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ORIGINAL PAPER

# Effects of a Mindfulness-based Intervention on Adolescents' Depression and Self-concept: The Moderating Role of Age

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## Abstract

During adolescence, there are important changes in both depressive symptoms and self-concept; thus, the present study aimed to examine the effects of a mindfulness-based intervention (MBI) on depression and self-concept in adolescents and test whether age moderated the changes. A sample of 300 students aged between 13 and 21 years ($M = 16.13$, $SD = 1.80$), randomly assigned to either the MBI or a wait-list control group, completed the Center for Epidemiologic Studies Depression Scale and Self-Concept Form-5 Questionnaire before and after implementation of the Learning to Breathe program. The intervention effects on the changes in some factors of depression and dimensions of self-concept were moderated by age. The intervention prevented increases in depression and somatic symptoms, decreased interpersonal difficulties, and increased social self-concept in older adolescents. However, in younger adolescents, there was an increase in depression, depressed affect, and somatic symptoms post-intervention. The effectiveness of mindfulness training was higher in the oldest adolescents, suggesting that MBIs should be even more precisely adapted for younger adolescents. Implications for the implementation of mindfulness programs in schools are discussed.

**Keywords** Mindfulness · Intervention · Depression · Self-concept · Adolescents

## Highlights

- This study examined the impact of a Mindfulness-Based Intervention (MBI) on adolescents´ depressive symptoms and self-concept.
- Participants' age moderated the effectiveness of mindfulness training.
- The MBI prevented increases in depression, depressed affect, and somatic symptoms, decreased interpersonal difficulties, and increased social self-concept in older adolescents.
- The findings suggest that MBIs should be even more precisely adapted for younger adolescents.

Longitudinal studies of community samples have shown that depression rates increase significantly during adolescence (Costello et al., 2006), with overall rates surging dramatically from about 5% to 20% from ages 14 to 17 (Hankin et al., 2015). Depression is currently considered the fourth leading cause of illness and disability among 15- to 19-year-olds—with suicide being the third leading cause of death—resulting in long-term impairments in academic, social, and family functioning (World Health Organization, 2019). Additionally, depressive symptoms have been shown to be strong predictors of major depressive episodes in adulthood, even among youths and adolescents who do not meet the criteria for major depression (Pine et al., 1999).

One of the most significant and powerful regulators of mood is self-concept, understood as the representation of what individuals think, feel, or believe about themselves (Higgins, 1987). Self-concept has been closely linked with depression in adolescents (Kuzucu et al., 2014) and youth transitioning to college (Alfeld-Liro & Sigelman, 1998). During adolescence, although cognitive development allows for more abstract perspectives, distortions and contradictions regarding self-concept can emerge (Roeser & Pinela, 2014). This is compounded by the fact that adolescents' self-concept can be especially dynamic and

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malleable due to crucial changes that take place in an increasing set of contexts (Cole et al., 2001; Schaffhuser et al., 2017; Van der Aar et al., 2018). Seventh to twelfth graders show significantly lower academic self-concept (García & Musitu, 2009), physical self-concept shows a decreasing tendency from childhood to adolescence (Kuzucu et al., 2014; García & Musitu, 2009), and social self-concept shows a significant decrease that starts in the last years of high-school and reaches it minimum in one's college years (García & Musitu, 2009). This may be due to increasing educational demands, pubertal changes, and increased sensitivity to peer context (Van der Aar et al., 2018).

Given that adolescents face important changes in both depressive symptoms and self-concept, it is especially important to implement preventive and mental health promotion programs (Kuyken et al., 2013). In this sense, educational settings facilitate access to interventions for a large number of adolescents and have great potential for improving psychosocial outcomes (Felver et al., 2016). Recently, mindfulness-based interventions (MBIs) have largely been implemented in schools (e.g., Black & Fernando, 2014) and with adolescents (e.g., Viafora et al., 2015). Several studies have highlighted the effectiveness of MBIs for reducing depressive symptoms in youths and adolescents (Edwards et al., 2014; Kuyken et al., 2013; Lau & Hue, 2011), with systematic reviews and meta-analyses reflecting small to moderate effect sizes (Kallapiran et al., 2015; Klingbeil et al., 2017). For instance, two randomized controlled studies that examined the effects of MBIs in middle and high-school students, showed that participants were significantly less likely to develop thoughts of suicide or self-mutilation (Britton et al., 2014), and depressive symptoms were reduced at 6-month follow-up (Raes et al., 2014).

Regarding self-concept, the non-evaluative and non-judgmental nature of mindfulness is thought to promote self-acceptance. The development of a disposition to evaluate oneself with kindness and compassion appears to be a crucial aspect of healthy adolescent identity development (Roeser & Pinela, 2014). Attending to the moment-to-moment experiential self prevents focusing on the future-conditional self or past-imperfect self, which have been linked with vulnerability to depression and depression relapse (Watkins & Teasdale, 2004; Williams et al., 2008). These attitudes can be cultivated through mindfulness meditation, and may significantly help to shape a more coherent sense of self (Crescentini & Capurso, 2015). Franco et al. (2011) conducted a randomized controlled trial to examine the effects of an MBI called "Meditación Fluir" (Franco, 2009) in 16- to 18-year-old students, and found increases in several self-concept dimensions: academic, social, emotional, and family self-concepts. However, Schonert-Reichl and Lawlor (2010) described a more complex picture, with benefits in self-concept for preadolescents (fourth and fifth graders), but not for early adolescents (sixth and seventh graders), concluding that developmental changes could play an important role in intervention effectiveness.

MBIs for youth have been conducted with students across diverse age groups, ranging from 5 to 19 years of age (McKeering & Hwang, 2019). However, some recent studies have suggested that MBIs could be more effective at certain developmental periods. Carsley et al. (2018) performed a meta-analysis that concluded that interventions implemented during late adolescence (15 to 18 years of age) had greater effects on mental health compared to those developed with younger children (6 to 10 years of age). They found no significant pre-post effects on mental health and well-being outcomes in early adolescence (11 to 14 years of age), and a recent systematic review showed that current research with this age group does not yet meet the criteria for evidence-based practice (McKeering & Hwang, 2019). One reason Johnson et al. (2016, 2017) proposed for the absence of significant results in early adolescent samples across a wide range of outcome measures, including depressive symptoms, was that previous studies had included slightly older students. Indeed, in the study of Johnson et al. (2016), some early adolescent subgroups participating in the MBI reported higher levels of anxiety at follow-up. There is little research that examines age as a moderator of responses to school-based MBIs, and even fewer studies have focused on adolescents. An exception is the study of Van der Gucht et al. (2017), who found a greater decrease in symptoms for older students. However, the authors attributed this effect to increased symptom scores for older students in the control group. Thus, further research is needed to determine at what specific age ranges programs should be implemented for optimal impact. This could help to determine which students would benefit most from MBIs, and whether some of them may require adaptations or alternative approaches.

