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Effect of a Mindfulness Program on Stress, Anxiety and Depression in University Students

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Abstract. Two of the problems that currently affect a large proportion of university students are high levels of anxiety and stress experienced in different situations, which are particularly high during the first years of their degree and during exam periods. The present study aims to investigate whether mindfulness training can bring about significant changes in the manifestations of depression, anxiety, and stress of students when compared to another group undergoing a physical activity program and a control group. The sample consisted of 125 students from the Bachelor of Education Program. The measuring instrument used was the Abbreviated Scale of Depression, Anxiety and Stress (DASS-21). The results indicate that the effects of reducing the identified variables were higher for the mindfulness group than for the physical education group and for the control group $F(2) = 5.91$, $p = .004$, $\eta^2 = .106$. The total scores for all variables related to the mindfulness group decreased significantly, including an important stress reduction $t(29) = 2.95$, $p = .006$, $d = .667$. Mindfulness exercises and some individual relaxing exercises involving Physical Education could help to reduce manifestations of stress and anxiety caused by exams in students.

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Nowadays, sufficient evidence exists to support the knowledge that high levels of stress cause different alterations in students, such as deficits in attention and concentration, difficulty memorizing and solving problems, low productivity and poor academic performance (Pérez, Martín, Borda, & Del Río, 2003). This becomes a major problem within the university framework, reaching higher levels in the first years of study and during those periods immediately preceding examinations (Álvarez, Aguilar, & Lorenzo, 2012; Muñoz, 1999, 2003).

Mindfulness is one of the techniques used for the prevention and treatment of stress that has received more attention in recent years. The main representative of this technique, Kabat-Zinn (1982, 1990), defines mindfulness as the ability to draw attention to the experiences that occur in the present moment, in a particular way, accepting them without judgment.

Concretely, Bishop et al. (2004) distinguish two components of mindfulness: (1) self-regulation of the attention paid to immediate experience, thereby allowing for the recognition of mental events in the present moment; and (2) a particular orientation to self-experience of the present moment, characterized by curiosity, openness and acceptance.

Although various therapies use mindfulness methods, there are four that explicitly recognized its use: *Mindfulness-Based Stress Reduction* (MBSR; Kabat-Zinn, 1982, 1990, 2003), *Mindfulness-Based Cognitive Therapy* (MBCT; Segal, Williams, & Teasdale, 2002), *Dialectical Behavioral Therapy* (DBT; Linehan, 1993) and *Acceptance and Commitment Therapy* (ACT; Hayes, Strosahl, & Wilson, 1999; Wilson & Luciano, 2002).

Within a university population, Weinstein, Brown, & Ryan (2009) found that, among psychology students, those that exhibited higher levels of mindfulness, gave less threatening attributions to stress, used less avoidance strategies (*avoidant coping*) and more coping strategies (*approach coping*). Meanwhile, Walach, Lynch, and Louise (2008) developed a program called *Mindfulness-Based Coping with University Life* (MBCUL), obtaining on one hand, reductions in perceived stress, anxiety and depression and, on the other hand, improvements in problem solving and in positive re-evaluations. Subsequently, Lynch, Gander, Kohls, Kudielka, and Walach (2009), applying the same procedure, found increases in mood and reductions in stress levels. Whereas, Kang, Choi, and Ryu (2009) obtained improvements in the levels of stress and anxiety but not in depression, among a group of nursing students.

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Moreover, most of the studies compare the efficacy of mindfulness training with a waiting control group, but it is not common to assess its effects in relation to other procedures, such as a physical education training, which can also be important in reducing stress and depression (Nguyen-Michel, Unger, Hamilton, & Spruijt-Metz, 2006; Olmedilla, Ortega, & Candel, 2010), hence the importance of also comparing their effects.

The objective of this study was to investigate whether a mindfulness procedure could reduce the levels of anxiety, stress and depression in student teachers. This group, as students of the Faculty of Education, will be subject to a high level of stress as professionals (Extremera, Rey, & Pena, 2010; Moriana & Herruzo, 2004). Moreover, they can learn to apply these techniques in their professional future, hence the importance of providing them with resources in this situation (Franco, 2010; Franco, Mañas, Cangas, Moreno, & Gallego, 2010).

