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A randomized controlled evaluation of a secondary school mindfulness program for early adolescents: do we have the recipe right yet?

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Abstract

Objective: Mindfulness is being promoted in schools as a prevention program despite a current small evidence base. The aim of this research was to conduct a rigorous evaluation of the .b (“Dot be”) mindfulness curriculum, with or without parental involvement, compared to a control condition. **Method:** In a randomized controlled design, students (M_{age} 13.44, SD .33; 45.4% female) across a broad range of socioeconomic indicators received the nine lesson curriculum delivered by an external facilitator with ($N = 191$) or without ($N = 186$) parental involvement, or were allocated to a usual curriculum control group ($N = 178$). Self-report outcome measures were anxiety, depression, weight/shape concerns, wellbeing and mindfulness. **Results:** There were no differences in outcomes between any of the three groups at post-intervention, six or twelve month follow-up. Between-group effect sizes (Cohen’s d) across the variables ranged from .002 - .37. A wide range of moderators were examined but none impacted outcome. **Conclusions:** Further research is required to identify the optimal age, content and length of mindfulness programs for adolescents in universal prevention settings.

Keywords: *Mindfulness; adolescence; schools; transdiagnostic; prevention*

Mindfulness presents as a promising transdiagnostic approach for mental health disorders, given its potential to counteract a number of shared risk factors for anxiety, depression and eating disorders (Johnson, Burke, Brinkman, & Wade, 2016a). Robust evidence exists in adults for the benefits of mindfulness-based interventions (MBIs) across this group of pathologies (Khoury et al., 2013). More recently, MBIs have been enthusiastically embraced in schools and are widely disseminated (Semple, Drouman, & Reid, 2017), but there are insufficient methodologically robust studies to make definitive conclusions about efficacy.

In mainstream secondary schools, only three large randomized controlled trials (RCTs) of MBIs have been conducted. Raes, Griffith, Van der Gucht, and Williams, (2014) tested an 8-week MBCT-informed curriculum ($N = 408$, $M_{\text{age}} 15.4$ years; mixed sex; external facilitator) finding improvements in depression at post intervention and 6-month follow-up (Cohen's $d \geq .25$). Atkinson and Wade (2015) investigated a 3-session mindfulness intervention with a body image focus ($N = 347$, $M_{\text{age}} 15.7$ years; female; external facilitator), with improvements across a range of eating disorder risk factors at 6 months ($d \geq .47$), but no improvements in negative affect. A third study evaluated the manualized *.b* ("Dot be") Mindfulness in Schools curriculum, which had previously shown promising results in a controlled study (Kuyken et al., 2013; $N = 522$, $M_{\text{age}} 14.8$ years, mixed sex, class teacher delivery), demonstrating reductions at 3 months for depression, stress and wellbeing ($d \geq .25$). The replication RCT (Johnson et al., 2016a; $N = 308$, $M_{\text{age}} 13.6$ years, mixed sex, external facilitator) showed no improvements across a wide range of outcomes at post-intervention or 3-month follow-up ($d < .28$).

Several hypotheses for the lack of replication of the *.b* curriculum exist. First, that the ideal dosage or active ingredients necessary to successfully translate adult MBIs for youth remain unknown. Second, although an early adolescent group was deliberately targeted, prior

to the escalating stressors of mid-late adolescence (Kuyken et al., 2013), it may be that older adolescents respond better. Third, inadequate program adherence in the replication trial may have impacted results i.e., the curriculum was shortened by one lesson, students were not supplied with a user friendly version of the home practice manual, and an external facilitator was used (Johnson et al., 2016a). Therefore, the main aim of the current study was to conduct a tighter replication of the .b curriculum. A secondary aim was to test whether increased “dose” might be achieved by inviting parents to take part in the intervention, to stimulate discussion of mindfulness at home together and remind students to do home practice. Three small controlled trials of MBIs (Bögels, Hoogstad, van Dun, de Schutter, & Restifo, 2008; Semple, Lee, Rosa, & Miller, 2010; van der Oord, Bögels, & Peijnenburg, 2012) have included parents in MBIs for children, evidencing medium to large effect size improvements in attention, behavior problems and anxiety in these clinical samples. However, there have been no experimental comparisons that isolate the effect of parental involvement, nor has this been tested in community samples. We predicted that our outcome measures would show improvement at 12 month follow-up (the longest to date in a youth MBI study) in the mindfulness group with parental involvement compared to the mindfulness group without, due to higher levels of home practice compliance, and that both of these groups would show improvement compared to the control group.

Method

Participants

Four urban coeducational secondary schools (one private, three public) participated. The mean age of the 555 students who participated was 13.44 ($SD = .33$); 45.4% were female. Power analysis showed that to detect a Cohen's d effect size of .25 (Kuyken et al., 2013; Raes et al., 2014), with a power level of .80, 127 participants per group were required

(Hedeker, Gibbons, & Waternaux, 1999).

Design

A cluster (class based) randomized controlled design was used, with assignment to mindfulness, mindfulness with parental involvement, or control using the randomization function in Excel 2010, and performed by the principal investigator prior to any contact with participating teachers. Clustering at the class level within schools allowed for matching of demographic variables, with the risk of contamination within schools considered low due to class and home-based activities involving experiential practice. Outcome measures were administered on four occasions: 3-4 weeks pre-intervention, post-intervention and 6- and 12-month follow-up.

Procedure

Research approval was granted by each School Principal, the South Australian Department for Education and Child Development, and the Social and Behavioural Research Ethics Committee of Flinders University. Opt-out consent was approved. Testing was performed in a classroom setting with the principal investigator and teacher present. It was not possible for students or the researcher to be blind to the allocated treatment group.