An example of an MBI that has been specifically developed to meet the contextual and maturational needs of adolescents is the Learning to Breathe (L2B; Broderick, 2013) program. Several studies examined the effectiveness of L2B and reported significant decreases in depressive symptoms (with medium to large effect sizes) based on pilot control randomized trials in samples of around 30 middle and high-school students (12- to 18-year-olds) (e.g., Bluth et al., 2016; Shomaker et al., 2017, 2019). These included samples consisting of girls at risk for diabetes (Shomaker et al., 2017, 2019) or of students of alternative schools (Bluth et al., 2016). Some other randomized controlled studies directly focused on adolescents with depressive symptoms and obtained

significant results. For instance, Fung et al. (2016) conducted a pilot study of seventh and eighth graders (12 to 14 years), finding reductions in self-reported internalizing problems (with effect sizes in the medium to large range) in adolescents receiving L2B. Those results were replicated in a subsequent study with a larger sample ($n = 145$) of students, in this case ninth graders (Fung et al., 2019). With regard to non-randomized studies, significant reductions of negative affect (medium effect size) and improvements in affect regulation (small effect size) have been shown in comparison to control groups in large samples of adolescents (between 137 and 244 participants) in grades 10, 11 (Metz et al., 2013), and 12 (Broderick & Metz, 2009; Metz et al., 2013). These studies have also reported increased feelings of calmness, relaxation, and self-acceptance (Broderick & Metz, 2009). In randomized controlled pilot trials with samples of around 100 1st-year university students (ranging from 17 to 21 years of age approximately), the social and emotional dimensions of self-concept, resilience, and satisfaction with life increased, while depression, anxiety, and rumination decreased significantly (Dvořáková et al., 2017; Gómez-Odriozola et al., 2019). Effect sizes for these findings ranged from small to medium. Finally, in studies with around 25 1st-year university students that collected data from interviews and focus groups (Eva & Thayer, 2017; Mahfouz et al., 2018), L2B participants indicated that the intervention had provided them with strategies to cope with stress. They described improvements in self-regulation, attention, positive thinking, time management, emotional awareness, relationships, self-pity, and commitment to a healthy lifestyle.

As there is increasing interest in conducting evidence-based programs for youths and adolescents, the aim of the present study was to contribute to existing research on the L2B program, by examining its impact on different aspects of depression and self-concept. We proposed that the intervention could support youth in dealing with developmental life tasks. Therefore, we expected that adolescents who received the MBI would experience a greater decrease in depressive symptoms and a greater increase in self-concept dimensions than those in the control group.

Additionally, due to the increasing importance of examining the characteristics and key principles of MBI implementation in educational settings, we aimed to determine whether students at different developmental stages (e.g., preadolescence, early adolescence, or late adolescence) responded differently to mindfulness training. Thus, the present study examined whether participant age moderated the effects of the intervention. We hypothesized that mindfulness training would be especially beneficial for older adolescents.

## Method

### Participants

A total of 300 students (64.1% female) from Bizkaia (Basque Country, Spain) between 13 and 21 years of age ($M = 16.13$, $SD = 1.80$) participated in this study. Of these students, 186 were in high school, in grades 9 ($n = 73$), 10 ($n = 72$), and 12 ($n = 41$), while 114 were 1st-year undergraduate students of Psychology and Physical Activity and Sport Sciences from (masked for review).

Figure 1 shows the participant flow from recruitment to posttest assessments. Of the 335 students assed for eligibility, 35 were excluded because they did not show up, declined to participate, or were older than 21. Then, those who consented to participate were assigned to either the intervention group ($n = 157$, 62.2% female) or the wait-list control group ($n = 143$, 65.6% female). For high school students, pairs of parallel classes were randomly assigned to either the wait-list control or intervention group. University students were individually randomized and assigned to either the intervention or wait-list group balanced by gender and depression level (high or low). Regarding intervention adherence, more than 90% of the students ($n = 142$) attended at least 5 of the 6 intervention sessions, which was the criterion to consider the intervention completed.

The target sample size was determined a priori using G*Power 3.1 to calculate the required sample to achieve sufficient power ($1\text{-}\beta = 0.95$) to detect mean group differences of small (0.2), medium (0.5), and large (0.8) effects using two tailed tests with $\alpha = 0.05$. The calculated sample sizes were 1.302, 210 and 84, respectively. Thus, the target sample of 335 and the reduced samples resulting from attrition ($n = 292$ at baseline and $n = 244$ at follow-up) reflected power to detect small-to-medium effects.

### Procedure

First-year undergraduate students were invited to participate in the study, and two schools agreed to take part. Student assent, and parental consent for students younger than 18 years, were required. The assessments took around 60 min to complete. For the intervention group, assessments were conducted pre-intervention (wave one, W1) and 2 months later, post-intervention (wave two, W2). Students in the delayed intervention condition completed a pre-intervention assessment (W1), a second baseline assessment 2 months later (at the conclusion of the immediate intervention group, W2), and a post-intervention assessment (wave three, W3), resulting in three assessment time points. Participants were informed that their responses were confidential and participation was voluntary. In order to pair the questionnaires at different time points, a code known only by the participant

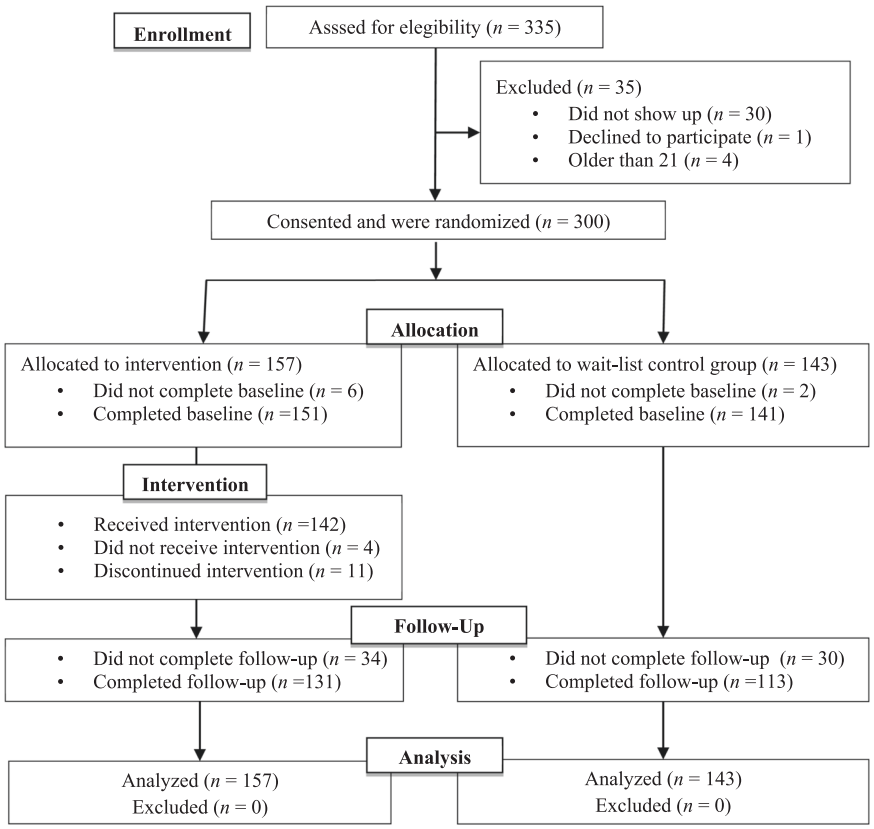


**Fig. 1** Flow chart

was used. The first seven intervention groups were held in the fall semester, and the seven delayed intervention groups were held in the spring semester. All study procedures were approved by the Ethics Committee of (masked for review).

