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Original

Improvement of attention and stress levels in students through a Mindfulness intervention program☆

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ABSTRACT

Mindfulness is the quality of being conscious and aware of the present moment harmonizing mind and body. This study presents a six-week intervention program carried out in four educational establishments in Granada with 5th and 6th grade primary school students and 1st, 2nd and 3rd year secondary school students. The aim was to find out whether Mindfulness has positive effects in terms of improving students' attention and reducing stress. The samples were 320 students; a quasi-experimental design was used. We collected socio-demographic and family data and carried out a pre-test to measure the attention variable by means of the *d2* questionnaire and the stress variable with the *Inventory Questionnaire of Childhood Stress*. Following the intervention, we carried out a post-test using the same instruments. A mixed linear model was used to study the effects of the Mindfulness program. The results show that applying a Mindfulness program improves attention and reduces stress in these students, with differences by sex, school- and ages.

Mejora de los niveles de atención y estrés en los estudiantes a través de un programa de intervención Mindfulness

Palabras clave:
conciencia
educación
control de la atención
control de estrés

RESUMEN

El Mindfulness es la cualidad de ser consciente del momento presente armonizando mente y cuerpo. Este estudio presenta un programa de intervención de seis semanas que se ha realizado en cuatro centros educativos de Granada con alumnado de 5º y 6º de Primaria y 1º, 2º y 3º de Educación Secundaria Obligatoria. El objetivo ha sido comprobar si el Mindfulness presenta efectos positivos en la mejora de la atención y la reducción del estrés del alumnado. La muestra es de 320 estudiantes y se ha utilizado un diseño cuasi-experimental de investigación. Se han recabado datos sociodemográficos y familiares, y se ha realizado un pre-test para medir la *atención* mediante el cuestionario *d2* y el *estrés* con el *Inventory Questionnaire of Childhood Stress*. Tras la intervención, se ha realizado un postest con los mismos instrumentos. Para analizar los efectos de la intervención se ha utilizado un modelo lineal mixto. Los resultados muestran que la aplicación de un programa de Mindfulness mejora la atención y reduce el estrés en estos estudiantes, con diferencias por sexo, centro educativo y edad.

Introduction

The educational approach of the 21st century is based on the acquisition of theoretical knowledge and academic skills and also on preparing students the daily life. Throughout each course, students are subject to many moments of stress, anxiety, and negative emotions due to increased academic demands and the need to improve themselves (Fuentes et al., 2018). The practice of

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Mindfulness in the educational field help reduce problems of a family nature, anxiety, depressive states or disruptive environments, increasing their own well-being, and improving learning and interpersonal relationships, generating emotional self-regulation in the child or adolescent (Langer et al., 2017; Modrego-Alarcón et al., 2016; Moscoso, 2019). The stressful situations that many students experience on a daily basis suggest a need to design and apply interventions that allow children to recognize and cope with them (Costello & Lawler, 2014). The childhood and adolescence are crucial periods for this kind of learning as in these stages of life people are highly vulnerable to the events they go through (Sacks et al., 2014). Mindfulness can be of great help when it comes to covering this need, as it would help students to improve their emotional management (Colichón, 2020) and to perceive and know deeply the state of their body (Moreno-Gómez et al., 2020). Following Chow et al. (2017), mindfulness meditation involves teaching the student to better maintain their attention towards a planned object (e.g., breathing), to be more aware of their body and keep their mind away from sources of distraction (e.g., negative thoughts).

Contextualizing the term Mindfulness is defined by Langer and Moldoveanu (2000) as a process of attentional self-regulation that allows the development of awareness of the present moment. In the words of Kabat-Zinn (2003), mindfulness is referred to as a heightened state of awareness at the present moment. Full awareness meditation involves three main actions: cultivating attention, regulation and emotional equity. These actions improve attention, emotions and behavior self-awareness and self-regulation in children and adolescents (Britton et al., 2014). Furthermore, following Zenner et al. (2014), these techniques help stabilize the mind and train the attention skill while providing a wider view at the same time. This concept does not have an exact translation into Spanish (Vallejo, 2006). Its meaning is close to the expressions full attention, awareness, full consciousness and open consciousness (Almansa et al., 2014), although the term Mindfulness is usually used. It could be said that from the scientific point of view, the state of Mindfulness or full awareness is a mental condition that arises when attention is intentionally focused on a specific support (Águila, 2020). This word has been the English word chosen to translate the expression Pali Sati from Sanskrit, whose meaning refers to awareness, attention and memory (Siegel et al., 2009) and allows us to maintain an unconditioned awareness that comes from our direct experience (Águila, 2020). However, neither the English term Mindfulness, nor the Spanish attention or awareness reflect the depth of the original meaning, as there is no equivalent term in Western culture (Águila, 2020).

The first interventions were carried out with adults and transferred to the educational field using conventional methods such as Mindfulness-Based Stress Reduction (MBSR), Mindfulness-Based Cognitive Therapy (MBCT), Dialectic Behavior Therapy (DBT), and Acceptance and Commitment Therapy (ACT) (Burke, 2010). In the field of education, it comes to school with the goal of improving academic performance, paying more attention, having greater emotional control, and reducing stress. Some studies have demonstrated the effects of an intervention program based on Mindfulness techniques, helping to regulate the emotions of schoolchildren and promoting their mental health, as well as caring for others (Almansa et al., 2014; Schonert-Reichl & Lawlor, 2010). The few interventions that are being carried out in this regard show the importance of developing Mindfulness in this area (Burke, 2010).