Intervention

Mindfulness curriculum. The .b (“Dot be”) Mindfulness in Schools curriculum, based on adult mindfulness programs but modified for 11-16 year olds (Kuyken et al., 2013), was used. The tightly manualized program consists of nine weekly lessons (40-60 minutes in our study). Throughout the course, a range of mindfulness practices were taught to students: short unguided practices (breath counting, “.b”: *stop, feel your feet, feel your breathing, and be present*, mindfulness of routine daily activities including walking, and watching thought

traffic) and two 9-minute guided audio files (“FOFBOC: *Feet on floor and bum on chair*”, a seated body scan and breath awareness; and “Beditation”, a lying down body scan and relaxation practice). Guided by a homework manual, and with access to the two guided audiofiles, students were encouraged to practice at home daily.

All mindfulness lessons were conducted by the first author (CJ), a mindfulness practitioner with ten years of personal practice, who in addition to .b certification had undergone adult facilitator training, and had taught the .b curriculum 8 times previously. The control group undertook normal lessons (i.e., Pastoral care, Community projects, English, Science or History).

Greater adherence to the curriculum was promoted as follows. The introductory lesson was delivered in full, and each student received a color, hard copy of the homework manual. A “team teaching” approach was adopted (van de Weijer-Bergsma, Langenberg, Brandsma, Oort, & Bögels, 2014), where classroom teachers were asked to take an active part in the lessons and remind students about their mindfulness home practice. Further, teachers were given a script for a short practice (.b) to run at the start of every lesson they had with this group of students, together with a choice of two meditation audiofiles to play once a week between formal mindfulness lessons.

The standard curriculum was also strengthened to maximize potency of the ideas, including a greater focus on motivation in the introductory lesson: emphasising the unique window to “immunize” their brain on the cusp of adolescence and its challenges; recording their individual motivations for retraining their brain on a home practice chart, and brainstorming obstacles and helpful ideas for remembering to do each week’s exercises at home. Second, we added the .b practice at the start of every formal mindfulness lesson in order to facilitate its use as a very familiar “anchoring” technique in stormy situations. Third, we added a quiz at the start of each lesson reviewing the previous lesson’s key points (with

small candy rewards). Fourth, we added more pages to the homework manual so that each week's activity could be easily recorded. Fifth, we gave each classroom two colorful A3 posters summarizing the four steps of the .b practice and illustrating a series of key mindfulness ideas. Sixth, at the final lesson, students received a laminated color copy of key ideas, and teachers received a handout describing how to reinforce mindfulness with their class into the future.

Parental involvement. For those students allocated to the *Mindfulness with parental involvement* arm of the trial, parents were also invited to be involved. The parental component was designed predominately in e-format to minimise the time burden and be easily accessible. Parents were invited to a one hour evening information session at their child's school before the program commenced, with a presentation explaining mindfulness, the research, and the .b program, followed by opportunity for questions. For those parents that could not attend, a link to a recording of this session was sent via email. Once a week, parents received a further email with a link to a 10-minute private YouTube clip which summarised the key points of the current lesson, took parents through an experiential exercise, explained the child's home practices for that week, and invited email feedback or questions.

Primary outcome measures

The validated measures (**Table 1**) were selected to permit comparison to previous studies with respect to the following constructs: anxiety and depression (Raes et al., 2014), weight and shape concerns (Atkinson & Wade, 2015), and well-being (Kuyken et al., 2013). A new multifactor mindfulness measure (Johnson et al., 2016b) was included to investigate mediators.

Secondary outcome measures

Fidelity and competence. There was no consent for recording of student lessons, so

the 10-minute YouTube clips for parents were used as an indirect measurement of the competence of the instructor and fidelity to the .b curriculum. The independent assessor (nominated by the .b organization) had postgraduate qualifications in mindfulness (M. St. MBCT, Oxford), was an experienced school teacher and mindfulness facilitator, and was also a trainer with .b in Australia and the UK. Given there was no direct assessment of classroom delivery, we modified the adult Mindfulness Based Interventions Teaching Assessment Criteria (MBI-TAC, Crane et al., 2012) which assess a combination of adherence and competence, and included the following domains: Coverage, pacing and organization; Embodiment of mindfulness; and Guiding mindfulness practices. Each domain was scored 1 (*Incompetent*) – 6 (*Advanced*) and averaged into an overall score for each lesson. This marking rubric was deemed appropriate by the .b organization.

Homework Practice. At the three post intervention time points, questions surveyed amount of home practice. On completion students were asked “*During the 9 week course, how often did you practice each of the following techniques outside of the lessons?*” Students were supplied with a list of techniques learnt during the course and asked to rate each as follows: 1 “*never*”, 2 “*once or twice in total*”, 3 “*greater than twice in total but less than once a week*”, 4 “*once or twice each week*” to 5 “*three times or more each week*”. At 6 and 12 month follow-up the question was reworded “*Since the mindfulness course at school, how often have you used the following mindfulness techniques?*”

Course acceptability. In the last lesson students were asked to rate the following on a 0-10 point Likert scale with higher scores indicating greater satisfaction/likelihood: “*How would you rate the course in terms of being enjoyable and interesting?*”, “*How much do you think you have learnt during the course?*”, and “*In the future, how likely are you to use any of the techniques you have learnt?*”.

Parent feedback. After the last student lesson, parents in the *Mindfulness with*

parental involvement arm of the trial were emailed a short anonymous feedback form, recording the school their child attended. Parents were asked whether they watched any of the weekly you-tube clips, and if so, which lessons (by selecting *watched/did not watch* options). Three questions inquired about interaction with their child during the mindfulness course, rating this on a 1-5 Likert scale with higher scores indicating greater involvement: “*My child and I talked about the mindfulness lessons*”, “*We did meditation practices together*” and “*I reminded my child about their mindfulness homework*”. Parents were then asked to rate the you-tube clips overall in terms of any benefit derived for themselves on a 1-5 Likert scale ranging from *Not at all helpful* to *Extremely helpful*.