Method

Participants

A total of 125 first year students from the Bachelor of Education at the University of Almería (Spain) took part in this study. There were 53 men and 72 women participating, with ages ranging between 18 and 43 years (M = 20.07; SD = 3.68). The students were randomly assigned to either the mindfulness group (41 students), the Physical Education intervention group (42 students) or the control group (42 students). There were no significant differences in either age or sex between the groups ($p > .05$). Exclusion criteria were: not accepting to sign informed consent or systematically failing to attend the program (over 80% of sessions). All students who took part in the study received one extra course credit.

Instruments

Abbreviated Depression, Anxiety and Stress Scales (DASS-21)

(Lovibond & Lovibond, 1995) This instrument consists of 21 items with a Likert-style, four-alternative response format, ranging from 0 ("does not describe at all what occurred to me or what I felt during the week") to 3 ("Yes, this happened to me a lot, or almost always"), indicating what the person experienced or felt during the previous week. They are arranged across three subscales (seven items each): depression, anxiety and stress. The Spanish version validated by Fonseca, Paino, Lemos, and Muñiz (2010) was used. The results showed that the levels of internal consistency for the DASS-21 subscales were .80 for the depression subscale, .73 for the anxiety subscale, .81 for the stress subscale and a Cronbach's alpha of .90 for the total score of the DASS-21.

Procedure

The Mindfulness experimental group received an intervention consisting of 8 sessions based on the *Mindfulness Based Cognitive Therapy* (MBCT) (Segal et al., 2002). Sessions were adapted to a weekly one-hour session, maintaining the main structure and components of MBCT in nonclinical populations (Langer, Cangas, & Gallego, 2010). Specifically, participants were trained in body exploration (*bodyscan*), breathing with complete attention (*mindfulbreathing*), three-minute breathing (*breathingspace*), yoga and sitting meditation exercises (*sittingmeditation*). Likewise, metaphors and poetry were used to illustrate the main concepts and components of *mindfulness*. Moreover, participants were provided with the *bodyscan* and the *sittingmeditation* in MP3 format so they could use it at home. The daily practice of *mindfulness* was highly recommended but was not required to continue participation in the workshop. The procedure was performed by a therapist with over four years experience in *mindfulness* techniques.

As for the Physical Education (PE) group, the intervention consisted of 8 sessions of physical education classes. The sessions were also one hour per week. They consisted of an initial 15-minute period of individual static stretches, postural, and breathing corrections in supine, prone, seated, and all-fours positions. The main part comprised 30 minutes of adapted sports games, emphasizing the respiratory and postural correction. The final 15 minutes involved paired static stretching, breathing and postural correction. The procedure was carried out by a specialist with over 10 years experience in this type of exercise.

Finally, the control group were administered the pre and post questionnaires in the corresponding moments without any intervention being applied.

Statistical analysis

To analyze the existence of statistically significant differences between the pre-test and post-test measures between the three groups, a one-way ANOVA was performed, complemented by effect size, with its corresponding statistical, etha squared, assuming the range established by Tabachnick and Fidell (2007): between 0 and .009, negligible; between .010 and .089, low effect size; between .090 and .249, medium effect size; and from .250, large effect size. In a second analysis, the pre-test and post-test measures for each group were compared, using a Student t-test for paired samples. Thirdly, Cohen's d was used to assess the magnitude of change caused by the intervention. In addition, the percentage change between the pre-test and post-test

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scores for both groups was calculated. Finally, a MANCOVA was conducted to assess the influence of variables such as sex, age and educational level (all analyzes were performed using SPSS 20.0).

Results

Means and standard deviations of the studied variables corresponding to the experimental (mindfulness group and PE group) and control groups for each of the phases of the study are presented in Table 1.

The analysis of the mean difference between pre-test measures between groups did not reflect the existence of any initial statistically significant difference between them for any of the variables analyzed, as can be observed in Table 2. However, statistically significant differences were found among the three groups after performing the post-test analysis in several of the variables evaluated. The DASS Total score yielded significant differences between groups ($p = .004$). Through post hoc (Tukey) analyzes, it was observed that the major differences were between the mindfulness group and the control group, with participants in the mindfulness group yielding a lower mean (hence, a better mental state) than participants in the PE and control group. However, it is noteworthy that the PE group also reduced its average and was lower than the control group, although to a lesser extent than with the mindfulness intervention. Through the etha-squared statistical, it was observed that the differences between the groups based on their DASS-Total score were larger between groups, with a moderate effect.