## Measures

The Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) was used to assess depressive symptoms. This scale includes four important factors in depression (depressed affect, positive affect, somatic symptoms, and interpersonal difficulties) and a second-order general depression factor. The positive affect factor measures depression inversely. The CES-D comprises of 20 items, rated on a scale ranging from 0 (*practically never*) to 3 (*almost all the time*). The CES-D has been widely used with young people, and its Spanish version has presented excellent psychometric properties, confirming its factorial structure (Calvete & Cardeñoso, 1999). Cronbach's alphas in this study ranged from 0.90 at baseline to 0.92 at 2-month follow-up for general depression, and coefficients for the different subscales ranged from 0.65 to 0.90 in the baseline and from 0.64 to 0.92 in the 2-month follow-up.

The Self-Concept Form 5 Questionnaire (García & Musitu, 2009) assesses the respondent's perception of the quality of his or her academic performance, social relationships, emotional state, family environment, and physical appearance. It comprises 30 items, with a response format ranging from 1 (*never*) to 5 (*always*), and is aimed at high school and university students. Four of its five subscales (six items per subscale) were used in the present study: academic self-concept, social self-concept, emotional self-concept, and physical self-concept. Cronbach's alphas ranged from 0.75 to 0.88 for the different subscales in the baseline and from 0.78 to 0.88 in the 2-month follow up.

Additionally, during the last session of the intervention, participants were asked about their impressions of the program. Specifically, students completed a brief satisfaction survey in which they indicated what they had learned or obtained from the program and what changes or additions they would make to it.

## Intervention

Students received an MBI consisting on the six-session version of the L2B curriculum (Broderick, 2013), a stress-reduction program adapted to adolescents. It comprises six core themes: (a) body awareness; (b) understanding and working with thoughts; (c) understanding and working with emotions; (d) integrating awareness of thoughts, feelings,

and bodily sensations; (e) reducing harmful self-judgments; and (f) integrating mindful awareness into daily life. Each session has a brief presentation on the subject, activities to facilitate understanding, and a formal mindfulness practice exercise (e.g., the body scanner). Students were also encouraged to practice at home with online material (see http://www.mindfulbizi.es). The program was translated and adapted, with permission from the author and publisher, to Spanish and Basque. It was implemented by psychologists with specific training in mindfulness. Weekly 50–60 min sessions were conducted in groups of between 13 and 26 students.

### Data Analyses

Hierarchical linear modeling seven (Raudenbush et al., 2011) was used, with full information maximum likelihood (FIML) estimation and robust standard errors. FIML estimates parameters based on all available data, including cases with missing data values. Separate models were estimated for depression, its factors, and self-concept subscales.

Each model included the construction of level-1 and level-2 equations. At level-1, regression equations modeled the variation in repeated measures as a function of time (two waves of data). Time was coded as 0 (W1, 1 week pre-intervention) or 1 (W2, post-intervention). At level-2, equations modeled individual differences in level-1 parameters (i.e., intercept and slope) as a function of between-subject variables. Level-2 predictors of the intercept included condition (0 = control, 1 = experimental), age (standardized), and the interaction term between condition and age. Level-2 predictors of the slope included the same predictors. The inclusion of these parameters at level-2 allowed for testing of the effects of condition, age and the interaction of these factors on the intercept, and on the changes in depressive symptoms and self-concept over time. We included random effects for the intercept at level-2, thereby allowing variability between individuals at initial levels.

Additionally, to explore changes over time in the full sample and the moderating effect of age, data from the immediate-intervention and delayed-intervention groups were pooled. W1 data from the immediate-intervention condition was combined with W2 pre-intervention data from the delayed-intervention condition to create a pooled pre-intervention assessment. Post-intervention (W2) data from the immediate-intervention condition was combined with post-intervention data from the delayed-intervention condition (W3) to create a pooled post-intervention assessment. For this pooled sample, separate models were estimated for depression and self-concept subscales. We included age as a level-2 predictor of the intercept and slope for time.

Effect sizes were calculated so that differences between groups (experimental vs. control conditions) in changes in the dependent variables from W1 to W2 could be compared. For results in the pooled sample, effect sizes were calculated to allow comparison of the dependent variables pre-intervention and post-intervention, using the estimated marginal means obtained in the mixed models. Cohen's d values were estimated following the formulas for between- and within-group designs (Cohen, 1988) for the original and pooled samples, respectively. Effect sizes were interpreted as small ($d = 0.2$), medium ($d = 0.5$), or large ($d = 0.8$). All data are available at the Open Science Framework (masked).

## Results

### Descriptive Statistics and Preliminary Analyses

Table 1 presents analyses for differences between the intervention and wait-list control groups. No significant differences were observed for any measure except emotional self-concept, which was slightly higher in the intervention group at W2. There were no significant age ($t = -1.40$, $p = 0.200$) or gender ($\chi 2$ (1) = 0.30, $p = 0.583$) differences between groups.

To summarize the results of the satisfaction survey, most students indicated that by participating in the L2B program they learned "many" and/or "new" things. Among the youngest students the most repeated ideas were having learned to breathe and having developed strategies to relax or to manage stress/nervousness (e.g., "I have learnt to breathe well and relax," 14-year-old participant). Some other concepts underlined by the participants were consciousness and control over feelings, thoughts, and bodily sensations (e.g., "I have become aware of what I do, and I have learnt to control my feelings and thoughts better," 15-year-old student). Concerning the attitudinal component of mindfulness, some adolescents expressed the development of a non-judging attitude (e.g., "I have learnt to accept myself as I am, without judging myself harshly," 14-year-old participant). Among 1-year University students, a deepener knowledge of the self was reported as a benefit derived from the intervention (e.g., "Now I understand myself and others better," 18-year-old participant). Some other examples of older students' responses to the survey are listed below:

> "In this program I have learnt specially to relax. Additionally, I gained a greater understanding of myself.

**Table 1** Descriptive statistics and differences between intervention and wait-list control groups in all study measures at baseline and at 2-month follow-up

