The effects of mindfulness training on emotion regulation in Vietnamese pre-adolescents:

A SenseMaker study

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Declaration of Interest:

Dusana Dorjee received grants for her research on well-being and mindfulness in education. She co-directs a community interest company providing training in mindfulness courses for teachers, pupils and general public (including The Present course investigated in this study), she does not receive royalties from delivery of these courses. She has authored two monographs on the topics of well-being and meditation (she receives royalties from these).

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Abstract

This 3-arm randomised controlled study with training (TG), active (ACG) and passive (NIG) control groups examined the impact of an 18-week mindfulness curriculum delivered by schoolteachers on emotion regulation and well-being in Vietnamese pre-adolescents (7-11-year-olds). SenseMaker was employed as a new measure of mindfulness and emotion regulation, along with self-reports. The training was highly acceptable to pupils. No changes were detected in self-reports. In SenseMaker assessments, the TG showed increased awareness of emotions and decreased reactivity after the mindfulness training compared to ACG that received Social Emotional Learning training (no difference between TG and NIG was found). At 6-month follow-up, emotional non-reactivity and emotional expression increased in TG, but so did ignoring of emotions (possibly associated with letting go of emotions) together with decreased awareness of emotions compared to NIG. School-based mindfulness training may support emotion regulation via decreased emotional reactivity and increased emotional expression in Eastern cultural context.

Keywords: education, mindfulness, SenseMaker, emotion regulation, culture.

Introduction

Emotion regulation refers to the ability to modify how emotions are experienced and expressed (Gross, 2015). This ability lays foundations for socioemotional functioning, cognition development, and mental health (Howard & Williams, 2018) and rapidly develops during early childhood to adolescence (Thompson et al., 2008). Successful emotion regulation is associated with greater peer acceptance, better academic achievement, and even improved physical health (Blair et al., 2015; Howard & Williams, 2018), while dysregulation of emotions underlies both externalising and internalising behavioural problems in children (J. Kim & Cicchetti, 2009; Sheppes et al., 2015).

Pre-adolescence is a transitional period for children entering adolescence that is characterised by biological changes, peer and academic pressures (Casey & Caudle, 2013). Increasing difficulties in emotion regulation during this stage result in poorer school performance, higher risk of self-harm or suicidal ideas, and violence or property crime in adolescence (Howard & Williams, 2018). Enhanced emotion regulation in pre-adolescence, therefore, can protect from risks of psychopathology during adolescence (Belden et al., 2014; Legerstee et al., 2010).

Regulation of emotions can start at any stage in generative emotion process model, from situation selection to response modulation (Gross, 2015). The two most studied emotion regulation strategies are cognitive reappraisal and expressive suppression. Cognitive reappraisal modifies how emotional stimuli are perceived and how such emotions are experienced by reframing the meaning or self-relevance of the emotional stimuli before an emotion is fully activated, whilst, expressive suppression impacts the expression of a full-activated emotion (Gross, 2015). Both cognitive reappraisal and expressive suppression are cognitive control strategies that rely on a top-down brain pathway, employing pre-frontal

cortex (PFC) to down-regulate activation of amygdalae and other regions in the limbic system (Ochsner et al., 2012). However, due to the delayed development of PFC compared to limbic system maturation (Berger et al., 2007; Casey & Caudle, 2013), the use of these two strategies may not be fully efficient in pre-adolescents compared to adults (Belden et al., 2014; de Veld et al., 2012; Dougherty et al., 2015).

Increasing evidence suggests that mindfulness may be an adaptive emotion regulation strategy (Chambers et al., 2009; Keng et al., 2013). Mindfulness involves metacognitive awareness of present moment experiences with an attitude of acceptance (Dorjee, 2016; Shapiro et al., 2006). Mindfulness-based programmes cultivate skills of monitoring mental processes from moment to moment without elaboration or evaluation (Desbordes et al., 2012; Lindsay & Creswell, 2017). These skills support adaptive emotion regulation by enabling noticing of early emotional signals and non-reactive responding to them (Chambers et al., 2009; Dorjee, 2016; Teper et al., 2013) rather than modifying meaning of emotional stimuli or inhibiting behavioural responses (Chiesa, 2013). Employing mindfulness skills to regulate emotions, thus, could be more effective than cognitive reappraisal and expressive suppression due to less cognitive effort (Keng et al., 2013; Murakami et al., 2015). This is particularly relevant to pre-adolescents since PFC involved in meaning modification or behavioural inhibition develops until the age of 25 (Kaunhoven & Dorjee, 2017). Indeed, mindfulness-based programmes in school settings have been shown to enhance children's mental health and well-being (Dunning et al., 2019). Mindfulness training improved inhibition and emotion control abilities in pre-adolescents (Flook et al., 2010; Schonert-Reichl et al., 2015); it can significantly reduce elaborative thoughts and emotional arousal in stress responses (Mendelson et al., 2010; Schonert-Reichl et al., 2015) and impulsivity (Tarrasch, 2018).

