combined exercise and educational intervention known as the 'MED-WELL' programme demonstrated it is feasible to deliver the intervention as part of a medical school's curriculum¹³.

Mindfulness-Based Stress Reduction (MBSR) programmes have also recently gained popularity and shown efficacy in reducing stress in medical students^{14,15}. In some populations MBSR programmes have also led to positive changes in empathy and psychosocial beliefs^{16,17}. Such programmes, however, do not educate participants on the clinical use of exercise as medicine.

This study compared the effectiveness of an exercise intervention (the 'MED-WELL' programme) versus a MBSR programme in promoting health and well-being among medical students.

Methods

This study was conducted in a single graduate-entry medical school at the University of Limerick (UL). All 140 graduate-entry medical students at UL who were in their second year of the 2019-2020 academic year were invited to participate in the study. Participation in either the 'MED-WELL' programme or a MBSR programme was mandatory as a part of the second-year medical school curriculum. Though attendance at their respective activity was mandatory, participation in this trial was voluntary and not linked to assessment in any way. All students could request their preference of participating in either the 'MED-WELL' programme or a MBSR programme. Eighty-nine participants requested the 'MED-WELL' programme. Due to space constraints seventy were randomly selected from these requests to participate in the 'MED-WELL' programme. The remaining seventy were allocated into the control group, which included the fifty-one participants who requested to be in the control group (Figure 1).

The intervention group participated in the 'MED-WELL' programme. This programme is an exercise intervention consisting of eight weekly sessions lasting two hours each. At the beginning of each session a PA and health professional spoke for thirty minutes to the participants on an exercise or health-related topic. One hour of each session consisted of a different type of PA adapted to different ability levels by a professional instructor (Table 1). Thirty minutes was then allowed at the end for completion of a weekly reflection assignment.

The control group participated in a MBSR programme of the same length and duration as the 'MED-WELL' programme. The MBSR programme focused on coping with and reducing stress, anxiety, and depression through mindfulness techniques such as breathing, movement meditation, and personal reflection (Table 1).

Before initiation of the programme informed and signed consent was obtained from all participants. Self-reported outcomes of both the intervention and control groups were evaluated before and after the eight weeks using a questionnaire. A link to a Qualtrics pre-questionnaire was emailed to all participants of both the intervention and control groups. Participants completed the pre-questionnaire on the first day of the intervention before the intervention started, and the post-questionnaire within four weeks of the last session.

The questionnaires examined the participant's current state of health and wellbeing; sleep quality and loneliness; levels of PA; daily average step count over the last seven days; and confidence in prescribing exercise as medicine to a patient. The questionnaires used the following validated measurement scales: EQ-5D-5L Visual Analogue Scale (VAS)¹⁸; WHO-5 Well-being Index¹⁹; single-item Sleep Quality Scale (SQS)²⁰; modified version of the UCLA LS-8 scale²¹; and the two-item measurement Patient-centred Assessment and Counselling for Exercise (PACE+)²². Confidence in prescribing exercise as medicine was measured using a self-reported scale.

The distribution of changes from baseline to follow-up for each outcome variable was tested for normality. Paired sample t-tests were used to examine mean changes over time within groups with 95% confidence intervals (CI). A repeated measures ANOVA was carried out with the outcome measures at baseline and follow up as the within-subjects factor and group (intervention, control) as the between-subjects factor. A 5% level of significance was used for all tests with no adjustment for multiple testing. All statistical analyses were performed using the software package SPSS (version 25.0).

Results

Programme schedule

Table 1 outlines the weekly programme schedule for both the intervention and control groups. Both groups participated in their respective activity for two hours a week for eight consecutive weeks.

Table 1: Eight-week 'MED-WELL' and MBSR programme schedule.