Statistical analysis

All analyses were performed using IBM Statistical Package for the Social Sciences, Version 22. Logistic regressions were conducted for the post intervention, 6- and 12-month follow-up data to test if any baseline variable predicted missing data. Data were not adjusted for the effect of clustering, given the same instructor delivered all mindfulness classes. Primary and secondary outcome analyses were conducted using Linear Mixed Modelling (LMM), enabling inclusion of cases with missing data via maximum likelihood estimation, with baseline measures entered as covariates. LMM was also used to investigate the following moderators: sex, depression, anxiety, weight/shape concerns, socioeconomic status (SES) and age. The amount of home practice was investigated as a moderator of outcome for the mindfulness group, using hierarchical multiple regression and controlling for baseline at Step 1, with the overall mean frequency of homework practices during the relevant period entered in Step 2.

Results

Description of participants

Figure 1 shows the flow of participants through the study. Only five parents (0.9%) actively requested that their child's data not be used for this research project. Participating schools represented a broad range of socioeconomic (SES) demographics as measured on the Index of Community Socio-Educational Advantage (ICSEA), whereby 1000 represents the mean, with a standard deviation of 100 (Australian Curriculum Assessment and Reporting Authority, 2012), ranging from 959 to 1144 ($M = 1061.50$, $SD = 76.41$).

Preliminary analysis

Data for depression, anxiety, and weight/shape concerns were positively skewed and transformed to achieve acceptable parameters for normality. At post intervention, those higher in the Awareness of Internal Experiences were more likely to be present at school for data collection ($OR\ 1.39$; $95\%\ CI\ 1.06 - 1.84$). At the 6-month follow-up, those lower in anxiety were more likely to be in attendance (0.46 ; $0.25 - 0.84$). At the final follow-up (12 months) those higher in Awareness of External Experiences were more likely to be available for participation 1.27 ($1.01-1.59$). Of the twelve outcome variables over three waves, only three variables showed an association, with none repeated in more than one wave, indicating that data could be accepted as missing at random.

Parental involvement

Attendance at the pre-course information night for parents was low (8%), varying according to SES group (high, 29%; medium, 6% and low, 0%). Similarly, return rates of post course feedback forms were low (8%) with varying responses amongst SES brackets (high, 17%; medium, 7% and low, 4%). Given the low numbers of feedback forms returned, we used an alternative measure of the parental uptake of the weekly information i.e., the number of hits on the private YouTube channel per individual weekly lesson, interpreting one hit as one family/parent logging on. For the first two lessons, involvement was relatively high

(38 - 40%) but dropped to 9% by the end of the course.

Fidelity and competence

A score out of six was given for each of the three domains assessed, together with an overall average score for each lesson (**Supplementary Table S1**), with an average in the Proficient Band (5/6) across lessons.

Repeated measures analyses

Descriptive statistics are shown in **Table 2**. **Table 3** presents results from the mixed models analyses. There were no interactions between time and group. Only one main effect of group across the twelve outcome variables tested was obtained, for *Acting with Awareness*, where both mindfulness groups were lower in this element of mindfulness compared to the control group. Between-group differences were only significant at post intervention (Cohen's $d = .30 - .37$). All other effect sizes were small (.002 to .23). There were three main effects of time, for depression, anxiety and mindfulness (*Acting with Awareness*).

Moderators

There were no moderator-group-time interactions for any of the analyses (see **Supplementary Material; Table S2**).

Home practice

Mean frequency for each type of home practice during the course are shown in **Table 4**. Averaged across practices and students, home practice occurred less than once a week. Independent t -tests demonstrated that mean frequency of homework did not differ between the mindfulness groups with and without parental involvement at any time point: Post intervention: $t(286) = -0.28, p = .78, d = .03$; 6-month follow-up: $t(253) = -0.34, p = .73, d = .05$; or 12-month follow-up: $t(222) = 0.54, p = .59, d = .07$.

Table 4 also shows percentages of students doing home practice once a week or more, showing modest involvement, ranging from 24.4% during the course to 7% by the 12-month follow-up. These figures are comparable to our earlier trial (26.3%; Johnson et al., 2016a). Shorter home practices were undertaken more frequently during the current course (for example, breath counting or *.b* compared to Beditation and FOFBOC). The amount of homework did not explain any variance in anxiety or depression as outcome variables (**Table 5**) but explained a modest variance (5.0 – 9.0%) for several mindfulness facets across one or more time points in a positive direction: *Awareness of Internal Experiences*; *Awareness of External Experiences*; *Decentering and non-reactivity*, *Relativity*, and *Insight*. A negative relationship occurred for weight/shape concerns at six-month follow up and for two mindfulness facets (*Acting with Awareness* at 12 months and *Openness* at both 6- and 12-month follow-ups) i.e., more homework was associated with worse outcomes, with less than 3% of variance explained.

Feedback

Of the 264 students who returned forms, mean ratings of the course were as follows: enjoyment and interest 6.92 (median 7; range 0-10) and amount learnt 6.84 (median 7; range 0-10), comparable to those reported in earlier trials of the *.b* curriculum (Johnson et al., 2016a; Kuyken et al., 2013). The mean reported likelihood of using mindfulness practices in the future was 6.1 (median 6; range 0-10), contrasting to the modest reported usage at six (10.6%) and twelve month follow-up (8.4%).

Discussion

This study retested the 9-week *.b* mindfulness program in young adolescents with tighter adherence than a previous RCT which obtained null results (Johnson et al., 2016a). We found no differences in outcomes between any of the groups at any time point. The one

main effect of group, where levels of *Acting with Awareness* were lower in both mindfulness groups compared to the control group, did not translate into any improvements in psychological functioning. Examination of a range of moderators did not reveal any improvement in subgroups.

Considering the potential for floor effects in universal studies, we compared our mean baseline scores for depression to two secondary school studies that also used the DASS-21. Nehmy and Wade's (2015) CBT intervention detected improvement despite lower baseline levels ($M = .58, SD = .53$) than the current study ($M = .75, SD = .70$). Using adult DASS-21 clinical cut-offs, 29.9% of our sample showed moderate or high levels of depression compared to 20% in the mindfulness study by Raes et al. (2014) which was able to detect reductions in depression. We also found no emergence of a prevention effect during our 12-month follow-up, where concerns regarding low baseline pathology do not apply. Taken together, there is no indication that the presence of floor effects adequately explains our null findings.