However, recent research on effects of mindfulness training on emotion processing and regulation in pre-adolescents mainly used self-reports and informant-reports (Britton et al., 2014; Flook et al., 2010). Self-reports require accurate awareness of internal and external experiences; this is challenging for children whose metacognition is still developing (Goodman et al., 2017; Kaunhoven & Dorjee, 2017). Informant reports can also be subject to biases due to lack of blinding to group interventions (Flook et al., 2010).

An innovative research tool, SenseMaker (Kurtz & Snowden, 2003), collects data based on quantitative self-interpretation of participants' stories on a particular theme using pre-designed questions presented in the form of triads or dyads. This method can reduce bias of self-reports and informant-reports since it does not rely on participants' averaged interpretation of their own, or others, experiences over a certain period. Rather, SenseMaker relies on children's perspectives of concrete stories that may more accurately depict their real-life emotion processing and regulation. To date, no studies employed SenseMaker in investigating the effects of mindfulness training on emotion regulation in children.

In contrast to the fast-growing research interest in investigating the effects of mindfulness-based programmes with children and adolescents in Western countries, research on mindfulness training in Eastern cultural context is scarce (Lau & Hue, 2011). No studies on mindfulness with pre-adolescents have so far been conducted in Vietnam. More than half of Vietnamese population follows Buddhism. Vietnam also has a long history of ancestor worship and has been influenced by Confucianism, which values emotion control, and in particular, suppression of emotions (e.g., anger) interfering with group harmony (Le & Trieu, 2016) together with low positive arousal and balanced emotional experience. This cultural context seems aligned with mindfulness which cultivates non-reactivity to negative experiences and non-striving for pleasant experiences (Dorjee, 2010, 2016; Shapiro et al.,

2006). Mindful emotion regulation, therefore, can be considered consistent with Vietnamese cultural values which might enhance mindfulness training effects in Vietnamese pre-adolescent (Le & Trieu, 2016).

The current study aimed to investigate whether a mindfulness-based curriculum delivered by children's own schoolteachers is acceptable and promotes emotion regulation in pre-adolescents from grades 3 to 5 in the Vietnamese cultural context. We employed randomised controlled design with active control (social emotional learning – SEL) and non-intervention groups. Data was collected at 3-time points, before training (T1), after training (T2) and 6-month follow up after training completion (T3). We integrated SenseMaker together with traditional self-reports in the evaluations.

It was expected that mindfulness training would improve well-being and emotion regulation via enhancing awareness of emotions, thoughts, body sensations and increased emotional non-reactivity. Given that mindfulness encourages acceptance rather than inhibition of emotional responses, habitual use of expressive suppression was expected to decrease after mindfulness training. Mindfulness training could either reduce employment of cognitive reappraisal due to reliance on a less cognitively demanding emotion regulation strategy, or enable cognitive reappraisal as reported for mindfulness training effects in adults (Garland et al., 2015). Changes would be expected only in TG, particularly for non-reactivity assessed in SenseMaker, since this is the core quality developed in mindfulness training compared to SEL.

Method

Participants

The study was approved by Ethics committee in the School of Psychology at Bangor University. The Primary Education Section in Ho Chi Minh City Department of Education and

Training approved access to primary schools in Ho Chi Minh City. Four schools in Ho Chi Minh City selected by the Head of Primary Education Section were assigned randomly to either mindfulness training group (TG, $n = 2$ schools) or active control group (ACG, $n = 1$ school) or non-intervention group (NIG, $n = 1$ school). Within each school, headmasters of the schools selected classrooms based on children's age requirement and parents provided informed consents for their children's participation and their own participation. At each testing session, children received a small stationary item (e.g., a notebook, a pencil) for their participation.

Power analysis was conducted in G*Power software. Our goal was to obtain .95 power to detect a medium effect size of .40 at the standard .05 alpha error probability. The total sample size calculated was 164. Informed parental consent and informed pupil assent was obtained from 171 pre-adolescents (TG $n = 108$; ACG $n = 33$; NIG $n = 30$). At pre-test, five children withdrew during the testing session or did not complete the assessments. At post-test, one child withdrew, and three children moved to different schools. Since follow-up data was collected at the beginning of new school year in Vietnam, 36 children (TG $n = 36$) in 5th grade moved to secondary schools where they could not be tested, and one child (TG) did not complete assessments fully. Hence, complete pre-post evaluations (data set 1 – DS1) were obtained from 162 children ($n(\text{TG}) = 103$; $n(\text{ACG}) = 31$; $n(\text{NIG}) = 28$). For post-follow-up evaluations (data set 2 – DS2), data was obtained from 125 children ($n(\text{TG}) = 66$; $n(\text{ACG}) = 31$; $n(\text{NIG}) = 28$) (see Table 1 for demographics). In addition, one-hundred-twenty-two parents of participating children ($M \text{ Age} = 38.50$, $SD = 6.33$) participated as informants on cultural values.