Week	Intervention (The 'MED-WELL' Programme)		Control (MBSR Programme)
	<i>Exercise curriculum</i>	<i>Educational curriculum</i>	<i>General curriculum</i>
1	Sports Yoga	Exercise as medicine: PA for student wellness and patient use for exercise as a treatment	Foundational attitude of mindfulness practice and 'beginner's mind'
2	High Intensity Interval Training	Metabolic adaptation to exercise and implications for obesity, type 2 diabetes, and cancer	Dealing with barriers and non-judgement
3	Body Pump	Making exercise a habit	Mindfulness of the breath and of the body in movement
4	Pilates	PA, exercise, and mental health	Staying present and recognizing aversion
5	Les Mills Body Attack	PA importance, regular health-enhancing dose response curve; understanding people and PA stages of change	Acceptance, allowing, letting be
6	Circuits with Boxing	Practical applications: Prescribing PA for patients with chronic diseases (case study of diabetes)	Mindful communication/thoughts are not facts
7	Circuits with Gunnex	Relating the behaviour change wheel to PA promotion in practice	How can I best take care of myself?
8	Super Circuits	Nutrition and exercise	Looking backward/going forward: Keeping your mindfulness alive

Study participation, gender, and age distribution

A complete data set was available for analysis on 107 participants (76% of all participants) in the study. This included sixty-nine participants (99% participation) in the intervention group, and thirty-eight participants (54% participation) in the control group (Figure 1).

At baseline the mean age of the intervention group participants was 27 years with a range of 22 to 43 years. This was similar to the control group which also had a mean age of 27 with a range of 22 to 40 years. The gender distribution in the intervention group was 30% male and 70% female. This was also similar to the control group which had a gender distribution of 34% male and 66% female.