| | Total | | | Wait-list control | | | Intervention | | | Differences between groups | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *N* | Mean | *SD* | *N* | Mean | *SD* | *N* | Mean | *SD* | *t* | *p* | *d* |
| W1 depression | 291 | 0.77 | 0.47 | 140 | 0.77 | 0.44 | 151 | 0.76 | 0.49 | 0.162 | 0.872 | 0.02 |
| W1 depressed affect | 291 | 0.75 | 0.58 | 140 | 0.75 | 0.59 | 151 | 0.74 | 0.58 | 0.193 | 0.847 | 0.02 |
| W1 positive affect | 291 | 2.09 | 0.66 | 140 | 2.09 | 0.64 | 151 | 2.10 | 0.68 | −0.218 | 0.827 | 0.02 |
| W1 somatic symptoms | 291 | 0.75 | 0.50 | 140 | 0.77 | 0.47 | 151 | 0.73 | 0.52 | 0.571 | 0.568 | 0.08 |
| W1 interpersonal difficulties | 291 | 0.61 | 0.69 | 140 | 0.54 | 0.65 | 151 | 0.67 | 0.72 | −1.648 | 0.100 | 0.19 |
| W1 academic self-concept | 292 | 3.50 | 0.74 | 141 | 3.53 | 0.72 | 151 | 3.47 | 0.77 | 0.595 | 0.552 | 0.08 |
| W1 social self-concept | 292 | 3.85 | 0.71 | 141 | 3.92 | 0.65 | 151 | 3.78 | 0.75 | 1.659 | 0.098 | 0.20 |
| W1 emotional self-concept | 292 | 3.13 | 0.83 | 141 | 3.07 | 0.81 | 151 | 3.19 | 0.85 | −1.293 | 0.197 | 0.14 |
| W1 physical self-concept | 292 | 3.15 | 0.75 | 141 | 3.12 | 0.70 | 151 | 3.17 | 0.80 | −0.598 | 0.550 | 0.07 |
| W2 depression | 244 | 0.79 | 0.51 | 113 | 0.80 | 0.51 | 131 | 0.78 | 0.52 | 0.318 | 0.750 | 0.04 |
| W2 depressed affect | 244 | 0.76 | 0.62 | 113 | 0.74 | 0.63 | 131 | 0.78 | 0.62 | −0.417 | 0.677 | 0.06 |
| W2 positive affect | 244 | 2.01 | 0.75 | 113 | 1.91 | 0.76 | 131 | 2.09 | 0.74 | −1.903 | 0.058 | 0.24 |
| W2 somatic symptoms | 244 | 0.76 | 0.52 | 113 | 0.76 | 0.53 | 131 | 0.76 | 0.51 | −0.026 | 0.980 | 0.00 |
| W2 interpersonal difficulties | 244 | 0.52 | 0.63 | 113 | 0.50 | 0.61 | 131 | 0.54 | 0.64 | −0.418 | 0.676 | 0.06 |
| W2 academic self-concept | 241 | 3.44 | 0.77 | 111 | 3.45 | 0.72 | 130 | 3.42 | 0.82 | 0.328 | 0.743 | 0.04 |
| W2 social self-concept | 241 | 3.83 | 0.70 | 111 | 3.84 | 0.64 | 130 | 3.82 | 0.75 | 0.254 | 0.800 | 0.03 |
| W2 emotional self-concept | 241 | 3.25 | 0.83 | 111 | 3.13 | 0.84 | 130 | 3.35 | 0.80 | −2.023 | 0.044 | 0.27 |
| W2 physical self-concept | 241 | 3.08 | 0.80 | 111 | 3.04 | 0.74 | 130 | 3.11 | 0.85 | −0.693 | 0.489 | 0.09 |

W1 = baseline, W2 = 2-month follow-up

I have also learnt to focus more on things, such as my actions." (17-year-old student).

"I have learnt to appreciate every moment individually, without being aware of time and hours. For example, when walking or eating. I feel that appreciating little moments helps you living in a more relaxing way." (19-year-old student).

"I have learnt that I need time too. I have found pleasure in meditation and in dedicating time to myself, because I was always from one side to other. Additionally, I have learnt the value of every moment and the joy of -now- with its good and bad things." (18-year-old student).

## Intervention Effects on Depressive Symptoms

We examined the role of age as a moderator of the intervention effect. Results for the random effects of the mixed models for age as moderator were significant for level-2 for depression ($SD = 0.41$, $VC = 0.17$, $\chi 2$ $(296) = 1701$, $p < 0.001$), depressed affect ($SD = 0.48$, $VC = 0.23$, $\chi 2$ $(296) = 1333$, $p < 0.001$), positive affect ($SD = 0.57$, $VC = 0.32$, $\chi 2$ $(296) = 1352$, $p < 0.001$), interpersonal difficulties ($SD = 0.40$, $VC = 0.16$, $\chi 2$ $(296) = 1243$, $p < 0.001$), and somatic symptoms ($SD = 0.49$, $VC = 0.24$, $\chi 2$ $(296) = 947$, $p < 0.001$), indicating significant variability between individuals in the intercept.

Table 2 presents the fixed effects. For depression, depressed affect, and somatic symptoms, the slopes for time were positive, indicating an increasing tendency of depression and its subscales over time. For positive affect, the time slope was negative and significant, indicating a decreasing tendency over time. In all cases, condition was not significantly associated with the slope for time. However, age was a statistically significant predictor of the time slope for depression, depressed affect, and somatic symptoms indicating an influence of age on changes over time. The interaction between age and condition was a statistically significant predictor of the time slope for depression, depressed affect, somatic symptoms, and interpersonal difficulties, indicating a

**Table 2** Results of mixed linear models predicting intervention effects on depression and its factors over time with age as moderator (fixed effects)

| | Depression | | | | Depressed affect | | | | Positive affect | | | | Somatic symptoms | | | | Interpersonal difficulties | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | *t* | *p* | *B* | *SE* | *t* | *p* | *B* | *SE* | *t* | *p* | *B* | *SE* | *t* | *p* | *B* | *SE* | *t* | *p* |
| Intercept | 0.73 | 0.04 | 20.99 | <0.001 | 0.76 | 0.05 | 15.44 | <0.001 | 2.08 | 0.05 | 38.17 | <0.001 | 0.77 | 0.04 | 19.38 | <0.001 | 0.54 | 0.05 | 9.98 | <0.001 |
| Condition (1 = Int. 0 = Cont.) | −0.03 | 0.05 | −0.48 | 0.634 | −0.03 | 0.07 | −0.49 | 0.623 | 0.04 | 0.08 | 0.48 | 0.631 | −0.05 | 0.06 | −0.80 | 0.424 | 0.12 | 0.08 | 1.51 | 0.101 |
| Age (standardized) | 0.03 | 0.04 | 0.79 | 0.433 | 0.05 | 0.05 | 0.93 | 0.356 | 0.00 | 0.05 | 0.04 | 0.972 | 0.02 | 0.04 | 0.54 | 0.591 | 0.03 | 0.05 | 0.50 | 0.775 |
| Age × condition | 0.10 | 0.06 | 1.73 | 0.084 | 0.10 | 0.07 | 1.43 | 0.155 | −0.10 | 0.07 | −1.32 | 0.189 | 0.10 | 0.06 | 1.70 | 0.089 | 0.12 | 0.08 | 1.47 | 0.143 |
| Time (0 = W1; 1 = W2) | 0.04 | 0.04 | 1.10 | 0.274 | 0.02 | 0.05 | 0.44 | 0.664 | −0.15 | 0.06 | −2.61 | 0.010 | 0.03 | 0.04 | 0.77 | 0.445 | −0.01 | 0.06 | −0.10 | 0.921 |
| Time × condition | 0.00 | 0.05 | 0.01 | 0.994 | 0.04 | 0.07 | 0.59 | 0.558 | 0.10 | 0.08 | 1.36 | 0.174 | 0.03 | 0.06 | 0.57 | 0.566 | −0.11 | 0.08 | −1.32 | 0.188 |
| Time × age | 0.09 | 0.04 | 2.39 | 0.017 | 0.11 | 0.05 | 2.30 | 0.022 | −0.06 | 0.06 | −1.12 | 0.264 | 0.11 | 0.04 | 2.90 | 0.004 | 0.06 | 0.06 | 0.90 | 0.368 |
| Time × age × condition | −0.15 | 0.05 | −3.25 | 0.002 | −0.16 | 0.06 | −2.49 | 0.013 | 0.08 | 0.07 | 1.07 | 0.286 | −0.20 | 0.06 | −3.60 | 0.001 | −0.19 | 0.08 | −2.38 | 0.018 |

W1 = baseline, W2 = 2-month follow-up, Int. = intervention group, Cont. = wait-list control group

moderating effect of age on the influence of condition on changes in depression and the three above-mentioned subscales over time.