To compare ages of children across groups, due to assumption of homogeneity of variance being violated in DS1 [$F(2,159) = 12.67$, $p < .001$], Brown-Forsythe F -ratio was used

and showed significant group differences in age [$F(2,121.91) = 3.30, p = .040$]. Children in NIG were significantly younger than those in TG [$t(129) = 2.49, p = .015, d = 0.41$] and ACG [$t(57) = 2.07, p = .043, d = 0.53$]. There were no age differences between TG and ACG ($p > .10$). For DS2, a one-way factorial analyses of variance (ANOVA) also found significant group differences in age [$F(2,122) = 4.78, p = .010$]. Children in ACG were significantly older than those in TG [$t(95) = -3.01, p = .003, d = 0.64$] and NIG [$t(57) = -2.07, p = .043, d = 0.53$]. There was no age difference between TG and NIG ($p > .10$). Chi-square test compared gender of children across groups and showed no gender differences in DS1 [$\chi^2(2, N=162) = 2.45, p = .293$] or DS2 [$\chi^2(2, N=125) = 1.92, p = .383$].

Table 1*Participant demographic information*

Demographic information	Pre-Post (DS1) (<i>N</i> = 162)			Post-Follow up (DS2) (<i>N</i> = 125)		
	TG (<i>n</i> = 103)	ACG (<i>n</i> = 31)	NIG (<i>n</i> = 28)	TG (<i>n</i> = 66)	ACG (<i>n</i> = 31)	NIG (<i>n</i> = 28)
Age (years)						
<i>M</i>	9.13	9.07	8.77	8.65	9.07	8.77
<i>SD</i>	0.94	0.56	0.57	0.69	0.56	0.57
<i>Range</i>	7.03 – 11.62	7.87 – 9.73	7.85 – 9.76	7.03 – 11.62	7.87 – 9.73	7.85 – 9.76
Gender (%)						
Female	52.4	61.3	67.9	53.0	61.3	67.9
Male	47.6	38.7	32.1	47.0	38.7	32.1

Note. TG = Training group. ACG = Active control group. NIG = Non-Intervention Group

Measures***SenseMaker***

Children self-interpreted their own stories about difficult situations at school and how they dealt with them using triads and dyads developed to assess mindfulness, emotion regulation and peer-relationships (see Triads and Dyads in Appendix). In the dyads, children responded by sliding a bubble between two opposite vectors. For example, the Dyad 1

question asked “How quickly do you react to your emotion?” with two extremes: “React straight away without thinking”, “I don’t react, I always pause”. Three dyads (Dyads 1, 4, and 5) assessed two main aspects of mindfulness: emotional non-reactivity (Dyad 1) and noticing in the present moment (noticing internal experience - Dyad 4, noticing outward surroundings - Dyad 5). Two additional dyads (Dyads 2 and 3) assessed cultural values related to emotion expression in Eastern cultures. The remaining five dyads (Dyads 6, 7, 8, 9 and 10) evaluated peer relationships but were not of interest in the current study which focused on emotion regulation and mindfulness (data was used in a cross-sectional study evaluating dispositional mindfulness effect at baseline only; manuscript is currently in preparation).

In the triads, children positioned their responses within a triangle with three corners designating three possible aspects of their experience. For example, in Triad 1, there were thoughts, emotions, and body sensations (feelings in my body) as possible responses (triangle corners) to the question “In my story, I noticed...”. Five triads (Triads 1, 2, 3, 4, and 5) assessed mindfulness as particular reactions to and noticing of own emotions, thoughts and body sensations. Triads 3 and 4 included corners designating cognitive reappraisal and expressive suppression to assess the use of these strategies in relation to mindfulness. Three more triads (Triads 6, 7, and 8) assessed cultural values related to emotion expression in Eastern cultures.

Three multiple choice questions about acceptability were included in SenseMaker and administered to children from TG and ACG after The Present curriculum and the SEL programme were delivered and at 6-month follow up. Participants rated how much they liked the curriculum/programme (ranging from ‘not at all’ to ‘very much’), how often they practised what they have learnt from the curriculum/programme at home (ranging from

‘never’ to ‘every day’), and whether they wish the curriculum/programme would continue to be delivered at school (ranging from ‘definitely no’ to ‘definitely yes’).

Self-report measures

A brief demographics questionnaire was completed at T1. Children completed four self-report questionnaires at T1, T2 and T3.

Emotion Expression Scale for Children (EESC; Penza-Clyve & Zeman, 2002) includes 16 items measuring poor awareness of emotions and reluctance in emotion expression. The EESC uses a 5-point Likert scale from 1 (not true) to 5 (very very true). The sum of items in each subscale is calculated. Lower scores indicate better emotion awareness and greater emotion expression. The Cronbach’s α are .83 for Poor Awareness and .81 for Expressive Reluctance for children from 9 to 12 years old (Penza-Clyve & Zeman, 2002).