The benefits of these techniques may be of even greater interest if we apply them at the end of the Primary Stage and the beginning of Secondary, since they coincide with puberty and adolescence. At these ages, the application of Mindfulness techniques would serve to attenuate the fluctuations suffered by schoolchildren. The current literature shows that the benefits of these techniques can reach both teachers (Braun et al., 2019) and students (Zenner et al., 2014). In the case of students, scientific evidence on Mindfulness has found benefits for children's socio-emotional learning (Schonert-Reichl et al., 2015), mental health (Weare, 2015) and resilience (Jennings et al., 2013), and even benefits for subjects with attention-deficit/hyperactivity disorder (ADHD), as it improves concentration, reduces stress levels and hyperactive behavior (Carboni et al., 2013). These benefits are driving an increase in Mindfulness-based interventions in the education field to promote students' psychological health and well-being in recent years (Schonert-Reichl & Roeser, 2016). In this regard, Felver et al. (2014) claim that students with high levels of disruptive behavior in primary school are at risk of future psychosocial difficulties and Mindfulness can help reduce this type of behavior.

A current related problem is the scant quantity of research carried out with samples of students in compulsory education. However, some studies based on awareness techniques and meditation aimed at improving attention and relaxation in school students have been published (Almansa et al., 2014). Meditation is a technique used in Mindfulness whose objective is to achieve full attention to the present moment. The small number of studies carried out nonetheless show the importance of promoting awareness in the school environment (Burke, 2010). In this regard, students across numerous educational centers show high stress levels and low attention levels as a result of various issues affecting their lives. This means that teachers increasingly demand techniques that might help lower stress and improve concentration in their students. As de Vibe et al. (2013) explain, several researches have indicated that women inform higher levels of distress and lower levels of subjective well-being than men, however, this field is still characterised by a lack of attention to gender-specific effects. Even, these authors referenced a meta-analysis of 31 randomised controlled on Mindfulness-based stress reduction program identified only two studies that had analysed gender as a moderator variable and neither of these reported gender-specific effects. This aspect has been corroborated in recent studies such as that of Kang et al. (2018), which shows the improvement of emotional variables in both boys and girls, but the improvements by gender are not compared. Related to age, it is necessary to take into account that although some Mindfulness practices (e.g., slow breathing) are easy to learn, practice, and follow in daily life, there are differences in the feasibility between ages (Bhimani et al., 2011), because adults or adolescents can understand better the practice and keep attention longer than children (Kurth et al., 2020). In addition, the different sociocultural environment of schools must be taken into account, since, as Lu et al. (2020) explain, more disadvantaged social environments can have an influence on the emotional regulation of children and adolescents. In view of the above, the aim of this paper was to verify the effects of an intervention program on school students' attention and stress level of schoolchildren of different ages and educational levels. In such a way, the hypothesis of this research was that students will improve their attention and stress levels with no differences in terms of sex but with differences according to age and educational center.

Method

Participants

The 14 groups formed an initial sample of 343 subjects from four schools in Granada, Spain (Table 1). Two criteria were considered to choose the sample: (1) All questions should be carried out in a correct and valid form; and, (2) The students must assist at least 90% of the class during the program. Finally, 320 of these subjects carried out the tests and the program in a correct and valid way while the data of 23 subjects was invalid due to mistakes in the completion

Table 1
Schools description

	School1	School2	School3	School4
Type of school	State	State	Chartered	State
Educational stages	Pre-school and Primary	Secondary	Pre-School, Primary, Secondary and Baccalaureate	Secondary Baccalaureate, vocational training
Number of teachers	1	2	2	2
Number of groups for level	2	2	2	2
Location	Granada city Northern Area (Almanjáyar)	Village in the metropolitan area Southern Area (Huétor Vega)	Granada city Central Area (Realejo)	Village in the metropolitan area Southern Area (Armilla)
Students' Socio-economic and family cultural context	Low	Heterogeneous	Uppermiddle	Lowmiddle