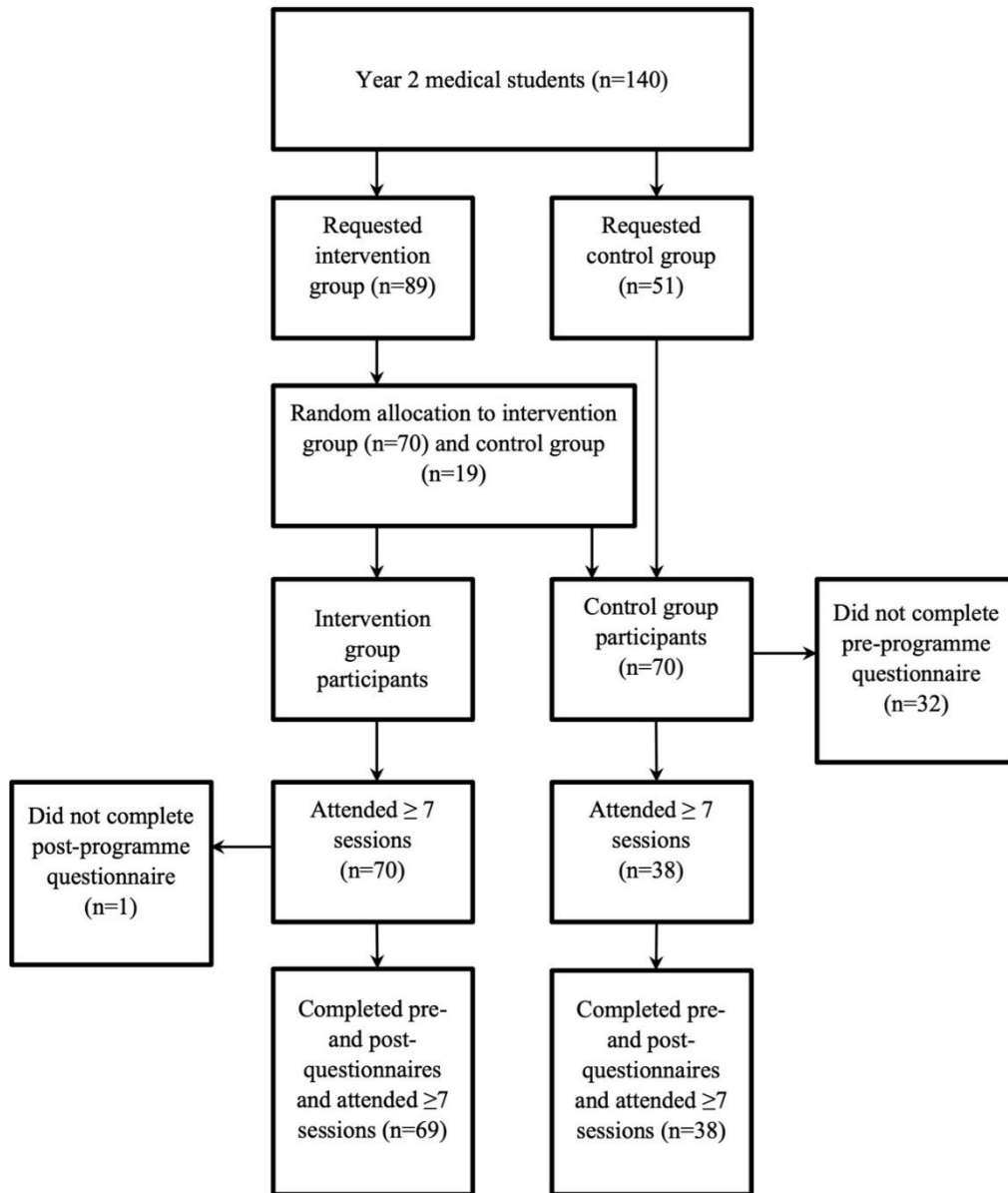


Figure 1: Outline of study participants.

Outcome measures

Table 2 summarizes the outcome measures for both the intervention and control groups. When comparing the outcome measures between intervention and control groups at baseline and follow-up there was no significant statistical differences in the mean outcomes. However, on analyzing the outcome measures within groups both the intervention and control groups showed statistically significant improvements in the EQ-5D-5L-VAS ($p=0.010$, $p=0.005$ respectively) and sleep quality ($p<0.001$, $p=0.007$ respectively).

The intervention group alone showed statistically significant improvements in PACE+ ($p=0.003$) and confidence in prescribing exercise ($p<0.001$). The intervention group also showed statistically significant changes in daily average step count improving from 5925 to 7335 (95%CI: 2910-8940); ($p=0.020$). However, a much smaller number of participants provided this data: 33% ($n=23$) of the intervention group and 17% ($n=12$) of the control group.

A sensitivity analysis excluding participants who did not receive their first choice of either the intervention or control groups was subsequently carried out; there were no changes in the significance of the results after this analysis was carried out.

Table 2: Summary of outcome measures of intervention versus control group>.

Outcome measure	Group	Baseline mean \pm SD	Post-intervention mean \pm SD	Mean change (95%CI)	p -value	p -value ^b
WHO-5 Well-Being Index	MED-WELL	61.6 (\pm 14.00)	64.2 (\pm 12.18)	2.8 (-0.16, 5.92)	0.063	0.41
	Mindfulness	59.2 (\pm 18.53)	61.7 (\pm 17.78)	2.5 (-1.42, 6.47)	0.202	
EQ-5D-5L-VAS	MED-WELL	73.4 (\pm 14.48)	77.4 (\pm 11.54)	^a 4.2 (1.04, 7.31)	0.010	0.89
	Mindfulness	72.3 (\pm 12.28)	77.7 (\pm 12.55)	^a 5.4 (1.74, 9.10)	0.005	
UCLA LS-8	MED-WELL	7.2 (\pm 2.25)	7.1 (\pm 1.89)	-0.15 (-0.55, 0.25)	0.465	0.27
	Mindfulness	6.7 (\pm 2.47)	6.6 (\pm 2.48)	-0.11 (-0.66, 0.44)	0.700	
PACE+	MED-WELL	3.3 (\pm 1.55)	3.7 (\pm 1.40)	^a 0.43 (0.15, 0.71)	0.003	0.66
	Mindfulness	3.5 (\pm 1.56)	3.6 (\pm 1.56)	0.04 (-0.28, 0.36)	0.806	
Sleep Quality	MED-WELL	5.9 (\pm 1.97)	6.8 (\pm 1.79)	^a 0.91 (0.47, 1.35)	<0.001	0.81
	Mindfulness	5.8 (\pm 1.95)	6.7 (\pm 1.67)	^a 0.81 (0.24, 1.38)	0.007	
Confidence in Prescribing Exercise	MED-WELL	4.0 (\pm 0.89)	4.5 (\pm 0.61)	^a 0.51 (0.31, 0.71)	<0.001	0.46
	Mindfulness	4.1 (\pm 1.09)	4.1 (\pm 1.11)	0.00 (-0.30, 0.30)	1.000	

^aStatistically significant change

^bFor the between-subjects factor of experimental group in a repeated-measures ANOVA

Discussion

Overall, there were no statistically significant differences in measured outcomes of the intervention group who participated in the 'MED-WELL' programme versus the control group who participated in a MBSR programme between baseline and follow-up. When examining data that excluded participants who received their second choice of preferred group in the non-randomised controlled trial there was also no statistically significant difference.