Emotion Regulation Index for Children and Adolescents (ERICA; MacDermott et al., 2010) contains 16 items with 5-point Likert scale responses from 1 (strongly disagree) to 5 (strongly agree). The scale measures three key aspects of children’s emotion regulation (emotional control, emotional self-awareness and situational responsiveness). Higher scores indicate more adaptive or efficient emotion regulation (MacDermott et al., 2010). For primary school children, the measure has acceptable reliability with $\alpha = .75$ for the overall ERICA scale, and .73, .60 and .64 respectively, for Emotional Control, Emotional Self-Awareness and Situational Responsiveness subscales (MacDermott et al., 2010).

Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA; Gullone & Taffe, 2012) with 10 items evaluated cognitive reappraisal and expressive suppression, using 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate more habitual use of the corresponding strategy. For 10 to 12 year olds, $\alpha = .82$ and .69

respectively, have been reported for the Cognitive Reappraisal and Expressive Suppression subscales (Gullone & Taffe, 2012).

Positive and Negative Affect Schedule short version for children (PANAS-C-SF; Ebesutani et al., 2012), measured positive and negative affect with 5 items for each subscale using a 5-point Likert scale from 1 (very slightly or not at all) to 5 (extremely). The Positive Affect and Negative Affect subscales have high internal consistency, ($\alpha = .86$ and $.82$, respectively) (Ebesutani et al., 2012).

In addition to children's self-reports, parents completed demographics forms with information about their age, gender, job, salary, education level and religion, and the 36-item Asian Values Scale (AVS; B. S. K. Kim et al., 1999) to assess adherence to Asian culture values with a scale from 1 (strongly disagree) to 7 (strongly agree). Higher total score indicates more adherence to Asian cultural values. The scale is highly reliable ($\alpha = .82$) (B. S. K. Kim et al., 1999).

None of these scales has been validated in Vietnam and scale validation was out of scope for this study, therefore, translation-and-back-translation method was used. Difficult words or phrases were revised based on pilot results with five children, producing final Vietnamese versions for this study. This translation- and-back-translation method has been advised by World Health Organization (WHO) and applied in cross-cultural research (Kaljee et al., 2011; Lostutter et al., 2013).

Reliabilities of these measures at T1, T2 and T3 ranged from poor to acceptable, using Revelle's omega total (see Table 2). Because factor analysis revealed that loading of item 10 in poor awareness subscale of the EESC was negative $-.48$ on subgroup factor, item 10 was excluded from the subscale in further analyses. Due to poor internal consistency ($\omega_{RT} < .50$), Emotional Self-awareness (ERICA_ESA) and Situational Responsiveness (ERICA_SR)

subscales in ERICA, and Negative Affect (NA) subscale in PANAS were excluded from further analyses.

Table 2

Reliabilities of Emotion Regulation Scales at Pre-, Post- and Follow-up-test

Scale	ω_{RT}		
	Pre-test	Post-test	Follow-up test
EESC			
EESC_PA_No Item 10	.68	.73	.63
EESC_ER	.67	.65	.69
ERICA			
ERICA_Total	.73	.70	.75
ERICA_EC	.76	.80	.77
ERICA_ESA	.54	.41	N/a
ERICA_SR	.47	N/a	N/a
ERQ			
ERQ_CR	.55	.64	.63
ERQ_ES	.59	.59	.64
PANAS-C-SF			
PA	.73	.71	.79
NA	.60	.49	N/a

Note. ω_{RT} = Revelle's omega total. EESC = Emotion Expression Scale for Children. EESC_PA = Poor Awareness. EESC_ER = Expressive Reluctance. ERICA = Emotion Regulation Index for Children and Adolescents. ERICA_EC = Emotional Control. ERICA_ESA = Emotional Self-awareness. ERICA_SR = Situational Responsiveness. ERQ = Emotion Regulation Questionnaire for Children and Adolescents. ERQ_CR = Cognitive Reappraisal. ERQ_ES = Expressive Suppression. PANAS-C-SF = Positive and Negative Affect Schedule short version for Children. PA = Positive Affect. NA = Negative Affect. N/a = Not applicable