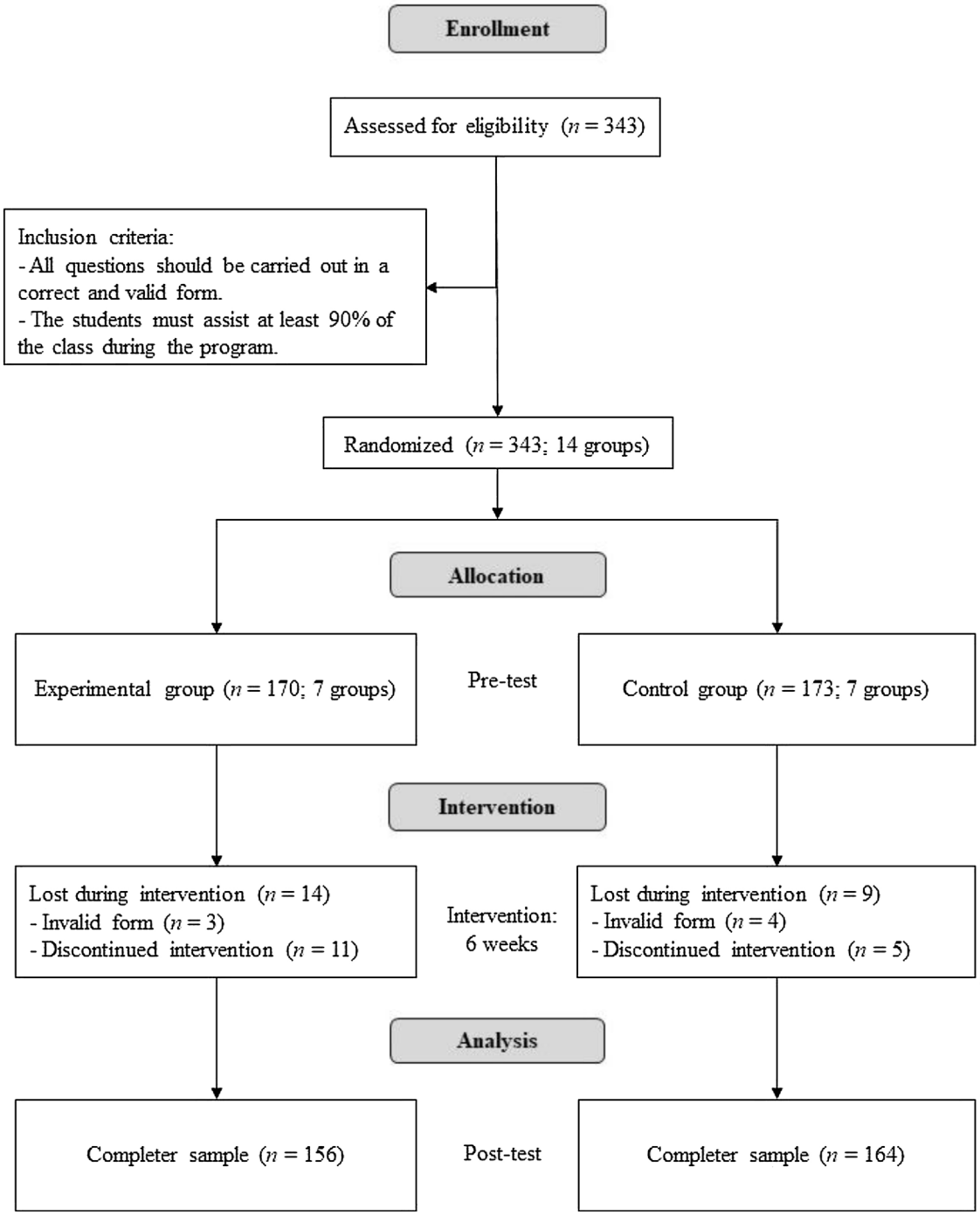

Figure 1. Flow chart of the progress of the quasi-experimental study.

of the questionnaires and assistant problems. Participants were between 10 and 16 years of age: in the EG were 156 students with a mean age of 13 years old (M_{boys} = 13.01, SD = .63; M_{girls} = 13.20, SD = .58) and in the CG were 164 students were also with a mean age of 13 years old (M_{boys} = 13.02, SD = .35; M_{girls} = 13.01, SD = .58) (see Figure 1). The socio-economic and family cultural level of the students is diverse as the schools selected feature low, low-middle and upper-middle class levels (see Table 1). The information about socio-economic level was obtained of Tax Agency while the information of cultural level was consulted in the Education Ministry of Andalusia and the public and official documents of each school.

Instruments

The following three measurement instruments were used to carry out this research.

An *ad hoc* questionnaire including a total of six questions to assess socio-demographic and family variables out of which only the question related to students' sex was used.

The Spanish version by Seisdedos (2004) of the *d2 Test of Attention* by Brickenkamp (2001). The d2 is a time limited test aiming at assessing a person's power of concentration and selective attention through a specific task. It can be carried out individually or collectively, during a period of time ranging between 8- and 10-minutes including instructions. The *d2* questionnaire includes 14 lines with 47 characters, i.e., a total of 658 elements. These stimuli contain the letters "d" or "p" with marks above and/or below. The test asks participants to cross (/) any letter "d" with two marks (correct stimuli or relevant elements). Subjects have to look at the contents of each line from left to right. The test requires concentration and attention as there are "d" letters with more than two marks or less than two marks as well as letters "p" which must not be crossed regardless of number of marks (irrelevant elements). The test includes a training or trial line. Participants have a limited time of 20 seconds per line that the researcher times saying the word "change". The scoring works as follows: TR (*total responses*) is the number of element stride in the 14 lines; TH (*total hits*) is the number of correct relevant elements; O (*omissions*) is the number of relevant elements tried but not crossed; C (*commissions*) is the number of irrelevant elements crossed; TOT is (*total effectiveness*) i.e. TR-(O + C); CON (*concentration rate*) or TH-C; TR + is the line with the highest number of tried elements; TR- is the line with the lowest number of tried elements, and VAR indicates the *variation or difference rate* (TR+)-(TR-). Cronbach's alpha (α) values were .77 (pre-test) and .77 (post-test). The average variance extracted (AVE), composite reliability (CR) McDonaldś Omega coefficient (ω) were also calculated, with values of AVE, .90 (pre-test) and .62 (post-test), CR values of .98 (pre-test) and .90 (post-test), and ω with values of .78 (pre-test) and .80 (post-test).

Inventory Questionnaire of Childhood Stress (IECI) (Trianes et al., 2011). It includes 22 dichotomous items (Yes/No) for students to complete and it measures three relevant and characteristic aspects of childhood stress corresponding to the following factors or scales: *health and psychosomatic problems* (with eight items related to health conditions, doctor visits, body image affliction and issues), *stress in the school context* (with seven items related to an excess in homework, interaction problems with teachers and classmates, poor grades, concentration difficulties, etc.) and *stress in the family context* (with seven items related to financial problems, lack of contact with parents and supervision, loneliness, sibling rivalry and parents' demands). There are no right or wrong answers, all students need to do is circle the answer to each question (Yes or No) in relation to the past year. They are reminded not to leave any blanks. This questionnaire can also be applied individually or collectively in the same way as *d2*. There is no time restriction though completion usually takes approximately 15 minutes. Two examples are provided. The IECI provides three partial scores which are obtained by adding up the number of positive answers on each of the scales: *health*, *school* and *family*. It also provides a *total stress score* (the sum or the scores on the three scales: *health* + *school* + *family*). The scores obtained are transferred to a summary chart, the percentage transformations attached to the IECI instructions are consulted, and a results' profile is completed. The sum of these variables shows each child's global stress rate and has the advantage of showing which of the three variables is causing more stress. In the pre-test (pos-test), α values were: *total stress score* = .79 (.80), *health* = .82 (.83), *school* = .80 (.80), *family* = .76 (.76); AVE values were: *total stress score* = .64 (.79), *health* = .63 (.80), *school* = .69 (.77), *family* = .61 (.81); CR values were: *total stress score* = .86 (.93), *health* = .89 (.94), *school* = .80 (.90), *family* = .89 (.95); ω values were: *total stress score* = .82 (.71), *health* = .84 (.72), *school* = .85 (.71), *family* = .77 (.70).