We used the three-way plotter with all options available on Jeremy Dawson's interaction effects website (http://www.jeremydawson.co.uk/slopes.htm) to plot the trajectories for depression over time by age (1 standard deviation below and above the mean) and condition (see Fig. 2A). Slope difference tests indicated that there was a significant difference between the intervention and control groups, both in younger ($t = 2.49$, $p = 0.013$, $d = 0.43$) and older ($t = -2.19$, $p = 0.027$, $d = 0.30$) adolescents. The results of simple slope tests provided by the interaction plotter demonstrated that, for younger adolescents, the time slope for those in the control group was not statistically different from zero ($b = -0.046$, $t = -1.09$, $p = 0.277$), while in the intervention group the time slope was positively and statistically significant ($b = 0.109$, $t = 2.38$, $p = 0.018$). In older adolescents in the control group, the time slope was positively and statistically significant ($b = 0.131$, $t = 2.49$, $p = 0.013$), while in the intervention group, it was not statistically different from zero ($b = -0.022$, $t = -0.50$, $p = 0.617$).

With regard to different factors of depression, slope difference tests for depressed affect and somatic symptoms subscales indicated that there was a significant difference between the intervention and control conditions in younger adolescents in both subscales ($t = 2.34$, $p = 0.020$, $d = 0.33$ and $t = 3.13$, $p = 0.002$, $d = 0.61$, respectively). In older adolescents, the slope difference test indicated that there were significant differences between the intervention and control conditions in somatic symptoms ($t = -2.04$, $p = 0.042$, $d = 0.33$) and interpersonal difficulties ($t = -2.50$, $p = 0.013$, $d = 0.41$). Simple slope tests for younger adolescents in the intervention group indicated a marginally significant increase of depressed affect ($b = 0.113$, $t = 1.84$, $p = 0.068$) and a significant increase of somatic symptoms ($b = 0.147$, $t = 2.72$, $p = 0.007$), while the time slopes for younger adolescents in the control group were not significant ($b = -0.084$, $t = -1.46$, $p = 0.146$ and $b = -0.083$, $t = -1.66$, $p = 0.097$, respectively). Simple slope tests for older adolescents indicated that, while the time slope for somatic symptoms in the intervention group was not significant ($b = -0.022$, $t = -0.42$, $p = 0.674$), there was a significant increase of somatic symptoms in the control group ($b = 0.145$, $t = 2.32$, $p = 0.021$). Regarding interpersonal difficulties, the time slope for older adolescents in the experimental group appeared to be statistically different from zero ($b = -0.247$, $t = -3.19$, $p = 0.002$) indicating a significant decrease at W2, while the time slope for the control group was not significant ($b = 0.051$, $t = 0.56$, $p = 0.577$).

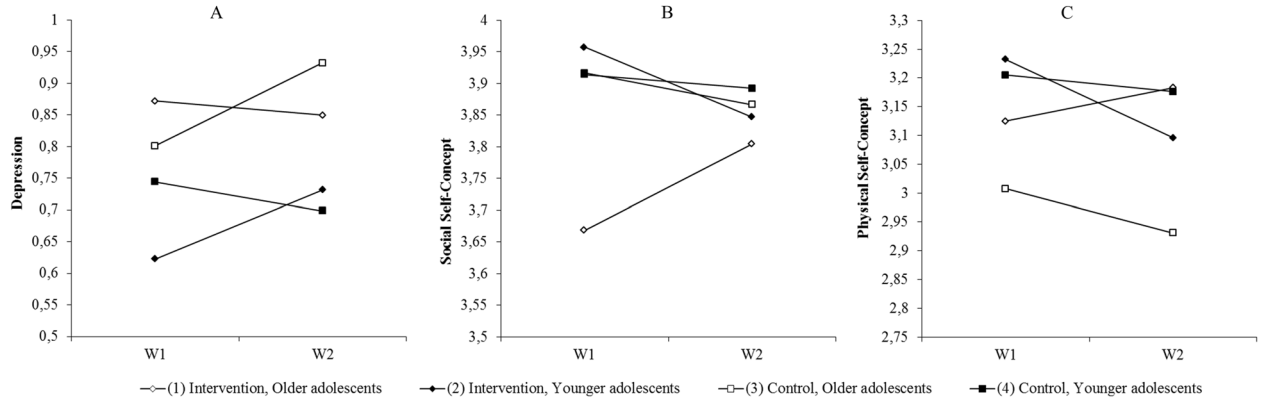


**Fig. 2** Trajectories of depression (**A**), social self-concept (**B**), and physical self-concept (**C**) (for younger and older adolescents) for participants in the control and intervention conditions (Learning to Breathe). W1 = baseline, W2 = 2-month follow-up, younger adolescents = 1 standard deviation below the mean, older adolescents = 1 standard deviation above the mean

## Intervention Effects on the Self-concept Subscales

Next, we tested the role of age as a moderator of the intervention effects on self-concept. The results for the random effects of the mixed models for age as a moderator were significant for level-2 for the academic ($SD = 0.65$, $VC = 0.43$, $\chi2\ (296) = 2245$, $p < 0.001$), social ($SD = 0.62$, $VC = 0.43$, $\chi2\ (296) = 2038$, $p < 0.001$), emotional ($SD = 0.70$, $VC = 0.49$, $\chi2\ (296) = 1821$, $p < 0.001$), and physical ($SD = 0.71$, $VC = 0.50$, $\chi2\ (296) = 3229$, $p < 0.001$) dimensions of self-concept, indicating significant variability between individuals in the intercept. Table 3 presents the fixed effects. In all cases, neither condition nor age were significantly associated with the slope for time. However, the interaction between age and condition was a statistically significant predictor of the time slope for social and physical self-concept, indicating a moderating effect of age on the influence of condition on changes in the above-mentioned self-concept subscales over time.

Figure 2B, C display trajectories in social and physical self-concept over time, by age and condition. Slope difference tests for social self-concept showed marginally significant differences between the control and intervention conditions in older adolescents ($t = 1.95$, $p = 0.052$, $d = 0.43$). The results of simple slope tests for social self-concept provided by the interaction plotter showed that the time slope for older adolescents in the intervention group was positively and statistically significant ($b = 0.136$, $t = 2.22$, $p = 0.027$) indicating an increase of social self-concept at W2, while the time slope for the control group was not statistically different from zero ($b = -0.050$, $t = -0.69$, $p = 0.494$).