Two other reasons for our lack of replication with previous work exist. Many of the controlled trials to date have been delivered at least in part by program developers (Atkinson & Wade, 2015; Kuyken et al., 2013; Raes et al., 2014) whereas our intervention was delivered by an experienced but independent mindfulness researcher. Second, previous studies have involved slightly older students (Kuyken et al., 2013; $M_{age} = 14.8$ years; Raes et al., 2014; $M_{age} = 15.4$; Atkinson and Wade, 2015; $M_{age} = 15.74$), which may indicate important differences in neurocognitive maturity within adolescence that impact MBI effectiveness. Currently, it remains unknown how trait mindfulness emerges developmentally and at what ages it might be most fertile to intervene during the period of rapid cognitive change from childhood through adolescence (Felder & Jennings, 2016). There is preliminary evidence that primary school children respond positively to MBIs (Felder et al., 2016),

suggesting receptivity through natural “beginner’s minds” (O’Brien, Larson & Murrell, 2008). Despite the added capacity for abstract thought to allow skills such as metacognition to unfold, perhaps more “cynical” early adolescents require increased life challenges before the relevance of socioemotional tools becomes evident. It will be important to compare programs across a range of age bands to guide optimal insertion into curricula.

Young people may also need greater scaffolding than adults to make connections between seemingly abstract tools and real life, especially if they are currently not distressed. This idea was used effectively in a school-based MBI targeting eating disorder risk factors (Atkinson & Wade, 2015). Students applied mindfulness practices to body image triggers (pictures of models), resulting in sustained improvement across multiple eating disorder risk variables. Making mindfulness concepts relevant to specific aspects of teen life through practical exercises is recommended.

The ideal dosage of mindfulness for young people is also unknown (Felver & Jennings, 2016). Given that lessons are shorter to provide a more digestible experience for youth, moving beyond the classical 8-week adult format may be indicated. Further, a spiral learning curriculum of modules specific to the stage of neurocognitive development might be necessary. Input between formal weekly lessons may be helpful to increase dosage, hence classroom teacher delivery of school-based MBIs has been proposed. However, we had a range of engagement from school teachers, and in real-world settings it is likely to fall to a core group of interested teachers to deliver classes, where regular contact with students between lessons may still not occur. In our trial, classroom teachers were encouraged to implement practices with their classes between weekly lessons, however, frequency of uptake was relatively low, suggesting that methods to improve compliance should be considered, such as better engaging homeroom teachers in the value of regular practices, and perhaps supplying a range of short, pre-recorded audiofiles for daily use.

Offering parents brief, weekly information on the program in e-format did not improve home practice compliance rates nor psychological outcomes for students. Although parental participation was greater in our highest versus lowest SES school (e.g., 29% vs 0% attendance at information night), SES did not moderate program effect. While it remains unclear whether greater parental uptake would impact outcomes, parental participation in our study was low despite clear explanations of the potential for mental health benefit, weekly reminders, low time burden, and ease of access, reflecting how time demands can outweigh perceived relevance in a non-clinical population. It appears unlikely that including parental involvement to improve dosage in universal MBIs is a good use of resources.

Similarly, the implemented changes in school delivery to encourage homework participation failed to result in increased compliance rates compared to the previous trial (Johnson et al., 2016a). Across both trials, rates of students undertaking home practice once a week or more during the course averaged 24.4%. However, our rates contrast to 70% reported with an earlier version of the *.b* curriculum delivered by UK classroom teachers to 14-15 year old students (Huppert & Johnson, 2010), and 49% in a Finnish RCT, where the *.b* curriculum was delivered by external facilitators to 12-15 year old students (Volanen et al., 2015). The UK rates might be partly explained by classroom teachers delivering the program with the potential for regular homework reminders, together with their slightly older age group, or the higher rates in both trials might reflect different school cultures. Invitational home practice appears to be an unreliable way to achieve a planned dosage of mindfulness with conscript audiences, and making home practice assessable to improve compliance is worthy of further investigation.

In adults, there is a small association between home practice and positive outcomes in both clinical and non-clinical populations (Parsons et al., 2017). In universal interventions for youth, there is conflicting evidence for its importance (Huppert and Johnson, 2010; Johnson

et al., 2016a; Kuyken et al., 2013; Quach et al., 2016). In our sample, amount of home practice did not explain any sizable variance in our outcomes, reflecting either the low percentage of students undertaking regular home practice or that unguided home practice does not impact non-clinical adolescents. Future research might test whether greater at-school exposure to guided meditation together with expanded inquiry (teacher facilitated interpretation of experience, considered an essential ingredient in adult MBIs; Crane et al 2016) increases effectiveness with adolescents. We note that student predictions of using mindfulness practices after the course were high compared to the self-reported rates of continuing use at follow-up, which suggests that booster sessions might also be necessary.

This study has a number of strengths: use of the RCT design with a large sample based on *a priori* power calculations, a broad range of socioeconomic demographics, and the longest follow-up to date in a school-based MBI. The use of the same facilitator for all lessons is a strength (consistency) as well as a limitation (generalizability of findings). Other limitations include our indirect measure of fidelity and competence which did not allow assessment of the facilitator in the group learning environment, and reliance on self-report measures. Cronbach's alpha was below .7 for two of the CHIME-A subscales, however all subscales had acceptable item-total correlations $>.44$.

Conclusion

In a second randomized controlled design evaluating the impact of a school-based mindfulness program in early adolescents, with tighter adherence to the curriculum and additional measures to increase student dosage between lessons via parents and class teachers, we again found no improvements on any outcome measure at post intervention or during a 12-month follow-up. Further research is required to identify the optimal age, content and length of programs delivering mindfulness to adolescents.