Design

A quasi-experimental design was used with intact groups due at centers organization and students by classroom. A priori sample size calculation determined that 19 participants per classroom were required to allow an effect size of 1, with value α of .05, and power (1-β) of .95, being statistical power of .95. To carry out this research, several selection criteria were taken into account to select teachers and students' classroom: (1) Teachers who completed successfully the Mindfulness course for teachers taught at the Teacher Center of Granada in 2018 by specialized national and international instructors. The course was nine weeks long, with four hours per week, where teachers were qualified about awareness, reality perceptions, emotions, stress reaction, stress response, communication, time management and personal practice. (2) Teachers who are willing to implement a Mindfulness program in their school; (3) Teachers who teaches two or more groups of students of the same educational level, to randomize between experimental group (EG) and control group (CG); (4) Teachers with teaching in two or more groups of students of similar academic level and the same number of repeat students in each classroom; and, (5) Finally, teachers with student groups with $n \geq 19$. Based on these criteria, seven teachers from four different schools were selected to be part of the program, with a total of 14 student groups.

As the students were distributed in classrooms (quasi-experimental design with pre and post-testing) (M = 24.5, SD = 2.3), a cluster simple random was conducted employing the technique of toss a coin. Thus, in each teacher their A group was a side of the coin and B group was the other side of coin. Finally, the distribution is shown in Table 2. Thus, in Almanjáyar school, the teacher had as CG the B group and as EG the A group. In Huétor-Vega school the teacher 2 had as CG the B group and as EG the A group, being at reverse in teacher 3. In Realejo school, the distribution was the same as teacher 2 and 3 respectively. In Armilla school, the teacher 6 had as CG group at A group and EG, B group, being the reverse in the teacher 7.

Procedure

Headmaster' school, teachers, parents and tutors signed informed consent forms and a statement of their rights as participants in the study based on the Declaración de Helsinki (World Medical Association, 2013). Also, was solicited approval of appropriate institutional ethics committees. Once the conditions of the study were accepted and prior to the intervention program a date was scheduled to fill in the general data table and carry out the pre-test on the subjects in each center (CG and EG) (*d2* and IECI questionnaires). Following the pre-test, the six-week intervention program was carried out in the EG only. The post-test was carried

Table 2
Distribution of the groups and the teachers

School	1 (Almanjáyar)	2 (Huétor-Vega)		3 (Realejo)		4 (Armilla)	
Teacher	1	2	3	4	5	6	7
Control Group	B	B	A	B	A	A	B
Experimental Group	A	A	B	A	B	B	A

Table 3
Descriptive data of the IECI and *d2* variables

Variables	Control Group (*n* = 164)				Experimental Group (*n* = 156)			
	General Pre		General Post		General Pre		General Posts	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Health	2.58	1.31	2.45	1.47	2.64	1.71	2.03	1.67
School	2.40	1.53	2.55	1.92	2.33	1.55	1.75	1.39
Family	1.57	1.94	1.73	1.45	1.65	1.49	1.42	1.33
Total stress	7.02	3.31	7.40	2.30	6.58	3.51	5.20	3.20
TR	569.33	58.41	585.00	60.01	424.23	78.14	476.00	89.08
TH	142.57	43.47	150.40	40.28	162.65	35.64	190.42	41.92
O	15.56	20.33	15.65	13.60	18.43	21.12	13.97	14.96
C	8.01	10.17	7.95	9.90	8.30	16.47	7.20	16.89
TOT	421.21	80.56	433.61	60.78	397.50	79.62	463.61	91.87
CON	150.93	29.81	153.32	30.75	154.23	39.08	183.55	50.75
VAR	17.97	7.68	18.07	5.39	16.69	6.76	14.07	5.39

Note. *M* = mean; *SD* = standard deviation; *n* = sample; TR = total responses; TH = total hits; O = omissions; C = commissions; TOT = total effectiveness; CON = concentration rate; VAR = variation or difference rate.

Table 4
Results of the experimental groups

		Experimental Group				
		PRE		POST		
Variables	Sex	*M*	*SD*	*M*	*SD*	*d* (IC 95%)
Health	Boys	2.30	1.55	1.71	1.53	0.38 (0.16; 0.61)
	Girls	2.98	1.84	2.40	1.75	0.32 (-0.55; 1.00)
School	Boys	2.19	1.57	1.70	1.47	-0.32 (-0.55; -1.00)
	Girls	2.49	1.52	1.80	1.30	0.49 (-0.71; -0.26)
Family	Boys	1.41	1.32	1.44	1.33	-0.02 (-0.20; 0.24)
	Girls	1.78	1.63	1.44	1.36	0.23 (0.00; 0.45)
Total	Boys	6.03	3.15	4.83	3.19	0.38 (0.15; 0.60)
stress	Girls	7.24	3.81	5.64	3.34	0.45 (0.22; 0.67)
TR	Boys	420.32	76.82	470.40	83.84	-0.62 (0.40; 0.85)
	Girls	428.92	79.77	482.71	94.90	-0.61 (0.39; 0.84)
TH	Boys	163.21	34.03	187.62	39.16	-0.66 (0.44; 0.89)
	Girls	161.98	37.60	193.78	44.94	-0.77 (0.54; 1.00)
O	Boys	17.08	20.37	12.67	14.90	0.25 (-0.50; -0.02)
	Girls	20.04	21.95	15.54	14.94	0.24 (-0.46; -0.02)
C	Boys	7.43	9.90	6.61	11.73	0.07 (-0.30; 0.15)
	Girls	9.34	21.90	7.92	21.54	0.06 (-0.29; 0.16)
TOT	Boys	395.75	77.16	445.70	89.20	-0.60 (0.37; 0.83)
	Girls	399.60	82.73	463.09	94.47	-0.71 (0.49; 0.94)
CON	Boys	155.61	36.84	181.73	51.08	0.59 (0.36; 0.81)
	Girls	152.57	41.70	185.72	50.50	-0.71 (0.49; 0.94)
VAR	Boys	16.46	6.56	14.32	5.17	0.36 (-0.59; -0.14)
	Girls	6.98	7.00	13.76	5.66	-1.06 (0.83; 1.30)

Note. *M* = mean; *SD* = standard deviation; *d* = effect size; TR = total responses; TH = total hits; O = omissions; C = commissions; TOT = total effectiveness; CON = concentration rate; VAR = variation or difference rate.

out afterwards in all groups (CG and EG). This time only the *d2* and IECI questionnaires were used. The average time invested in completing the pre- and post-tests was approximately 30 minutes, respectively. Next, the pre and post-tests were corrected to identify valid and non-valid questionnaires.