## Changes over Time in the Full Sample: Age as a Moderator

We examined whether age was a potential moderator explaining variability in the intervention effects in the full sample. Table 4 presents the results for the random and fixed effects of the mixed models with age as moderator. Random effects were significant for level-2 for all variables, indicating significant variability between individuals in the intercept. For all measures, age was significantly associated with the intercept, indicating an influence of age on individual levels of depression, its factors, and self-concept subscales.

We used the two-way plotter with all options available on Jeremy Dawson's interaction effects website to plot the trajectories for depression over time by age (1 standard deviation below and above the mean) (see Fig. 3A). Regarding depression and its factors, the interaction between time and age was a statistically significant predictor of the time slope for depression, depressed affect, somatic symptoms, and interpersonal difficulties. The results of simple slope tests provided by the interaction plotter demonstrated a significant decrease in depression for older adolescents ($b = -0.070$, $t = -2.11$, $p = 0.036$, $d = 2.26$) and a significant increase in depression post-intervention for younger adolescents ($b = 0.077$, $t = 2.59$, $p = 0.010$, $d = 1.73$). Simple slope tests indicated a significant increase of depressed affect ($b = 0.089$, $t = 2.17$, $p = 0.031$, $d = 2.60$) and a marginally significant increase of post-intervention somatic symptoms ($b = 0.074$, $t = 1.92$, $p = 0.056$, $d = 1.44$) in younger adolescents. Contrastingly, in older adolescents post-intervention, interpersonal difficulties decreased significantly ($b = -0.176$, $t = -3.06$, $p = 0.002$, $d = 3.83$), and marginally significant results were obtained for reductions in somatic symptoms ($b = -0.080$, $t = -1.87$, $p = 0.063$, $d = 2.03$).

Regarding the self-concept subscales, the interaction between time and age was a statistically significant predictor of the time slope for social and physical self-concept. When conducting simple slope tests, older adolescents showed a significant increase in social self-concept ($b = 0.114$, $t = 2.48$, $p = 0.014$, $d = 2.09$) post-intervention. However, the slope

**Table 3** Results of mixed linear models predicting intervention effects on self-concept subscales over time with age as moderator (fixed effects)

| | Academic self-concept | | | | Social self-concept | | | | Emotional self-concept | | | | Physical self-concept | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | *t* | *p* | *B* | *SE* | *t* | *p* | *B* | *SE* | *t* | *p* | *B* | *SE* | *t* | *p* |
| Intercept | 3.53 | 0.06 | 60.29 | <0.001 | 3.92 | 0.06 | 70.31 | <0.001 | 3.01 | 0.07 | 46.12 | <0.001 | 3.12 | 0.06 | 52.76 | <0.001 |
| Condition (1 = Int. 0 = Cont.) | −0.08 | 0.08 | −0.93 | 0.354 | −0.10 | 0.08 | −1.26 | 0.209 | 0.16 | 0.10 | 1.70 | 0.090 | 0.07 | 0.09 | 0.84 | 0.404 |
| Age (standardized) | 0.10 | 0.06 | 1.78 | 0.075 | 0.00 | 0.05 | 0.02 | 0.983 | −0.12 | 0.07 | −1.74 | 0.082 | −0.10 | 0.06 | −1.72 | 0.086 |
| Age × condition | 0.17 | 0.08 | 1.25 | 0.213 | −0.15 | 0.08 | −1.88 | 0.061 | −0.06 | 0.10 | −0.63 | 0.529 | 0.05 | 0.09 | 0.53 | 0.597 |
| Time (0 = W1; 1 = W2) | −0.05 | 0.05 | −1.04 | 0.301 | −0.04 | 0.05 | −0.79 | 0.430 | 0.04 | 0.05 | 0.81 | 0.420 | −0.05 | 0.04 | −1.41 | 0.159 |
| Time × condition | 0.03 | 0.07 | 0.50 | 0.616 | 0.05 | 0.06 | 0.78 | 0.436 | 0.08 | 0.08 | 1.09 | 0.278 | 0.01 | 0.05 | 0.25 | 0.800 |
| Time × age | −0.02 | 0.05 | −0.36 | 0.716 | −0.01 | 0.04 | −0.32 | 0.746 | −0.01 | 0.05 | −0.20 | 0.843 | −0.02 | 0.04 | −0.63 | 0.528 |
| Time × age × condition | −0.07 | 0.07 | −1.02 | 0.310 | 0.14 | 0.07 | 2.08 | 0.038 | 0.07 | 0.07 | 0.95 | 0.341 | 0.12 | 0.06 | 2.00 | 0.045 |

W1 = baseline, W2 = 2-month follow-up, Int. = intervention group, Cont. = wait-list control group

was not significant for younger adolescents. Finally, slopes for physical self-concept were not statistically different from zero. Interaction plots are shown in Fig. 3B, C.

## Discussion

The development and implementation of effective universal programs for preventing affective disorders in youths and adolescents continues to be an important challenge to overcome. The present study examined the effects of an MBI on different aspects of depression and self-concept. The effects of the change in some factors of depression and dimensions of self-concept were moderated by age.

Older adolescents in the control condition showed significant increases in depression and somatic symptoms that the intervention seemed to prevent. Moreover, interpersonal difficulties decreased for older adolescents who participated in the MBI. However, for younger adolescents in the MBI, there were increases in depression, depressed affect, and somatic symptoms, while there were no significant effects for those factors in the control condition. Once the whole sample received the MBI, the results showed decreases in depression, somatic symptoms and interpersonal difficulties for older adolescents, and increases in depression, depressed affect, and somatic symptoms for younger adolescents. Similar results were obtained by Johnson and Wade (2019), who testing the effects of the "Mindfulness Training for Teens" curriculum found that only the older age group (tenth graders) showed significant improvements, compared to the control group at 4-month follow-up, for symptoms of depression and anxiety.

Participant age also moderated the intervention effects on social and physical self-concepts. Social self-concept for older adolescents in the intervention group increased significantly, while in younger adolescents, no significant effects were observed. These beneficial intervention effects in older adolescents were also shown in the whole sample post-intervention. Therefore, results are consistent with previous studies conducted with late adolescents (16- to 18-year-olds; Franco et al., 2011) and early adolescents (11- to 12-year-olds; Schonert-Reichl & Lawlor, 2010) that found increases and decreases in self-concept, respectively, after an MBI.

It has been suggested that the increased self-consciousness characteristic of the onset of adolescence (due to increased socio-cognitive abilities and information processing), along with the self-awareness fostered by MBIs, could result in a more realistic and critical view of the self (Schonert-Reichl & Lawlor, 2010). Another possible explanation for the different responses to mindfulness training based on developmental stage is that there could be certain moments during adolescence in which specific brain regions and networks are more likely to be modified, predisposing youth to be open to training (Carsley et al., 2018). In fact, neurocognitive maturity is one factor that could influence these differences between older and younger adolescents (Johnson et al., 2017). Additionally, it has been suggested that positive results obtained for younger children may be due their natural receptivity ("beginner's mind") while, in the case of older adolescents, the emergence of abstract thinking, with increased cognitive and metacognitive capacities, would lead them benefit more from MBIs (Johnson & Wade, 2019). However, during early adolescence, students may still be unaware of the importance of acquiring tools to face future challenges (Johnson et al., 2017) and therefore, be less motivated.