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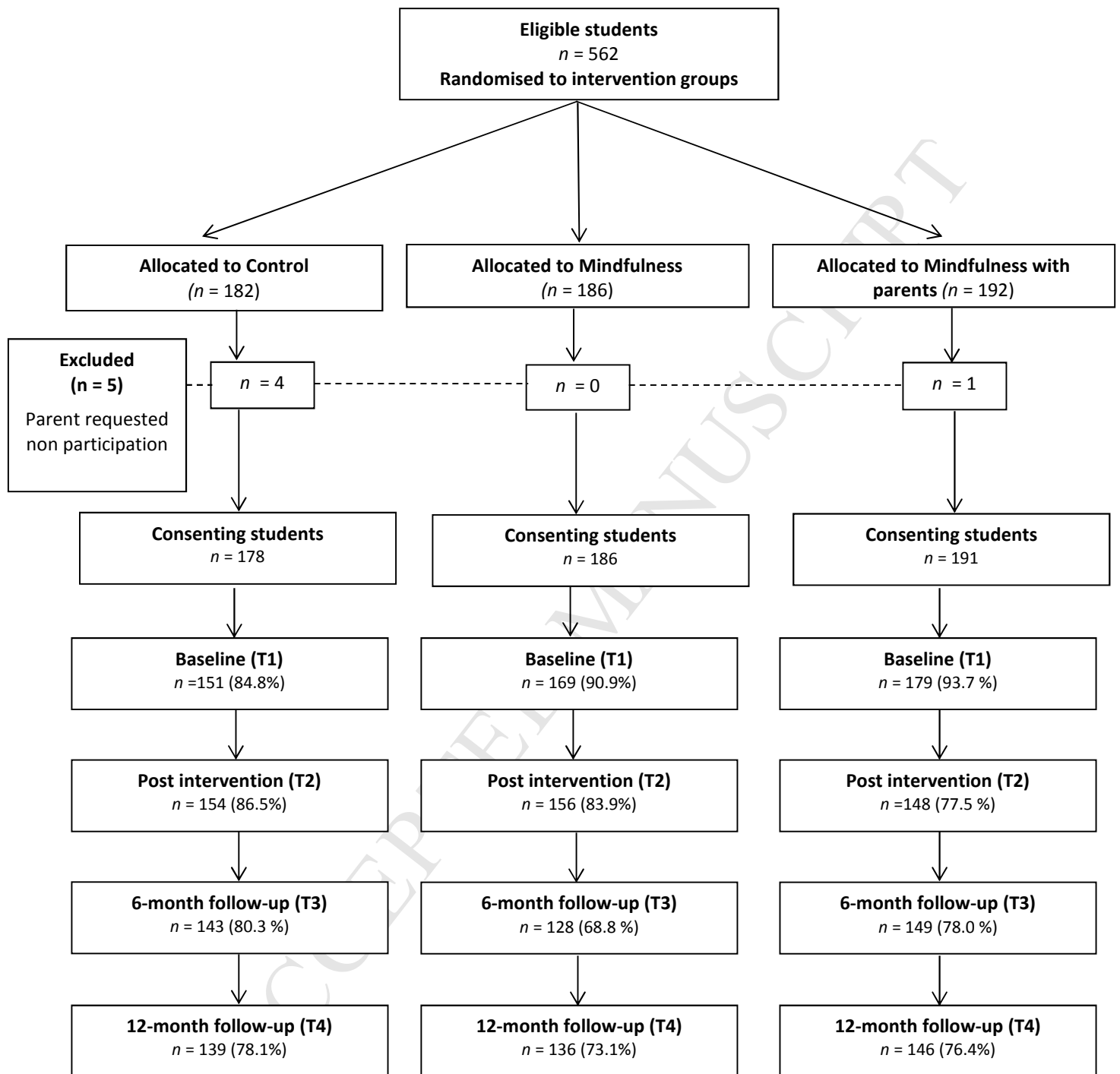
Figure 1. *Flow of participants through study*

Table 1. Validated measures used in the study

Outcome measure (author)	Description
Negative affect: Depression Anxiety Stress Scale – Short form (DASS-21; Lovibond & Lovibond, 1995)	Two 7-item anxiety and depression factors. Each item is scored on a 4-point scale from 0 “ <i>never</i> ” to 3 “ <i>almost always</i> ”, with higher scores reflecting higher depression or anxiety over the past week.
Weight and shape concern: subscales from the Eating Disorder Examination-Questionnaire (EDE-Q; Fairburn & Beglin, 1994)	Combined 12 items use a 7-point rating scale ranging from 0 “ <i>not at all</i> ” to 6 “ <i>markedly</i> ” relating to the last 28 days; higher scores indicate greater concerns.
Well-being: Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS; Tennant et al., 2007)	14-item scale surveys the last two weeks; items are rated on a 5-point scale from 1 “ <i>none of the time</i> ” to 5 “ <i>all of the time</i> ”, with higher scores signifying higher wellbeing.
Mindfulness: Comprehensive Inventory of Mindfulness Experiences – Adolescents (CHIME-A; Johnson et al., 2016b)	25-item scale supports eight individual factors but not an overall total score. A 5-point rating scale ranging from 1 “ <i>never true</i> ” to 5 “ <i>always true</i> ” to survey the last two weeks. For each factor, a higher score indicates greater mindfulness.

Table 2. Descriptive statistics for mindfulness and control groups at baseline (T1), post-intervention (T2), six month (T3) and twelve month (T4) follow-up