Intervention program

To carry out the research, it was developed a specific intervention program based on the book "Breathe through this: Mindfulness for parents of teenagers" (Snel, 2015). The description of the intervention can be found in Chart 1, prepared according to the TIDIER guide (Hoffmann et al., 2014). The objective of the program was to improve concentration / attention and reduce stress in Primary and Secondary students through the systematic practice of Mindfulness. It is a program designed for six weeks, divided into two blocks of three weeks each. The intervention consisted of two types of activities: some to perform in the classroom and others at home.

The teaching staff was provided with a manual describing all the activities and the Snel program CD based on 13 audios of guided meditations. Snel (2015) points out that listening to audios to perform Mindfulness techniques is an essential element to carry out this technique. The selection of activities was carried out by teachers according to the time available in the classroom and the context. In the block I, weeks 1, 2 and 3, teachers had to choose an activity between tracks 1, 2, 3, 4, 5 and 6 of the CD. Their duration ranged between 4.45 and 16.26 minutes. In the block II, weeks 4, 5 and 6, they had to choose an activity between tracks 3, 7, 9, 10, 11 and 12 of the CD. Their duration ranged from 1.58 to 16.26 minutes. In both blocks, track 3 (Body scan) was repeated, given its interest in the program and being the longest. A record sheet of daily activities per block was used.

For the activities called "home breaks" (to be carried out by the students autonomously), those established in the Snel program (2015) were not followed, due to their complexity. In this case, and under the advice of a psychologist and instructor qualified in Mindfulness, with experience in the training of Primary and Secondary teachers in the Center of Teachers of Granada, we chose to design more simple and affordable activities for the subjects participating in the investigation. One activity was designed per week. These con-

sisted of doing with daily attention some daily action. The activities were called: Ÿour slower movements, Ïake some time to get up, Ïurn off the TV, Ïake a walk, Ïake a breakänd Ïhe third sip or bite. These activities were delivered on paper to teachers and students together with a registration template on their daily execution. During the intervention, the participating teachers were asked to fill in some information collection records about the context, the teaching staff and the students of their center. Therefore, the fidelity of the program was carried out with observations of field notes and observation by the teachers.

Finally, the intervention program in the school environment has the objective that schoolchildren know what Mindfulness is, which techniques it uses, as well as its benefits. It is complemented with autonomous activities at home. The ultimate goal is for the student, after verifying the benefits of Mindfulness, to incorporate them into their daily life.

Data analysis

The reliability and internal consistency of each scale was evaluated with Cronbach's alpha (α), McDonaldś Omega coefficient (ω) and average variance extracted (AVE). Acceptable values are considered: α > .70, CR > .70, ω > .70, and AVE > .50 (Hair et al., 2018). Effect sizes (Cohen's *d*) were calculated and we have to into account the intervals reported by Cohen (1988): 0.1 to 0.3, small effect; 0.3 to 0.5, intermediate effect; 0.5 and higher, strong effect. In order to achieve the objectives of this study, we checked the data for normality. Given that the data proved to be normal, we used parametric statistics. A mixed linear model was used to study the effects of the Mindfulness program. Sex, age and class were covariates of interest while center and pre-post intervention were considered random factors. The mixed linear model was selected using the Schwzarz criterion (SBIC) and Akaike criterion (AIC). The lower the criterion, the better the model fit. Finally, we decided to use an auto-regressive type of covariance as it was the one obtaining the lowest value (SBIC = 1952.74, AIC = 1944.23). All the calculations were carried out with SPSS Statistics 22.0.

Results

Descriptive analysis

The analysis of the *IECI* questionnaire (see Tables 3 and 4) shows that both the *health* and *school* variables decreased post-test, differences being similar in boys and girls. With regard to the *family* variable, the values decreased in the post-test measure and, taking into account the sex variable, the decrease occurred especially in girls.

The *d2* questionnaire variables had a pre-test mean of 397.50, which went up to 463.61 post-test. Comparing by sex, this increase in the post-test measure was higher in girls (ΔM = 63.49) than in boys (ΔM = 49.95). In terms of the *CON* variable, the values were higher in the post-test. Comparing by sex, this increase was higher in girls (ΔM = 33.15) than in boys (ΔM = 26.12).

The analysis of the IECI through mixed linear methods and with *total stress* as the dependent variable showed significant differences in all effects: *school*, $F_{(3, 259.00)}$ = 6.35, p = .001, prepost $F_{(1, 262.00)}$ = 85.06, p = .001), *School**prepost, $F_{(3, 262.00)}$ = 7.54, p = .001, *sex*, $F_{(1, 259.00)}$ = 9.11, p = .003), and *age* (primary school in contrast with secundary school) ($F_{(1, 259.00)}$ = 5.74, p = .017). Differences by school were found through the Bonferronit test and were (p = .049) between school1 and 2 (p = .001) between 1 and 4 and (p = .011) between 2 and 4. When compared to the control groups, all the experimental groups obtained significant differences: p = .001 in school1 and school2, p = .015 in school3 and p = .018 in school4 (Figure 2).

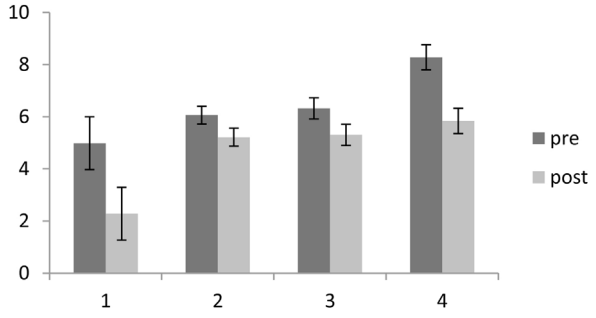

Figure 2. Pre-post differences with measurement errors using *total stress* as the dependent variable. Note: 1 = School1 (Northern Area); 2 = School2 (Southern Area); 3 = School3 (Central Area); 4 = School4 (Southern Area).