Mindfulness and well-being programme

The Present curriculum (Silverton, Dorjee & Sawyer, 2018) was developed as a spiral mindfulness and well-being programme for 3-11-year-olds, building on learning across the age groups. The curriculum covered seven themes: Here and Now, Focusing, Choosing, Connecting, Human Body, Human Mind, and Noticing Change with age-appropriate activities and practices and was delivered by pupils' own classroom teachers. Each theme in The Present was introduced for two weeks. When the next theme was introduced, the previous one(s) were continuously practised and merged with the current theme. Because of two 2-week breaks for school holidays during delivery time, schoolteachers required

extra four weeks to review all seven themes. Accordingly, the curriculum was delivered over 18 weeks, but the length from start to end was 22 weeks. Mindfulness practices and activities were integrated into the regular school curriculum. Children were instructed to do regular classroom activities (e.g., measuring, listening to music, writing) in a mindful way, together with age-specific mindfulness practices and neuroscience information (if possible) applied in everyday life scenarios for five to ten minutes each day. Activities and practices were flexibly delivered to suit classroom contexts. To ensure fidelity of the curriculum delivery, a research team member visited classrooms to observe activities being implemented. Photos and videos were taken during the visits. Schoolteachers attended a mindfulness course (adapted Mindfulness-Based Stress Reduction for the workplace) over two consecutive weekends (8 sessions, 3 hours in length for each) and were given six months to develop a regular mindfulness practice before they received three full days of The Present curriculum training. The Present was delivered to whole classrooms but participation in research was optional.

Active control condition

To identify effects specific to mindfulness training, ACG received Social Emotional Learning (SEL) programme without any mindfulness components within the same time frame as The Present - over 18 weeks (with two 2-week breaks in between as TG, 22 weeks from start to end). SEL was delivered by external trainers as an additional subject within regular school curriculum. The programme included seven topics: self-awareness, emotional management, empathy and sharing, communication, teamwork, decision-making and self-protection from sexual harassment. Each skill was delivered for two weeks, 40 minutes on a particular day each week and reviewed together with the next skill delivered the following two weeks. Last four weeks were used to review all seven topics. External trainers for the

SEL program were graduate educational psychology students who had experience in teaching social emotional skills to children for at least two years but no experience in mindfulness practice. SEL training was delivered to whole classrooms but participation in research was optional.

Design and Procedure

This study followed a randomised controlled longitudinal design with TG, ACG and NIG. The TG received The Present curriculum over 18 weeks while the ACG received the SEL program delivered by external trainers over 18 weeks. The NIG followed regular school curriculum without extra wellbeing interventions. Data collection sessions were conducted with children in TG first, then ACG and lastly NIG; this principle was applied all data collection points to ensure the same time gap between testing sessions across groups. The testing sessions were conducted individually on school premises in small rooms designated for testing. Participants completed SenseMaker assessments first, then self-report measures under research assistant's supervision. Each testing session took approximately half an hour per participant (a subsample of children participated in additional ERP experiments reported elsewhere; manuscript is currently in preparation).

Data analysis

Missing values (<5%) were replaced using expectation maximization method. Extreme outliers (>3 x interquartile range) were winsorised before analysis. Due to significant group differences in age, age was corrected for all outcome variables via simple linear regression with age as an independent variable, then resulting standardised residuals were used as new outcome variables for further analyses (Böhning et al., 2016).

Baseline group differences were assessed using mixed factorial ANOVAs with corner (a, b, and c) of each triad as within-subject factor and group (TG, ACG and NIG) as between-

subject factor. One-way ANOVAs were conducted for Dyads 1, 4 and 5 in SenseMaker and for all self-report measures. Where significant group differences were found at baseline, difference scores were derived by subtracting post-test scores from pre-test scores ($T2 - T1$), and follow-up from post-test ($T3 - T2$) and used in longitudinal analyses.

Changes over time were analysed using mixed factorial ANOVAs with 3(corner: a, b, c) x 2(time: T1, T2 or T2, T3) x 3(group: TG, ACG, NIG) design for each triad. Same mixed factorial ANOVAs without factor of time were applied for difference scores of triads with significant group differences at baseline. Changes in dyads and self-reports were analysed using mixed factorial ANOVAs with factors of 2(time: T1, T2 or T2, T3) x 3(group: TG, ACG, NIG). One-way ANOVAs were applied for difference scores of dyads and self-reports with significant group differences at baseline. Partial eta squared (η_p^2) provided an estimate of effect size. When the assumption of Sphericity was violated (Mauchley's Sphericity test, $p < .05$), Greenhouse-Geisser (G-G) correction was applied. Changes in measures over time across groups were of interest in this study, therefore, significant interaction effects of time with other factors took priority in reporting findings and were followed up by pairwise comparisons with Bonferroni corrected p -values, Cohens' d estimated effect sizes.

Results

Acceptability results

82.6% of participants liked The Present, 47.6% said they liked it very much; 1% did not like it at all. 93.2% of participants would like to continue learning The Present at school, 1.9% did not want to continue with The Present at school. 18.4% of participants reported practising mindfulness at home every day, 36.9 % practised few times a week and 9.7% practised few times a month. At T3, 56.1% of children reported they still practised mindfulness at home, ranging from every day to few times a month.