	T1		MF-Parents		MF		Control		Note. Measures: Depression/Anxiety = DAS S-21; Weight/shape concerns = Weight/shape subscales of the Eating Disorder Examination-Questionnaire; Wellbeing = Warwick Edinburgh Mental Wellbeing Scale; Mindfulness = Comprehensive Inventory of Mindfulness Experiences - Adolescents (CHIME-A); where abbreviated:
	Cronbach α r item-total		Mean	SD	Mean	SD	Mean	SD	
Depression	.90 .52-.79	T1	.77	.65	.74	.75	.74	.71	
		T2	.84	.70	.73	.69	.70	.69	
		T3	.81	.73	.71	.75	.74	.71	
		T4	.81	.70	.75	.71	.86	.77	
Anxiety	.80 .26-.68	T1	.87	.57	.82	.63	.86	.63	
		T2	.91	.59	.86	.58	.81	.61	
		T3	.83	.56	.80	.69	.82	.61	
		T4	.85	.55	.84	.64	.90	.67	
Weight/Shape Concerns	.94 .37-.79	T1	1.68	1.27	1.72	1.39	1.63	1.43	
		T2	1.72	1.39	1.74	1.35	1.79	1.49	
		T3	1.78	1.44	1.78	1.43	1.86	1.53	
		T4	1.87	1.47	1.70	1.39	1.90	1.54	
Wellbeing	.91 .52-.85	T1	3.46	.66	3.47	0.73	3.53	.70	
		T2	3.37	.71	3.46	0.75	3.50	.67	
		T3	3.37	.69	3.41	.76	3.48	.75	
		T4	3.36	.73	3.49	.78	3.44	.75	
Mindfulness									
Aware INT	.66 .45 - .49	T1	3.66	.75	3.69	.73	3.71	.68	
		T2	3.59	.70	3.64	.76	3.73	.62	
		T3	3.63	.70	3.46	.75	3.63	.71	
		T4	3.69	.71	3.52	.77	3.67	.64	
Aware EXT	.74 .55 - .59	T1	3.56	.88	3.61	.86	3.58	.94	
		T2	3.48	.85	3.47	.89	3.42	.88	
		T3	3.43	.82	3.41	.90	3.45	.92	
		T4	3.48	.82	3.41	.95	3.44	.81	
ACT Aware	.66 .44 - .54	T1	2.99	.82	3.06	.81	3.02	.92	
		T2	2.82	.76	2.86	.82	3.07	.84	
		T3	2.95	.85	2.94	.83	3.08	.84	
		T4	2.98	.80	2.95	.81	3.02	.85	
AccNJ	.75 .55 - .60	T1	2.98	.84	3.03	.85	3.06	.97	
		T2	3.03	.79	3.07	.78	3.02	.83	
		T3	3.09	.90	2.99	.81	3.04	.86	
		T4	3.11	.84	3.01	.85	2.99	.87	
DecNR	.73 .49 - .59	T1	3.00	.82	3.07	.77	3.08	.70	
		T2	3.02	.73	3.09	.77	3.05	.70	
		T3	3.05	.77	2.92	.75	3.09	.73	
		T4	3.09	.80	3.04	.81	3.03	.71	
Openness	.65 .40 - .49	T1	2.70	.70	2.60	.71	2.62	.79	
		T2	2.78	.77	2.64	.76	2.65	.75	
		T3	2.79	.78	2.73	.82	2.57	.77	
		T4	2.73	.74	2.69	.86	2.63	.73	
Relativity	.77 .55 - .63	T1	3.62	.83	3.73	.73	3.66	.72	
		T2	3.50	.75	3.62	.79	3.63	.67	
		T3	3.54	.74	3.48	.75	3.62	.75	
		T4	3.59	.76	3.59	.80	3.64	.64	
Insight	.72 .48 - .57	T1	2.73	.98	2.74	.90	2.77	.87	
		T2	2.76	.86	2.83	.84	2.81	.88	
		T3	2.81	.91	2.73	.83	2.68	.92	
		T4	2.83	1.01	2.79	.93	2.72	.93	

Aware INT = Awareness of Internal Experiences; Aware EXT = Awareness of External Experiences; Act Aware = Acting with Awareness; AccNJ = Acceptance and non-judgement; DecNR = Decentering and non-reactivity

Table 3. Mixed Model Analyses with Between-group Effect Sizes ($N = 555$)