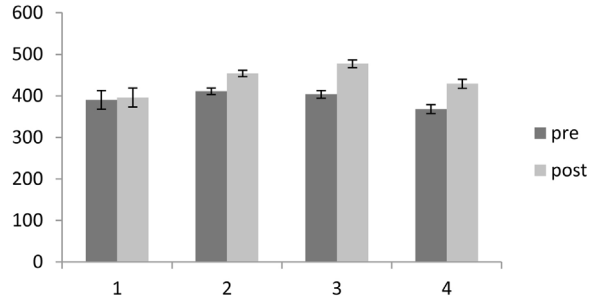

Figure 3. Pre-post differences with measurement errors using TOT as the dependent variable. Note: 1 = School1 (Northern Area); 2 = School2 (Southern Area); 3 = School3 (Central Area); 4 = School4 (Southern Area).

No significant differences were found in any of the IECI, CG variables e.g., *health* $F_{(1, 149.00)}$ = 1.66, p = .876, *school* $F_{(1, 152.00)}$ = 1.43, p = .768 and *family* $F_{(1, 152.00)}$ = 2.23, p = .723. However, significant pre-post differences were found in all three contexts in EG: *health* $F_{(1, 149.00)}$ = 42.68, p = .001, *school* $F_{(1,152.00)}$ = 51.32, p = .001 and *family* $F_{(1, 152.00)}$ = 10.39, p = .001. *Center**prepost differences were found only in the *health* dependent variable, $F_{(3, 152.00)}$ = 3.22, p = .023 and in *school*, $F_{(3,152.00)}$ = 4.61, p = .004. Finally, sex differences were found only in the *health* dependent variable, $F_{(1,149.0)}$ = 16.26, p = .001 with intermediate effect size; age differences were found in the *family* variable, $F_{(1, 149.00)}$ = 6.57, p = .011; and differences according to school were found in the *school* dependent variable, $F_{(3, 149.00)}$ = 11.30, p = .001. In the latter case, the Bonferroni test was carried out for the *school* variable; significant differences were found between school1 and 2 (p = .006), 1 and 3 (p = .014), 1 and 4 (p = .001), and 2 and 4 (p = .036). When compared to the CG, significant differences were found for school2 (p = .010), school3 (p = .020), and school4 (p = .005).

As for the *d2* questionnaire, the calculation of the contrast effects with the TOT variable showed significant differences amongst schools, $F_{(3, 149.00)}$ = 3.03, p = .030, in pre-post, $F_{(1, 152.00)}$ = 86.35, p = .001 and in center*pre-post, $F_{(3, 152.00)}$ = 7.43 p = .001; no sex differences were found. The Bonferroni test found significant differences between schools, 2 and 4 (p = .038) and 3 and 4 (p = .038). When compared to the CG, significant differences were found for school2 (p = .008), school3 (p = .015), and school4 (p = .010) (Figure 3).

Contrast differences of the *CON* dependent variable showed significant diferences in pre-post, $F_{(1, 152.00)}$ = 83.28, p = .001 and center*pre-post, $F_{(3, 152.00)}$ = 11.18, p = .001, with differences in relation tothe control group in school2 (p = .008), school3 (p = .005), and school4 (p = .001); no sex differences were found (Figure 4).

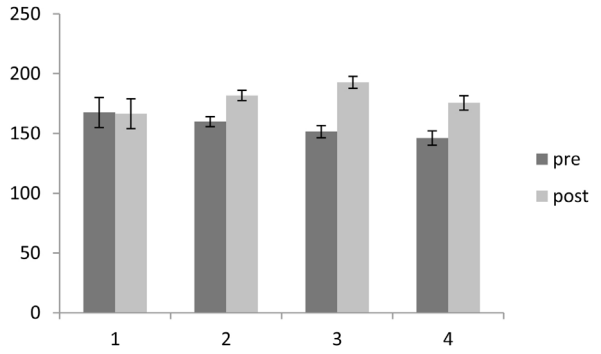

Figure 4. Prepost differences with measurement errors using CON as the dependent variable. Note: 1 = School1 (Northern Area); 2 = School2 (Southern Area); 3 = School3 (Central Area); 4 = School4 (Southern Area).

Discussion

The aim of this study was to apply a Mindfulness program in order to analyze its effects on school students' attention/concentration and stress. The activities of the program, in audio format, are original from the book *Breathe: Mindfulness for parents with adolescent children* (Snel, 2015). The breaks at home were specifically designed by a Mindfulness specialist, as the breaks in the book were excessively long and complex. In terms of the hypothesis, after carrying out a six-week Mindfulness program we were able to confirm that the variables measuring *speed and quality of processing* (TOT), *selective attention and mental processing speed* (CON), *number of hits* (TH), *number of omission errors* (O), *number of commission errors* (C) and the *variation rate* (VAR), as well as those variables measuring *stress* on the scales related to *health* and the *school* and *family* contexts and *total stress* significantly improve when post-test results are compared to pre-test and in relation to the CG.

Similarly, we observed important pre-post differences in all the *d2* and IECI variables only in the EG, an aspect that reflex the programś effects. This data confirms the contributions of Sánchez et al. (2011) who found improvements with the *d2* after applying an intervention program for older people. The authors were able to determine the effectiveness of a specific attention training program on different measurements of selective attention and concentration. Based on their research with students, San Luis et al. (2013) state that the results they obtained with a sample of 65 primary school children revealed significant improvement in selective and sustained attention, cognitive processing accuracy, attention control and balance between speed and accuracy after applying a neurofeedback-based program. In line with these contributions, the research by Ricarte et al. (2015) and Almansa et al. (2014) confirmed that after carrying out a seven-week Mindfulness program in children in the third stage of primary school they obtained positive results in terms of task orientation and psychological well-being and the attention level of the experimental group also improved. Therefore, the results obtained in this research are in line with the scientific literature helping to corroborate the effectiveness of the program used.