In ACG, 87.1% of participants liked the SEL - 64.5% liked it very much and 100% of participants would like to continue learning SEL skills at school. 32.3% of participants reported practising SEL skills every day, 35.5 % practised few times a week and 9.7% practised few times a month. At T3, 71% of participants reported continuing practising SEL skills, ranging from every day to few times a month.

Baseline comparisons

Mixed factorial ANOVAs with 3(corner: a, b, c) x 3(group: TG, ACG, NIG) assessed baseline differences for triads showed significant group x corner interactions in Triad 2 – Responses to emotions [$F(4,318) = 2.46, p = .046, \eta_p^2 = .030$] and Triad 5 – Responses to body sensations [$F(4,318) = 2.41, p = .050, \eta_p^2 = .029$]. Pairwise comparisons revealed that reacting to emotions (Triad2c) in TG was significantly higher than ACG ($p = .025, d = 0.58$). Reacting to body sensations (Triad5a) in NIG was significantly lower than both TG ($p = .033, d = 0.59$) and ACG ($p = .046, d = 0.74$). However, noticing body sensations (Triad5c) in NIG tended to be higher than both in TG ($p = .055, d = 0.49$) and ACG ($p = .057, d = 0.63$). There were no significant group differences in the remaining triads ($ps > .10$).

One-way ANOVA compared group differences at baseline for Dyads 1, 4 and 5, and all emotion regulation and well-being questionnaires. There were no significant group differences ($ps > .10$).

Based on baseline assessment findings, longitudinal analyses for Triads 2 and 5 were conducted on their difference scores.

Longitudinal changes in SenseMaker

Dyads: Mixed factorial ANOVAs with 2(time: T1, T2 or T2, T3) x 3(group: TG, ACG, NIG) for the three dyad indicators of mindfulness (Dyad 1 – Emotional non-reactivity, Dyad 4 – Noticing internal experiences and Dyad 5 – Noticing external experiences) showed

changes only in Dyad 1. For Dyad 1, time x group interaction was marginally significant in DS1 [$F(2,159) = 2.86, p = .060, \eta_p^2 = .035$] but significant in DS2 [$F(2,122) = 3.32, p = .039, \eta_p^2 = .052$]. Pairwise comparisons revealed that changes in Dyad 1 were observed only within group. Children in TG reported no change in emotional non-reactivity from T1 to T2 but they showed an increase trend in emotional non-reactivity from T2 to T3 ($p = .093, d = 0.27$). Children in ACG reported significantly more emotional non-reactivity at T2 relative to T1 ($p = .034, d = 0.48$), but from T2 to T3, their emotional non-reactivity tended to decrease ($p = .071, d = 0.44$). NIG showed no changes in Dyad 1 over time ($ps > .10$). See Figure 1. All remaining main effects were no-significant in both data sets ($ps > .10$). For Dyads 4 and 5, no significant main effects interaction effects were found in both data sets ($ps > .10$).

Figure 1.

Changes in Dyad 1 – Emotional non-reactivity over time. A) Changes within ACG from T1 to T2. B) Changes within TG and ACG from T2 to T3.

Note. Solid line = * $p < .05$. Dashed line = * $.05 < p < .10$

Triads: Mixed factorial ANOVAs with 2(time: T1, T2 or T2, T3) x 3(corner: a, b, c) x

3(group: TG, ACG, NIG) assessed longitudinal changes in Triad 1 – Noticing experience, Triad

3 – Responses to thoughts and Triad 4 – Expressive behaviours. They showed changes only in Triad 4 in DS2. For Triad 4, interactions of time x group [$F(2,122) = 4.53, p = .013, \eta_p^2 = .069$] and time x corner x group [$F(4,244) = 2.74, p = .030, \eta_p^2 = .043$] were significant in DS2. Pairwise comparisons showed that general scores of Triad 4 were marginally lower at T2 than T3 for TG ($p = .056$) but significantly higher at T2 than T3 for NIG ($p = .030$). The time x corner x group interaction was traced to Triad4a – expression of emotions by specific behaviours, such as crying, smiling or speaking out. Children in TG reported more of these expressive behaviours at T3 than T2 ($p = .041, d = 0.35$), while children in NIG expressed emotions via such behaviours less at T3 than T2 ($p = .028, d = 0.58$). The difference between TG and NIG in Triad4a was marginally significant at T3 ($p = .083, d = 0.53$); there were no group differences at T2 ($ps > .10$). See Figures 2, 3. All remaining main effects were not significant in both data sets ($ps > .10$).

Figure 2

Changes in Triad4a – Expression of emotion via behaviours, such crying, smiling or speaking out between TG and NIG, and within TG from T2 to T3

Note. Solid line = * $p < .05$. Dashed line = * $.05 < p < .10$

Figure 3

Changes in Triad 4 – Expression of emotion via behaviours – crying, smiling, speaking out within groups over time. A) Training group. B) Non-intervention Group.