Outcome measures	Treatment Group	Time	Treatment Group x time	Post intervention (T2)		6-month follow-up (T3)		12-month follow-up (T4)		
				Adjusted mean difference (95% CI)	ES	Adjusted mean difference (95% CI)	ES	Adjusted mean difference (95% CI)	ES	
Depression	$F(446.59) = 1.04$	$F(375.45) = 4.24^*$	$F(393.77) = 1.02$	MF-P v MF	-.02 (-.07-.03)	.12	-.03 (-.09-.03)	.14	-.02 (-.08-.04)	.08
				MF-P v C	-.04 (-.09-.01)	.18	-.01 (-.06-.05)	.03	.01 (-.05-.07)	.03
				MF v C	-.01 (-.06-.04)	.07	.03 (-.03-.08)	.11	.03 (-.03-.09)	.11
Anxiety	$F(448.50) = 0.60$	$F(383.76) = 5.90^{**}$	$F(386.29) = 1.68$	MF-P v MF	-.01 (-.09-.07)	.02	.05 (-.05-.14)	.12	.01 (-.09-.10)	.02
				MF-P v C	.07 (-.02-.15)	.20	.01 (-.08-.11)	.03	.01 (-.09-.11)	.03
				MF v C	.08 (-.01-.16)	.23	-.04 (-.13-.06)	.09	.01 (-.09-.11)	.02
WSC	$F(439.16) = 1.43$	$F(360.79) = 0.69$	$F(360.89) = 0.64$	MF-P v MF	-.01 (-.12-.10)	.02	.001 (-.13-.13)	.002	.08 (-.07-.23)	.13
				MF-P v C	-.06 (-.17-.06)	.13	-.05 (-.18-.08)	.10	-.04 (-.19-.11)	.07
				MF v C	-.05 (-.16-.07)	.10	-.05 (-.18-.08)	.10	-.12 (-.28-.03)	.20
Wellbeing	$F(423.44) = 2.66$	$F(372.91) = 0.39$	$F(375.16) = 0.23$	MF-P v MF	-.10 (-.25-.05)	.16	-.11 (-.29-.07)	.15	-.17 (-.35-.02)	.22
				MF-P v C	-.08 (-.23-.07)	.13	-.07 (-.25-.11)	.10	-.08 (-.27-.11)	.11
				MF v C	.02 (-.14-.17)	.02	.04 (-.15-.22)	.05	.08 (-.11-.28)	.11
Mindfulness										
Aware INT	$F(439.86) = .745$	$F(386.63) = 1.53$	$F(388.48) = 1.69$	MF-P v MF	-.08 (-.26-.09)	.12	.11 (-.08-.30)	.14	.10 (-.10-.29)	.12
				MF-P v C	-.13 (-.31-.05)	.19	.02 (-.17-.21)	.03	.02 (-.18-.21)	.02
				MF v C	-.05 (-.22-.13)	.07	-.09 (-.28-.11)	.11	-.08 (-.28-.12)	.10
Aware EXT	$F(427.54) = 0.13$	$F(383.21) = 1.36$	$F(392.57) = 0.32$	MF-P v MF	.002 (-.20-.20)	.003	.04 (-.19-.27)	.04	-.04 (-.27-.19)	.04
				MF-P v C	.08 (-.13-.28)	.09	.03 (-.20-.25)	.03	-.01 (-.24-.23)	.01
				MF v C	.07 (-.13-.28)	.09	-.01 (-.25-.22)	.01	.03 (-.21-.27)	.04
Act Aware	$F(422.54) = 4.78^{**}$	$F(374.82) = 5.46^{**}$	$F(376.65) = 0.72$	MF-P v MF	-.06 (-.23-.12)	.08	-.03 (-.24-.18)	.03	.02 (-.20-.25)	.03
				MF-P v C	-.27** (-.45-.09)	.37	-.17 (-.38-.04)	.20	-.10 (-.32-.13)	.11
				MF v C	-.21* (-.40-.03)	.30	-.14 (-.36-.08)	.17	-.12 (-.35-.11)	.14
AccNJ	$F(455.78) = 1.29$	$F(384.27) = 0.08$	$F(385.37) = 0.87$	MF-P v MF	-.06 (-.23-.12)	.08	.03 (-.18-.23)	.03	.11 (-.10-.32)	.13
				MF-P v C	.04 (-.14-.22)	.06	.11 (-.10-.31)	.13	.16 (-.05-.37)	.19
				MF v C	.10 (-.08-.28)	.14	.08 (-.13-.29)	.10	.05 (-.17-.27)	.06
DecNR	$F(437.50) = 0.17$	$F(387.05) = 0.56$	$F(390.02) = 1.37$	MF-P v MF	-.10 (-.27-.07)	.14	.07 (-.13-.27)	.09	.004 (-.21-.22)	.01
				MF-P v C	.02 (-.16-.19)	.02	.004 (-.19-.20)	.01	.06 (-.16-.28)	.07

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				MF v C	.12	(-.06-.29)	.17	-.07	(-.27-.14)	.08	.06	(-.16-.28)	.06
Openness	$F(442.19) = 1.07$	$F(382.71) = 0.16$	$F(387.77) = 0.84$	MF-P v MF	.05	(-.15-.24)	.06	-.003	(-.22-.21)	.004	.02	(-.20-.23)	.02
				MF-P v C	.04	(-.16-.23)	.04	.16	(-.06-.37)	.19	.08	(-.14-.29)	.09
				MF v C	-.01	(-.21-.18)	.02	.16	(-.06-.39)	.18	.06	(-.16-.28)	.07
Relativity	$F(441.34) = 1.61$	$F(395.12) = 1.01$	$F(407.86) = 1.18$	MF-P v MF	-.12	(-.29-.05)	.17	.06	(-.15-.26)	.07	-.08	(-.28-.12)	.10
				MF-P v C	-.16	(-.34-.02)	.22	-.08	(-.28-.12)	.10	-.07	(-.27-.13)	.09
				MF v C	-.04	(-.21-.14)	.05	-.14	(-.35-.07)	.17	.01	(-.20-.22)	.01
Insight	$F(442.35) = 1.10$	$F(384.52) = 1.44$	$F(386.58) = 2.12$	MF-P v MF	-.12	(-.31-.07)	.15	.10	(-.13-.33)	.11	-.02	(-.26-.22)	.02
				MF-P v C	-.06	(-.25-.14)	.07	.21	(-.02-.43)	.23	.10	(-.14-.35)	.11
				MF v C	.06	(-.13-.25)	.08	.11	(-.13-.34)	.12	.13	(-.13-.38)	.13

Note. ES = Between-group Effect Size (Cohen's d); * $p < .05$ ** $p < .01$; MF-P = Mindfulness intervention with parental involvement; group; MF = Mindfulness intervention; C = Control group; Measures: Depression/Anxiety = DASS-21; Weight/shape concerns = Weight/shape subscales of the Eating Disorder Examination-Questionnaire; Wellbeing = Warwick Edinburgh Mental Wellbeing Scale; Mindfulness = Comprehensive Inventory of Mindfulness Experiences -Adolescents (CHIME-A). CHIME-A facets where abbreviated: Aware INT = Awareness of Internal Experiences; Aware EXT = Awareness of External Experiences; Act Aware = Acting with Awareness; AccNJ = Acceptance and non-judgement; DecNR = Decentering and non-reactivity.

Table 4. Frequency of Home Practice Compliance and Percentage of High Compliance in Mindfulness Intervention Groups