Overall, the present study highlights the relevance of considering age as moderator of MBIs' effectiveness. Thus, our results support the conclusions of theoretical frameworks that suggest the potential effectiveness of MBIs could

**Table 4** Results of mixed linear models predicting changes on study variables in the full sample over time with age as moderator (fixed effects) and final estimation variance components (random effects)

| | Fixed effect | | | | Random effect | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | *t* | *p* | *SD* | VC | *df* | $\chi^2$ | *p* |
| Depression | | | | | 0.42 | 0.18 | 281 | 1.915 | <0.001 |
| Intercept | 0.75 | 0.03 | 26.54 | <0.001 | | | | | |
| Age (standardized) | 0.13 | 0.03 | 4.37 | <0.001 | | | | | |
| Time (0 = Pre; 1 = Post) | 0.00 | 0.02 | 0.15 | 0.878 | | | | | |
| Time × age | −0.07 | 0.02 | −3.14 | 0.002 | | | | | |
| Depressed affect | | | | | 0.48 | 0.23 | 281 | 1.352 | <0.001 |
| Intercept | 0.70 | 0.03 | 20.87 | <0.001 | | | | | |
| Age (standardized) | 0.17 | 0.03 | 4.80 | <0.001 | | | | | |
| Time (0 = Pre; 1 = Post) | 0.02 | 0.03 | 0.63 | 0.532 | | | | | |
| Time × age | −0.07 | 0.03 | −2.18 | 0.030 | | | | | |
| Positive affect | | | | | 0.58 | 0.34 | 281 | 1.264 | <0.001 |
| Intercept | 2.05 | 0.04 | 49.47 | <0.001 | | | | | |
| Age (standardized) | −0.09 | 0.04 | −2.22 | 0.027 | | | | | |
| Time (0 = Pre; 1 = Post) | −0.02 | 0.04 | −0.62 | 0.538 | | | | | |
| Time × age | 0.06 | 0.04 | 1.47 | 0.141 | | | | | |
| Somatic symptoms | | | | | 0.39 | 0.15 | 281 | 1.102 | <0.001 |
| Intercept | 0.73 | 0.03 | 24.23 | <0.001 | | | | | |
| Age (standardized) | 0.11 | 0.03 | 3.79 | <0.001 | | | | | |
| Time (0 = Pre; 1 = Post) | 0.00 | 0.03 | −0.11 | 0.914 | | | | | |
| Time × age | −0.08 | 0.03 | −2.57 | 0.011 | | | | | |
| Interpersonal difficulties | | | | | 0.50 | 0.25 | 281 | 1.007 | <0.001 |
| Intercept | 0.59 | 0.04 | 14.92 | <0.001 | | | | | |
| Age (standardized) | 0.11 | 0.04 | 2.82 | 0.006 | | | | | |
| Time (0 = Pre; 1 = Post) | −0.08 | 0.04 | −2.20 | 0.028 | | | | | |
| Time × age | −0.09 | 0.04 | −2.30 | 0.022 | | | | | |
| Academic self-concept | | | | | 0.70 | 0.49 | 280 | 2.383 | <0.001 |
| Intercept | 3.49 | 0.04 | 77.90 | <0.001 | | | | | |
| Age (standardized) | 0.12 | 0.04 | 2.85 | 0.005 | | | | | |
| Time (0 = Pre; 1 = Post) | 0.01 | 0.03 | 0.35 | 0.729 | | | | | |
| Time × age | −0.03 | 0.03 | −1.02 | 0.307 | | | | | |
| Social self-concept | | | | | 0.63 | 0.40 | 280 | 2.269 | <0.001 |
| Intercept | 3.84 | 0.04 | 89.87 | <0.001 | | | | | |
| Age (standardized) | −0.10 | 0.04 | −2.53 | 0.012 | | | | | |
| Time (0 = Pre; 1 = Post) | 0.03 | 0.03 | 1.10 | 0.274 | | | | | |
| Time × age | 0.08 | 0.03 | 2.55 | 0.011 | | | | | |
| Emotional self-concept | | | | | 0.71 | 0.51 | 280 | 1.629 | <0.001 |
| Intercept | 3.18 | 0.05 | 63.11 | <0.001 | | | | | |
| Age (standardized) | −0.16 | 0.05 | −3.22 | 0.002 | | | | | |
| Time (0 = Pre; 1 = Post) | 0.11 | 0.04 | 2.74 | 0.007 | | | | | |
| Time × age | 0.07 | 0.04 | 1.62 | 0.105 | | | | | |
| Physical self-concept | | | | | 0.74 | 0.55 | 280 | 2.889 | <0.001 |
| Intercept | 3.13 | 0.04 | 66.59 | <0.001 | | | | | |
| Age (standardized) | −0.10 | 0.05 | −2.31 | 0.021 | | | | | |
| Time (0 = Pre; 1 = Post) | 0.00 | 0.03 | 0.12 | 0.903 | | | | | |
| Time × age | 0.07 | 0.03 | 2.05 | 0.041 | | | | | |

Pre = pre-intervention assessment, Post = post-intervention assessment

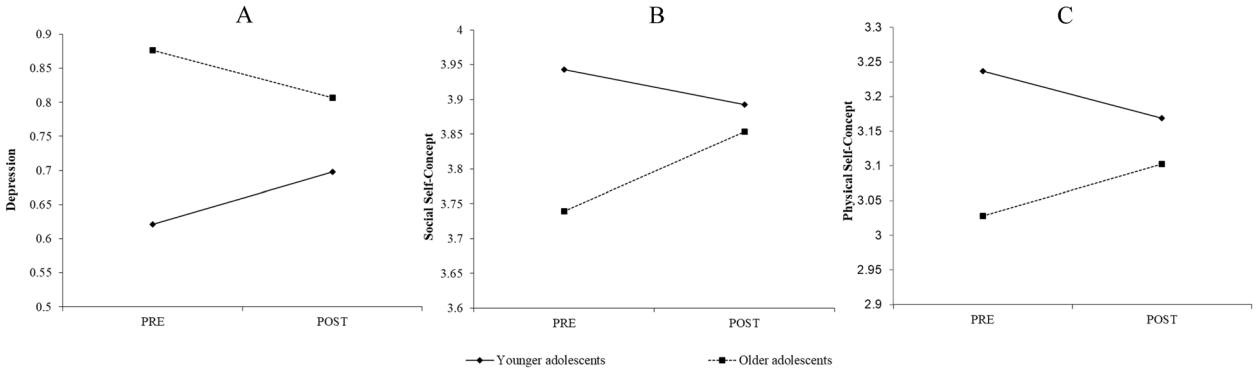


**Fig. 3** Trajectories of depression (**A**), social self-concept (**B**), and physical self-concept (**C**) (for younger and older adolescents) for the full sample (mindfulness-based intervention). Pre = pre-intervention assessment, Post = post-intervention assessment, younger adolescents = 1 standard deviation below the mean, older adolescents = 1 standard deviation above the mean

differ based on participants' developmental stages (Roeser & Pinela, 2014; Roeser & Zelazo, 2012), and that taking a developmental perspective will be essential in future research (Greenberg & Harris, 2012). Attention should be paid to age-related developmental needs (e.g., attention span, cognitive capacities, language, physicality, relevant content). More precision is needed when determining adequate program adaptations for each student group, discerning between preadolescents, early adolescents, mid-adolescents, and late adolescents.