Note. Solid line = * $p < .05$. Dashed line = * $.05 < p < .10$. Bottom left = Corner a: Crying, smiling, speaking... Top = Corner b: Doing something to change the situation. Bottom right = Corner c: Taking a pause and deep breath.

Mixed factorial ANOVAs with 3(corner: a, b, c) x 3(group: TG, ACG, NIG) for difference scores of Triad 2 – Responses to emotions and Triad 5 – Responses to body sensations showed significant corner x group interactions for Triad 2 in DS1 [$F(3.84, 305.48) = 2.61, p = .038, \eta_p^2 = .032$] and DS2 [$F(4, 244) = 3.95, p = .004, \eta_p^2 = .061$]. In DS1, pairwise comparisons showed significant differences between TG and ACG, children in TG after mindfulness training indicated an increase in awareness of emotions (Triad2b; $p = .042, d = 0.55$) and a decrease in reacting to emotions (Triad2c; $p = .021, d = 0.59$) compared to those in ACG. Within ACG, children had a tendency to be more reactive (Triad2c) than being aware of emotions (Triad2b) ($p = .067, d = 0.87$) while no changes were found within TG ($ps > .10$). In DS2, pairwise comparison revealed significant differences between TG and NIG at 6-

month follow up, children in TG increased in ignoring emotions (Triad2a; $p = .037$, $d = 0.57$) and decreased in awareness of emotions (Triad2b; $p = .010$, $d = 0.66$) compared to NIG. Also, children in NIG were more aware of emotions (Triad2b) than ignoring them (Triad2a) ($p = .032$, $d = 0.86$), while there were no changes within TG ($ps > .10$). See Figures 4, 5. No main effects were significant in both data sets ($ps > .10$). For Triad 5, there were no significant main or interaction effects in both data sets ($ps > .10$).

Figure 4

Changes in Triad 2 – Responses to emotions over time. A) Changes in Triad2b, Triad2c between TG and ACG, and within ACG, from T1 to T2. B) Changes in Triad2a, Triad2b between TG and NIG, and within NIG, from T2 to T3.

Note. Solid line = * $p < .05$. Dashed line = * $.05 < p < .10$

Figure 5

Changes in Triad 2 – Responses to emotions within groups over time. A) Training group. B) Active Control Group. C) Passive Control Group.

Note. Solid line = * $p < .05$. Dashed line = * $.05 < p < .10$. Bottom left = Corner a: Ignoring emotion. Top = Corner b: Being aware of emotion. Bottom right = Corner c: Reacting to emotion.

Longitudinal changes in self-reports

Mixed factorial ANOVAs with 2(time: T1, T2 or T2, T3) x 3(group: TG, ACG, NIG)

factors for Poor Emotional Self-Awareness, Expressive Reluctance, Emotion Regulation

Indexes, Emotional Control, Cognitive Reappraisal, Expressive Suppression, and Positive

Affect subscales showed no significant main effects and no significant time x group interaction effects in both data sets. The time x group interaction for ERICA total – Emotion Regulation Index was marginally significant in DS1 [$F(2,159) = 2.64, p = .074, \eta_p^2 = .032$] but pairwise comparison did not show any significant or marginally significant effects ($ps > .10$).

Correlation between cultural values and longitudinal changes in SenseMaker

This analysis explored possible links between cultural values and longitudinal changes in mindful emotion regulation. Pearson correlations were conducted between Triads 6, 7, 8, Dyads 2, 3 at baseline and changes in Dyad 1, Triad2b, Triad2c at T2, and Dyad 1, Triad2a, Triad2b, Triad4a at T3. For DS1, no correlations were significant after Bonferroni correction at $.05/33 = .002$ ($ps > .002$). Similarly, for DS2, no correlations were significant after Bonferroni correction at $.05/44 = .001$ ($ps > .001$).

Pearson correlations were also conducted between AVS reported by parents at baseline and changes in Dyad 1, Triad2b, Triad2c at T2, and Dyad 1, Triad2a, Triad2b, Triad4a at T3. For DS1, no correlations were significant ($ps > .05$). For DS2, after Bonferroni correction at $.05/4 = .013$, positive correlation between AVS and changes in Triad4a was significant only in TG, children of parents who adhered more to Asian values showed greater increase in expression of emotions via behaviours (Triad4a) at T3 [$r(47) = .37, p = .009$]. A simple regression to test if Asian values predicted changes in Triad4a indicated that the model explained 13.7% variance of changes in Triad4a from T2 to T3 [$F(1,47) = 7.44, p = .009, R^2 = .137$], Asian values significantly predicted changes in Triad4a from T2 to T3 [$b_0 = -4.54, b = .031, SE b = .012, t = 2.73, p = .009$].