Moreover, for the stress variable, participants in the mindfulness group had a lower mean (therefore, less stress) than the control group and the PE group. In this case, the only statistically significant differences were found regarding the mindfulness group compared to the other two groups. No statistically significant differences between the control group and those who participated in the physical education program were found in relation to the stress variable.

Regarding the anxiety and depression variables, statistically significant differences between the mindfulness group and the control group were also found; exhibiting a lower average, therefore, lower levels of anxiety and depression in the first group. No differences between the PE group and the control group or for the PE group and mindfulness group were found in relation to these variables.

In the analysis between the post-test – pre-test scores, the control group yielded no significant differences for any of the variables evaluated, as can be observed in Table 1. When the same analysis was performed on the mindfulness intervention group, significant differences were found only for the stress variable, showing a higher average for pre-test, $M = 7.95$, $SD = 3.89$, $n = 30$, than for the post-test, $M = 5.70$, $SD = 2.75$, $n = 30$; $t(29) = 2,953$, $p = .006$, $d = .667$, 95% IC [.543, 2.990]; hence stress levels of people who participated in the mindfulness program were significantly reduced. Considering the effect size, it was noted that the impact of the mindfulness program on the stress levels of the person was high. However, despite not finding significant differences in relation to other variables in terms of pre-test and post-test in this group, an improvement in these averages was observed after the mindfulness intervention. In addition, the effect size observed in the interactions in which no significant difference between pre-test and post-test was found for the mindfulness group has shown that the impact of the program had a moderate effect on all variables, except on anxiety, in which the effect size was lower. Finally, regarding the PE intervention group, statistically significant differences were found, similarly to the mindfulness group, for the stress variable only between the pre-test and post-test. In this case, the variable is reduced, presenting a higher mean for the pre-test, $M = 9.02$, $SD = 3.82$, $n = 28$, than for the post-test, $M = 7.93$, $SD = 4.40$, $n = 28$; $t(27) = 2.364$, $p = .026$, $d = .260$, 95% IC [.169, 2.401]; hence, the stress levels of people who participated in the PE program also suffered a statistically significant reduction, although based on the effect size, this program showed a lesser influence.

Finally, a multivariate analysis was performed to assess the influence of sex and age on the benefits of the intervention. The MANCOVA inferential analysis led to the conclusion that there were no statistically significant differences due to age ($p = .722$, $F(12, 000) < 1$, Wilks' Lambda = .909; $\eta^2 = .047$). There were no significant differences due to gender ($p = .154$, $F(178, 000) = 1.434$, Wilks' Lambda = .831; $\eta^2 = .088$). Therefore, it was concluded that the effect of the programs was the same for all participants regardless of gender or age.

Discussion

The present study examined whether a mindfulness-based intervention could produce significant changes in psychological variables (such as anxiety, stress and depression) among students from the Bachelor of Education. In this sense, mindfulness training caused a significant reduction in levels of depression, anxiety and stress in relation to the control group. This was not the case for students undergoing the PE program, whom did not differ from the control group with respect to any of these variables. Therefore, it can be concluded that the effect of mindfulness was greater than for the group that practiced physical activity, particularly for the stress variable and for the total DASS

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Table 1. *Pre-test and Post-test means and standard deviations and Student t-test for paired samples of pre-test – post-test differences in the variables of the study for the Physical Education (PE), Mindfulness and control groups*

	PE					Mindfulness					Control				
	Pre-test	Post-test	Pre-Post			Pre-test	Post-test	Pre-Post			Pre-test	Post-test	Pre-Post		
	M (SD)	*M (SD)*	*t*	*p*	*d*	*M (SD)*	*M (SD)*	*t*	*p*	*d*	*M (SD)*	*M (SD)*	*t*	*p*	*d*
Depression	5.66 (4.97)	4.64 (5.01)	1.242	.225	.204	4.75 (3.55)	2.90 (2.50)	2.019	.053	.602	5.97 (4.56)	6.07 (4.67)	–1.432	.160	.021
Anxiety	5.79 (4.26)	5.09 (5.05)	.823	.418	.149	4.47 (3.78)	3.46 (2.41)	.715	.480	.318	6.40 (3.72)	6.52 (3.76)	–1,704	.096	.032
Stress	9.02 (3.82)	7.93 (4.40)	2.364	.026	.260	7.95 (3.89)	5.70 (2.75)	2.953	.006	.667	7.59 (3.63)	7.78 (3.82)	–.720	.476	.050
Total DASS	20.48 (11.86)	17.67 (13.56)	1.590	.123	.220	17.17 (9.89)	12.06 (6.27)	1.975	.058	.617	19.97 (9.09)	20.38 (9.47)	–1.311	.197	.044