In this sense, it is very important to consider program characteristics. There is little research examining the efficacy of the six-session version of L2B for early adolescents from the general population. The study of Bluth et al. (2015) represents an exception, although it had some important limitations, such as the lack of a control group and the small sample size ($n = 27$). However, Metz et al. (2013) found that the 18-session version of the program reduced perceived stress and psychosomatic complaints and increased levels of efficacy in affective regulation in a sample of 244 adolescents in which 31.8% of students were still in tenth grade. The 18-session of L2B version (in which sessions take ~15 min and can be offered two or three times per week) expands elements of the six-session version and allows for more in-class practice, reinforcement of concepts, and activities (Broderick, 2013). Therefore, younger adolescents may require more sessions or a lengthier offering of the intervention. For instance, a 14-year-old student textually indicated in the satisfaction survey that it would be interesting to develop the program "more than once a week," and another ninth grader would modify the intervention to "make it longer" by extending its duration.

Another possibility is that MBIs for younger adolescents require further developmental adaptations to youths' and adolescents' cognitive and emotional levels. Some authors have proposed different ways of adapting adults' programs to children and adolescents, for instance, increasing explanations, providing examples from everyday life, using a wide variety of practices, using metaphors, repeating until skills are acquired, or limiting the duration of activities so that shorter attention spans are required (Thompson & Gauntlett-Gilbert, 2008). Despite the fact that L2B has certain important attributes that make it a developmentally appropriate intervention -such as the use of breathing as an anchor for meditation, or the use of reminders for practice- there are other practical tips in the literature that include involving teachers or looking for creative ways to make the process enjoyable and stimulating (Shonin et al., 2014). For instance, L2B includes an optional activity that implies practicing mindfulness outdoors, in nature, which was not feasible in the present because of busy school schedules but could have engaged younger adolescents in a more meaningful way. In the present study, some of the youngest students expressed feeling bored or highlighted the need to make the program more entertaining or interesting. For instance, here are some of the ninth and tenth graders' (14- to 16-year-olds) proposals for improving the intervention, reflected in their answers to the satisfaction survey: "Using mats and more relaxing music," "making more different activities," "adding some games," "doing funnier and less formal activities," "writing less, doing more activities, and watching videos," and "making the program more attractive, more dynamic, and adding more activities to take part."

However, other authors (Johnson & Wade, 2019) have found better results in certain age brackets of youths with interventions more closely modeled on adult programs (with larger session and meditation durations and more post-meditation discussions). In this sense, at the end of the intervention in the present study, 5-year university students indicated that they would modify the program so that it incorporated longer session times and lengthier activities (e.g., "I would not change anything, I would just add some more time to sessions," "I would add a longer meditation," "I would add duration, that is, having more time for each session"). Apart from these suggestions, most university

students felt that "the program was complete enough," that "the method was adequate and useful," or that they liked the program "as it is." Thus, more precision is needed when determining adequate program adaptations for each group of adolescents, distinguishing between preadolescents, early-adolescents, mid-adolescents, and late-adolescents. Researchers, program developers, and implementers need to be cognizant of the importance of accurately adapting interventions to adolescents' developmental stage. Determining what kind of adaptations or specific interventions are more optimal and the developmental stages at which mindfulness training is most effective would be helpful for the management of the available resources for interventions. Hence, further research is needed on factors that affect the implementation of mindfulness programs in schools (Hudson et al., 2020).

The positive findings in older adolescents' were consistent with L2B's group format that, among other things, seeks to promote prosocial behaviors through the development of social skills (Broderick, 2013). Social self-concept increased (e.g., perceptions of making friends easily and of being friendly), while interpersonal difficulties (e.g., feeling that people were unfriendly or that people did not like them) decreased. The benefits for depression and self-concept demonstrated in older adolescents, evidence shows the need to continue working on the development and implementation of MBIs for youth. Despite the difficulties that adjusting MBIs to busy school schedules may entail, increasing numbers of authors have advocated for the inclusion of these kinds of interventions into school curricula. Specifically, our study supports the implementation of L2B with adolescents in later high school courses and when transitioning to college. Therefore, the data reported here are encouraging for continued investigation of L2B's effectiveness.

## Limitations and Future Research

There are some important limitations to the present study that should be noted. First, all variables were measured by self-report, which could be subject to social desirability bias. A multiple-source approach to measurement, including parent or teacher reports, would improve the study's validity. Future research should also complement the examination of the moderating effect of age with hormonal indicators, direct measures, or self-reports of pubertal development. Another limitation of the study is the lack of a more comprehensive collection of qualitative data. In recent years, the number of studies collecting qualitative data on students involved in the delivery of MBIs has increased (for a review, see Sapthiang et al., 2019). Therefore, it would have been helpful and interesting to delve more intensely into youths' perspectives about the program. Future studies could consider mixed methods approaches, including interviews or focus groups with participants to examine the different factors that could affect the effectiveness of the intervention in more detail. Asking students about perceived benefits or about recommendations for improving programs, for example, could be an important key for complementing the information provided by self-report inventories. An additional point to consider is the fact that the number of students per age band was quite low in some cases. Moreover, an extended follow-up assessment that investigates the long-term effectiveness of the L2B program is needed to determine whether the positive impact will be sustained.

Finally, the group of 5-year university students could have been influenced by self-selection bias. While this implies that those students could have been more motivated to improve their mindfulness skills than the sample of high school students—a fact that could have affected perceived changes—motivation could also be a key for experiencing benefits from MBIs. Given the evidenced need for universal interventions and including mental health promotion programs into school curricula, enhancing youths and adolescents' motivation could be essential, and more research is required in this area. Future studies should assess students' initial predisposition toward mindfulness training and determine whether it has an impact on the effectiveness of such programs.

Despite the above-mentioned limitations, this study contributes to the field by providing data on the influence of age on MBI effectiveness. The results indicated that the intervention was more effective for reducing depressive symptoms and increasing self-concept in older adolescents than younger adolescents. However, these findings should be interpreted with caution, as available studies on the role of age in MBI implementation with adolescents are still scarce. The present research also contributes to a growing body of literature on mindfulness-based practices in schools, and broadens the evidence on the effectiveness of the L2B program. Future studies should continue the search for ways students' mental health could be cultivated in schools, and for factors that affect the implementation of mindfulness programs in educational settings.

## Data Availability

All data are available at the Open Science Framework (https://osf.io/jry8e/).

**Author Contributions** J.G.-O.: collaborated with the design of the study, analyzed the data, wrote the paper, prepared the tables, and revised the references. E.C.: designed the study, collaborated with the writing of the study, analyzed the data, and wrote part of the results. All authors approved the final version of the manuscript for submission.

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## Compliance with Ethical Standards

**Conflict of Interest** The authors declare no competing interests.

**Ethical Approval** The procedures of this study have been approved by the institutional research committee of the University of (masked for review) and have been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

**Informed Consent** Informed consent was obtained from all individual participants and from the parents/guardians of students younger than 18 years old.

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