When analyzing outcome measures within the intervention and control groups the study showed that both groups had statistically significant improvements in the EQ-5D-5L-VAS and sleep quality measured outcomes. These findings suggest an improvement in the state of health and sleep quality of both groups from baseline to follow-up, despite no overall difference between the intervention and control group. It is interesting to note that both the intervention and control groups had high baseline means in the EQ-5D-5L-VAS outcome measure (73.4 and 72.3, respectively) yet still saw statistically significant improvements (to 77.4 and 77.7, respectively), potentially demonstrating the positive effect of both programme types on the mental health of participants.

The intervention group also had a statistically significant improvement in the PACE+ which suggests an increase in overall levels of PA. This positively reflects on the fact that the intervention group participated in a programme that was in-part dedicated to engaging participants in PA.

Both the intervention and control groups had high baseline mean values in confidence in prescribing exercise as medicine (4.0 and 4.1, respectively) however the intervention group showed a statistically significant change whereas the control group had no change (to 4.5 and 4.1, respectively). These results reflect the fact that the intervention group participants engaged in education on the use of exercise as medicine in clinical practice through the 'MED-WELL' programme. This is compared to the control group which received no education on the use of exercise as medicine and similarly saw no change in their confidence in prescribing exercise between baseline and follow-up.

Participants in the intervention group also significantly increased their step count from baseline to follow-up, while a significant change was not observed in the control group. This may also be a reflection on the fact that the intervention group participated in PA through the 'MED-WELL' programme.

However, a reduced number of participants in both groups completed the measurement for daily average step count compared to self-report assessments. Therefore, the observed patterns are interpreted cautiously with this limitation in mind.

A common goal of both the intervention and control group programmes is to improve the mental health and wellbeing of medical students. Despite no statistically significant difference between baseline and follow-up of the intervention and control groups, both groups independently showed positive improvements in some of the outcome measures. The 'MED-WELL' programme on its own has been shown to be effective in this regard¹³. MBSR programmes for medical students have also been studied and have shown positive effects in mental health and wellbeing^{15,23}. Although results of this study concluded there was no statistically significant difference between the two groups, the shift in participants' results in both control and intervention groups were in the direction of a positive mental health and well-being change in most outcome measures.

The results align with studies that demonstrate how PA and mindfulness both lead to improvement in mental health, including better adaptation to stress²⁴. PA and mindfulness have also been shown in previous studies to have similar effects on cognitive processes, such as attention control and executive functioning, in young adults²⁵.

Overall, there remains an opportunity in many medical school curriculums around Ireland and internationally to incorporate these types of programmes as mandatory curricular modules. Although the 'MED-WELL' programme offers the additional benefits of PA and education on exercise as medicine, the mutually positive effects on student mental health and well-being offer evidence for recommending both programmes as options in a mandatory curricular module.

The strengths of this trial are the use of validated outcome measures and procedures, and the use of a control group which was also engaging in an activity aimed to support student mental health and well-being. Participants in both groups also had similar baseline characteristics in age and gender distribution.

Limitations include the non-randomised design, which was in-part addressed by the similar baseline characteristics of both groups, and the fact that a majority of participants in the control group did not complete the post-programme questionnaire.

This may be attributed to the fact that all participants who did not get their first choice of either intervention or control group participation were placed in the control group. Some participants in both groups also skipped questions on the questionnaire, particularly the question regarding daily average step count which was more time consuming to complete.

In conclusion, our study has demonstrated that medical students who participate in an exercise intervention (the 'MED-WELL' programme) show similar improvements in overall wellbeing and sleep quality when compared to students who participate in a MBSR programme of the same duration. Additional research using larger samples and longitudinal randomized study designs are needed to further ascertain the relative merits of each approach and the sustained effects of each intervention on medical students' health and well-being.

Declaration of Conflicts of Interest:

All authors declare that they have no conflicts of interest.

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