In relation to gender and attention, Lawlor et al. (2014) found gendered score differences in another instrument called Mindful Attention Awareness Scale-Children. In contrast, this study showed no significant pre- or post- intervention differences between boys and girls, but there were significant differences in other variables such as *health* and *total stress*. Veytia-López et al. (2016) also support these results as they found significant gendered differences in the depression and Mindfulness variables. Men obtained better scores in Mindfulness and women scored higher in the depression variable. Although both genders improved with Mindfulness techniques, women were still more prone to depression than men. In this regard, García-Fogueda (2016) found statistically significant differences between men and women. With regard to the IECI questionnaire, Ramírez (2015) used this instrument to measure stress in a case study with subjects showing disruptive behavior after applying an intervention program to study the effectiveness of cognitive-behavioral therapy on disruptive behavior. He concluded that the intervention was effective in the school context and pointed out benefits in teachers and in the application of systems and contingency plans. The results obtained reveal significant changes in terms of sex, age and center of origin. In line with these results, Ibinarriaga et al. (2014) found significant gendered differences, men obtaining higher scores in stress. Sturgess (2012), however, also found significant gendered differences but in this case women scored higher. According to González-Forteza et al. (2015), both boys and girls suffer from depressive disorders during adolescence, but they grow worse in girls towards the end of their teenage years. These significant gendered differences are probably related to a series of stressors that in our current society affect women more seriously than men (Shih et al., 2009).

In terms of the age variable, IECI differences were observed only when comparing primary and secondary students. Our results and the effectiveness of the program are supported by studies such as Ibinarriaga et al. (2014), who found statistically significant differences across school classes where the higher classes obtain better results than lower ones. A study by García-Fogueda (2016) explains the differences we have found. This author found significant differences in terms of this variable and revealed that the older the subjects, the higher their level of self-compassion, as self-identification with mankind is increased.

Further interesting results are related to the differences across educational centers, caused among other factors by the specific characteristics of students in each school. It is worth highlighting, for instance, the difference in *total stress* across centers. The program was especially effective in centers 1 and 4, where students come from low and low-middle socio-economic and cultural backgrounds. On the other hand, it is also interesting to note that in the case of the CON variable, the greatest changes were observed in those centers with higher cultural, social and economic levels. These data are of great interest not only for teachers but also for educational policymakers. With regard to these differences across students with different backgrounds, there are further studies in the literature which confirm these contributions. Specifically, Mindfulness has been applied to different populations and an improvement in the stress and attention/concentration variables was achieved. Britton et al. (2014), for instance, reported a perceived benefit of meditation practice in terms of either an increase in relaxation and decrease in anxiety or an increase in the ability to focus or concentrate in forty-eight students. Our study found similar results; the attention and stress variables show remarkable improvement after the intervention program.

Furthermore, the sample in this research includes students with special education needs and with learning difficulties. The results show that all of them have made some improvement in each of the fields analyzed. This is particularly interesting if we take into account that Carboni et al. (2013) also concluded that these studies show a functional relation between Mindfulness training and an improvement in task behavior in the general education classroom for children with ADHD when Mindfulness is applied. In this line, a meta-analysis carried out by Zoogman et al. (2015) concludes that Mindfulness-based interventions are more effective in reducing negative functioning than in improving positive functioning. These results are relevant for future research.

Although the existing literature suggests that Mindfulness programs in educational settings seem to be effective, several aspects during the application of these programs should be noted and to