	During course (at post-intervention)				Since course (at 6 month follow-up)				Since course (at 12 month follow-up)			
	MF-P (N = 148)		MF (N = 156)		MF-P (N = 149)		MF (N = 128)		MF-P (N = 146)		MF (N = 136)	
	Mean (SD)	Percentage with high frequency ¹	Mean (SD)	Percentage with high frequency ¹	Mean (SD)	Percentage with high frequency ¹	Mean (SD)	Percentage with high frequency ¹	Mean (SD)	Percentage with high frequency ¹	Mean (SD)	Percentage with high frequency ¹
Mindfulness Practice												
Breath counting	2.80 (1.27)	33.6	2.69 (1.13)	27.6	2.06 (1.02)	9.6	2.07 (1.07)	12.6	2.03 (1.12)	9.6	1.90 (1.15)	9.2
.b ²	2.85 (1.32)	37.8	2.95 (1.34)	35.9	2.02 (1.04)	9.5	2.02 (1.07)	10.9	1.83 (.98)	4.3	1.83 (1.15)	11.0
Beditation ³	2.10 (1.15)	13.3	2.06 (1.09)	11.7	1.72 (.99)	7.3	1.81 (1.11)	10.9	1.71 (1.01)	5.2	1.61 (1.01)	5.5
FOFBOC ³	2.09 (1.16)	17.5	2.09 (1.15)	15.9	1.57 (.93)	7.3	1.55 (.84)	3.3	1.57 (.88)	3.5	1.46 (.94)	4.6
Everyday activities	2.61 (1.32)	26.6	2.70 (1.28)	27.6	2.10 (1.22)	15.4	2.19 (1.29)	18.5	1.99 (1.12)	11.3	2.04 (1.39)	19.3
Thought Traffic	2.23 (1.28)	17.5	2.38 (1.17)	18.6	1.83 (1.08)	11.0	1.88 (1.09)	11.0	1.77 (1.06)	7.8	1.71 (1.13)	9.2
Overall	2.45 (.91)	24.4	2.48 (.89)	22.9	1.88 (.83)	10.0	1.92 (.80)	11.2	1.82 (.79)	7.0	1.76 (.90)	9.8

Note. ¹undertook homework once a week or more ²Stop and be present - brief meditation ³Nine minute audio file guided body scan meditation; MF-P = Mindfulness intervention with parental involvement; group; MF = Mindfulness intervention

Table 5. Regression Analysis Showing the Extent to which Frequency of Home Practice Predicted Change on the Outcome Measures at Post Intervention, Six- and Twelve-month Follow-up

		Post Intervention (N = 304)			6 Month Follow-up (N = 277)			12 Month Follow-up (N = 282)		
		Model 1	Model 2	Home Practice ²	Model 1	Model 2	Home Practice	Model 1	Model 2	Home Practice
		Baseline DV ¹	Baseline DV		Baseline DV	Baseline DV		Baseline DV	Baseline DV	Home Practice
Depression	R^2	.42**			.36**			.26**		
	$R^2\Delta$			.004			.000			.00
	β	.65**	.64**	.07	.60**	.60**	.01	.51**	.51**	-.003
Anxiety	R^2	.46**			.40**			.25**		
	$R^2\Delta$			.00			.01			.002
	β	.68**	.68**	-.01	.63**	.62**	.09	.50**	.50**	.05
Weight/Shape concerns	R^2	.60**			.58**			.42**		
	$R^2\Delta$			.002			.01*			.00
	β	.77**	.77**	.05	.76**	.76**	.10*	.65**	.65**	.01
Wellbeing	R^2	.45**			.36**			.36**		
	$R^2\Delta$			.02**			.004			.01
	β	.67**	.66**	.16**	.60**	.60**	.07	.60**	.60**	.10
Mindfulness										
Aw INT	R^2	.22**			.16**			.11**		
	$R^2\Delta$			.06**			.05**			.01
	β	.47**	.42**	.25**	.40**	.40**	.22**	.32**	.31**	.11
Aw EXT	R^2	.27**			.21**			.17**		
	$R^2\Delta$			.06**			.06**			.02*
	β	.52**	.48**	.24**	.46**	.43**	.26**	.41**	.39**	.13*
Act Aw	R^2	.34**			.29**			.22**		
	$R^2\Delta$			.01			.00			.02*
	β	.59**	.59**	.07	.54**	.54**	.01	.46**	.46**	-.15**
AccNJ	R^2	.40**			.32**			.20**		
	$R^2\Delta$			.004			.02*			.01
	β	.64**	.63**	.06	.57**	.56**	.14*	.45**	.44**	.12
DecNR	R^2	.27**			.14**			.11**		
	$R^2\Delta$			.04**			.09**			.05**
	β	.52**	.46**	.20**	.38**	.35**	.31**	.34**	.32**	.22**
Openness	R^2	.15**			.13**			.10**		
	$R^2\Delta$			.01			.02*			.03*
	β	.39**	.39**	-.08	.35**	.35**	-.15*	.32**	.30**	-.16**
Relativity	R^2	.32**			.19**			.14**		
	$R^2\Delta$			.04**			.06**			.02*
	β	.57**	.53**	.21**	.43**	.42**	.25**	.37**	.36**	.14*
Insight	R^2	.38**			.25**			.27**		
	$R^2\Delta$			.03**			.07**			.03**
	β	.62**	.60**	.18**	.50**	.46**	.26**	.52**	.50**	.18**

Note: ¹Model 1 contains baseline measure of each outcome measure; ² Mean frequency of home practice; Depression/Anxiety = DASS-21; Weight/shape concerns = Weight/shape subscales of the Eating Disorder Examination-Questionnaire; Wellbeing = Warwick Edinburgh Mental Wellbeing Scale; Mindfulness = Comprehensive Inventory of Mindfulness Experiences -Adolescents (CHIME-A). CHIME-A facets where abbreviated: Aware INT = Awareness of Internal Experiences; Aware EXT = Awareness of External Experiences; Act Aware = Acting with Awareness; AccNJ = Acceptance and non-judgement; DecNR = Decentering and non-reactivity.

Highlights

- We investigated the .b mindfulness program for a second time in early adolescents
- We tightened adherence to the manualised curriculum
- Parental involvement was added in one arm of the RCT design
- We found no differences between the mindfulness groups with/without parental involvement and the control group
- Further research is required to identify optimal age and content of school-based mindfulness programs



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Conflict of Interest Policy

Manuscript number (if applicable): <i>N/A</i>	Author name:
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Declarations
Behaviour Research and Therapy requires that all authors sign a declaration of conflicting interests. If you have nothing to declare in any of these categories then this should be stated.

Conflict of Interest

Please declare any financial or personal interests that might be potentially viewed to influence the work presented. Interests could include consultancies, honoraria, patent ownership or other. If there are none state 'there are none'.

Please state any competing interests

There are none

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Signature (a scanned signature is acceptable, the signature should from the corresponding author)

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