Table 2. *One-Way ANOVA and post hoc tests (Tukey) between the Mindfulness, Physical Education (PE) and control groups and the variables of the study (stress, anxiety and depression)*

Variable	Test	Mean differences between groups			Squared Mean (inter-group) (d.f.)	*F*	Sig.	η^2
Stress	Pre-test	|Mindfulness -PE|	|Mindfulness -Control|	|PE -Control|	22,181(2)	1,548	.217	–
	Post-test	|Mindfulness -PE|*	|Mindfulness -Control|*	|PE -Control|	49,311(2)	3,519	.033	.066
Anxiety	Pre-test	|Mindfulness -PE|	|Mindfulness -Control|	|PE -Control|	39,600(2)	2,567	.081	–
	Post-test	|Mindfulness -PE|	|Mindfulness -Control|**	|PE -Control|	82,033(2)	5,402	.006	.098
Depression	Pre-test	|Mindfulness -PE|	|Mindfulness -Control|	|PE -Control|	16,503(2)	0,851	.429	–
	Post-test	|Mindfulness -PE|	|Mindfulness -Control|*	|PE -Control|	88,126(2)	4,830	.010	.088
Total DASS	Pre-test	|Mindfulness -PE|	|Mindfulness -Control|	|PE -Control|	126,959(2)	1,193	.307	–
	Post-test	|Mindfulness -PE|*	|Mindfulness -Control|**	|PE -Control|	611,135(2)	5,911	.004	.106

*$p < .05$.
**$p < .01$.

score (where significant differences were found between these two groups). In anxiety and depression, despite differences between the control group and the mindfulness group, no significant differences were found between the two interventions. However, the effect size suggests greater effectiveness of the mindfulness program in relation to all variables, being remarkable in all of them except for anxiety, where a lower effect was found.

The results obtained in this study were in line with other studies applying mindfulness-based interventions on university students. For example, Kang et al. (2009) found that the experimental group showed a statistically significant decrease in the variables of stress and anxiety, but not for the depression variable. Furthermore, Warnecke, Quinn, Ogden, Towle, and Nelson (2011) analyzed the responses of 66 medical students, finding statistically significant decreases in anxiety and stress in the mindfulness group relative to the control group.

These results suggest that a mindfulness-based training helps college students learn how to manage adverse emotional states and, in particular, stress. That is, directing attention to the present moment, allowing the emergence of any internal event and not reacting automatically, allows distancing from those thoughts, emotions, or adverse physical sensations, favoring greater psychological flexibility (Langer et al., 2010).

Reducing psychological stress in college students has a clear impact on disease prevention and the promotion of physical and mental health. This becomes more important for professionals exposed to high levels of stress, "burnout", depression, absenteeism, etc..; such is the case of teachers (Extremera et al., 2010; Moriana & Herruzo, 2004). In this sense, maladaptive coping with stress and negative emotional states not only affects the physical and mental health of teachers but also of their students and their families (Mañas, Franco, & Justo, 2011). On the contrary, the positive effects of mindfulness suggest the relevance of including this type of intervention in the educational context, as part of the curriculum of university and school students (Mañas, Franco, Cangas, & Gallego, 2011).

Even though changes in anxiety and depression in the mindfulness group were higher than in the PE group, this difference was not statistically significant. Hence, it is possible to conclude that these two types of training may be important in reducing these variables. More research is needed to deepen the knowledge precisely in the specifics of mindfulness, which, as discussed in the introduction, may be present in many therapies and, therefore, has common ingredients to other types of intervention.

Among the variables that limit the external validity of the results, the small size of the sample was found. Moreover, there was no follow-up performed to assess whether the results were maintained over time. On the other hand, similarly to other studies, no specific measures of mindfulness or acceptance were taken. This would have allowed analyzing the mediational role of these variables in the results. Future studies with a larger sample and incorporating psychophysiological variables that complement the results obtained by self-administered questionnaires are needed.

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