Chart 1
Description of the intervention according to the TIDIER guide

Nº	Item	Contents
1	*Brief Name*	An intervention program for the management of attention and stress in Primary and Secondary students.
2	*Why*	The practice of Mindfulness activities is proposed as a training program that combines exercises to become aware of the stimuli in the present moment, involving intention, attention, and attitude. Full awareness in the present moment will provide students with a more efficient response to what is happening in the classroom
3	*What (materials)*	Research measuring instruments: - Questionnaire ad hoc: sociodemographic and family variables. - Test d2, to evaluate the concentration and selective attention. - IECI test to measure stress. Materials used in the intervention program: - CD audio tracks: Breath, mindfulness for parents with teenage children. • Track 1 CD. Pause and tune: perception of feelings and thoughts of the present moment. • Track 2 CD. Calm and attentive like an adult frog: 10 minutes sitting paying attention to the breath. • Track 3 CD. Body scan: organized body way feeling the passage of air through each segment when breathing. • Track 4 CD. Handle difficult feelings: learn to handle feelings in different situations. • Track 5 CD. Start the day right: a short meditation in order you not to start the day in a hurry. • Track 6 CD. The worry factory: learning to listen and manage positive and negative thoughts. • Track 7 CD. Solid as a mountain: meditate to strengthen inner strength, stability and presence. • Track 9 CD. Self pity: taking confidence in ourselves through awareness of our body. • Track 10 CD. The desire to be happy: learn to love ourselves to love others and be happy. • Track 11 CD. The art of listening: learning to listen to ourselves and to listen to others without reservation and accepting what they say. • Track 12 CD. Patience, confidence and letting go: learning to manage patience, trust and not to manipulate things. - Texts to direct breaks at home: • 1st week. Your slower movements: full awareness performing everyday acts slowly and consciously. • 2nd week. Take time to get up: become aware of the body when you wake up for 3 minutes. • 3rd week. Turn off the TV: become aware of silence and your surroundings by turning off the television for a few minutes per day. • 4th week. Take a ride: take a walk in the open air with a firm step and breathing deeply while observing the surroundings. • 5th week. Pause: take 3 minutes after doing an activity to low stress levels. • 6th week. The third sip or bite: when eating pay attention to the third sip or bite.
4	*What (procedures)*	Intervention program: - Pre-test: • Questionnaire sociodemographic and family variables (ad hoc). • Questionnaire d2, to measure the level of concentration / attention. • IECI questionnaire, to measure students' stress. - 1st Block (1st, 2nd and 3rd weeks of the intervention): • Classroom: each teacher chooses the activities offered: Tracks 1, 2, 3, 4, 5 and 6 of the CD, and repeats them during the 3 weeks, every day. The teacher plays the audio in the class and everyone follows its content. • Breaks at home. Every day they do the same activity indicated for each week. - 2nd Block (4th, 5th and 6th weeks of the intervention): • Classroom: each teacher chooses the activities offered: Tracks 3, 7, 9, 10, 11 and 12 of the CD, and repeats them during the 3 weeks, every day. The teacher plays the audio in the class and everyone follows its content. • Breaks at home. Every day they do the same activity indicated for each week. - Pos-test. Passing the d2 and IECI questionnaires.
5	*Who (provided)*	The pretest and the posttest were passed on to two of the main researchers, one with 25 years of university teaching and research experience and the other one in the initial phase. Both with training in Mindfulness. The intervention program was carried out by 7 teachers from 4 teaching centers who have successfully completed the Mindfulness course for teachers taught at the Teacher Center of Granada in 2018 and met the inclusion criteria.
6	*How*	The teachers carried out the activities selected in each block at the beginning of their classes. The duration of the same ranges: 1st Block between 4.45 and 16.26 min.; 2nd Block between 1.58 and 16.26 min. They were delivered in groups ranging from 6 to 31 participants.
7	*Where*	The intervention has been carried out in four schools in Granada (two located in the capital, central and Northern Area, and two in the metropolitan area, Southern Area).
8	*When and How Much*	The pre-test was done on one day, previously arranged, in less than 1 hour, the week before the intervention. Classroom activities were always carried out at the beginning of lessons, with a duration of between 4.45 and 16.26 minutes, in the 1st Block (1st, 2nd and 3rd weeks), and between 1.58 and 16.26 minutes, in the 2nd Block (weeks 4, 5 and 6). Activities were carried out in all the classes of the participating teachers, several times a day in some case. The breaks at home were taken by the students for several minutes every day. The post-test was performed the week after the end of the 6 weeks of intervention, during approximately half an hour.
9	*Tailoring*	Six different audio CD activities were offered in each block for the teachers to choose the most suitable for each group.
10	*Modifications*	When applying the intervention program based on the book R̈espirad Mindfulness para padres con hijos adolescentes, it was decided not to take the breaks at home in this program due to their complexity. We opted to design others that are easier and more affordable for the participants.

Chart 1 (*Continued*)

Nº	Item	Contents
11	*How Well (planned)*	The general supervision of the intervention was carried out by the main investigators in frequent meetings until the program was finalized and the necessary material was provided. Each teacher had a record sheet per Block to indicate the selected class activities and the days on which they were carried out. The students had a template to record the execution of the breaks at home. At the end of the intervention, each center recorded data under the following coding: Centers (numbered from 1 to 4 in order of passing the Pretest; Teachers (identified by 2 digits separated by a point: 1st digit, corresponding to the center and 2nd digit, to identify each teacher); and Groups (identified by 2 digits separated by a period: 1st digit, the middle digit, and 2nd digit, a letter to identify each group). Data were collected on the characteristics of the students, number of Students by gender, participating teachers, their training, work experience and groups. They also valued each of the activities carried out, in the classroom and at home, and were asked for their opinion on changes to the program for future interventions.. The fidelity of the program was carried out with observations of field notes and observation by the teachers.
12	*How Well (actual)*	The intervention proceeded as planned and the effects of the program were verified.

take certain caution. For example, given its novelty, we must be prudent when introducing Mindfulness in educational contexts. The first obstacle that we could encounter would be the difficulty to understand the concept of Mindfulness itself (Palomero & Valero, 2016). Although there are few systematic studies to know how teachers who have not practiced it personally represent Mindfulness, Gunaratana (2016) collects the most common erroneous preconceptions among the general population. It is relatively common for Mindfulness to be associated with esoteric philosophies, with paranormal experiences, or with states of holiness and ecstasy unattainable for ordinary people. These erroneous beliefs could constitute an obstacle to the introduction of Mindfulness in the educational world. Therefore, it should be clarified that Mindfulness is accessible to the vast majority of people and is disconnected from specific religious practices, adopting an inclusive and universalist perspective that is perfectly compatible with democratic values. In addition, following Body et al. (2016), on the one hand, we consider that the success of the implementation of Mindfulness in school depends largely on the quality and experience of the trainer, that is, the teacher himself. For example, the Mindfulness in School Project (MISP) guides on how to incorporate Mindfulness into schools, based on teacher training (Body et al., 2016). On the other hand, few studies have used interventions that had previously been empirically evaluated (Felver et al., 2015), which would be determinant to check previously. Finally, another problem is at what time of the day to carry out the activities, in each subject, in a specific subject, such as the hidden curriculum (Pulido, 2020), etc. This discussion should be taken into account in future researches.

Conclusions and future perspectives

This research being now complete, it is safe to state that the hypothesis was virtually fully verified. We can conclude that the Mindfulness programs was effective to reducing stress and improving attention in student, according to age, educational center and sex. Also, this program produced improvements in all schools, showing differences between the CG and the EG. Unlike other programs, the main innovation and contribution of this research, including the results, is the possibility of using a program described in a book that is available to any teacher. Thus, the teachers could use both the activities and the audios described in Chart 1, which is an easy program to implement. For this, this research reinforces the theory of the profits of these programs in the educational field. Nevertheless, in relation with the limitations, this research has several limitations: firstly, the sample could be more extensive and would be interesting include students with disabilities. Secondly, in future research more academics variables could be studied in the students and the teachers.

Declaration of interest statement

The authors declare that the research was conducted in the absence of any financial relationships that could be construed as a potential conflict of interest.

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