Discussion

This randomised controlled study investigated effects of a mindfulness and well-being curriculum delivered by children's own schoolteachers on emotion regulation in

Vietnamese pre-adolescents. The mindfulness curriculum was highly acceptable as reported by pupils – over four fifths of them liked the curriculum and wished to continue practising it in schools in the future.

Improvements in emotion regulation and well-being were expected for children in TG after completion of mindfulness training compared to ACG who received SEL training and NIG (no intervention). No changes were found in self-reports, but significant effects were found in SenseMaker assessments. The TG showed no changes in Dyad 1 – Emotional non-reactivity after mindfulness training followed by a marginal increase in non-reactivity at 6-month follow up with a small effect size; the ACG showed an increase in non-reactivity after receiving SEL and a marginal decrease in non-reactivity at 6-month follow up with a medium effect size; no changes in non-reactivity were found in NIG.

For mindful emotion regulation, as expected, difference scores in SenseMaker, Triad 2 – Responses to emotions showed increased awareness of emotions and a reduction in reacting to emotions in TG after mindfulness training compared to ACG. However, at 6-month follow up, the TG showed increased ignoring of emotions and decreased awareness of emotions compared to NIG which showed the opposite pattern. Within TG, there were no significant changes from pre to post-test and from post-test to follow up. The ACG showed a marginal shift toward more reacting than being aware of emotions after receiving SEL training. Changes in responses to emotions between groups showed medium effect sizes and within groups large effect sizes. The TG also showed more expressive behaviours (Triad4a) at 6-month follow up - compared to NIG with a medium effect size; increases in these behaviours between completion of mindfulness training and 6-month follow up were observed in TG with a small effect size, while the NIG showed the opposite pattern with a medium effect size.

To our knowledge, this study was one of few studies on the impact of universal school-based mindfulness training in Eastern cultural context and the first quantitative study of this type in Vietnam. The high acceptability rates of The Present curriculum in this study are in line with a previous study conducted with handicapped and at-risk youth in Vietnam (Le & Trieu, 2016) and previous studies in Western culture, where the curricula were delivered by children's own schoolteachers (Britton et al., 2014; Vickery & Dorjee, 2016). This study successfully replicated the mindfulness training implementation model from other school-based studies conducted in the West (Sanger et al., 2018), where schoolteachers received MBSR training first and had at least six months to practise mindfulness before being trained to deliver the mindfulness curriculum. These results suggest that mindfulness curricula delivered by schoolteachers with sufficient experiential training in mindfulness to pre-adolescent in primary schools could be implemented successfully in Vietnamese school settings.

The lack of effects on emotion regulation and well-being assessed by self-reports in this study further confirms that questionnaires assessing emotion regulation in children are often not sensitive enough to capture changes in emotion regulation processes, such as emotional awareness, emotional control or changes resulting from mindfulness training (Dennis, 2010; Kaunhoven & Dorjee, 2017). Previous studies on impact of mindfulness on emotion regulation and well-being in the West also did not find effects on emotion awareness and expression using same measures (Vickery & Dorjee, 2016). In the current study, the lack of self-report effects could also be due to the reliabilities of scales ranging from acceptable to medium while in previous studies they were medium or better.

Although no changes in habitual use of emotion regulation strategies, such as reappraisal or suppression, were found directly, behaviours expressing emotions increased

in TG. Whilst this is a positive finding, since greater emotion expression has been linked to greater ability to acknowledge and identify experienced emotions and resilience (Burton & Bonanno, 2016), it raises an interesting question whether increased emotional expression would be contradictory to Asian culture's expectations about suppressing emotions to maintain harmony in relationships. We found that a greater increase in children's expressive behaviours in TG linked to more adherence to Asian values in parents, Asian values predicted greater increase in expressive behaviours. Hence, Asian cultural values appear to support the positive effect of mindfulness training on enhanced emotional expression in children.

The finding that at T2 children in TG were more aware of their emotions and less reactive to emotions than children in ACG suggests that mindfulness training and SEL impact on emotional responsiveness differently. The mindfulness training seemed to have modified the core of its mechanisms, noticing or awareness of emotions without reacting. In contrast, children in ACG became more reactive compared to being aware of emotions in emotional situations; this can imply that mindfulness protected children from overacting to emotions which links to anxiety in children (Carthy et al., 2010) and predicts psychological problems in adolescents (Shapiro & Steinberg, 2013).

The dyad assessment of non-reactivity may have tapped into a different aspect of this mindfulness mechanism. In these assessments, TG did not show change right after mindfulness training but showed a tendency of increase at 6-month follow up. This may suggest that mindfulness training may take time to impact non-reactivity, which is consistent with evidence of the effect of mindfulness depending on the amount of time spent practising in research with adults (Taylor et al., 2011) and adolescents (Huppert & Johnson, 2010). Interestingly, at 6-month follow-up, TG showed more ignoring of emotions

and less awareness of emotions compared to NIG. This could be due to increased awareness of emotions resulting from mindfulness practice as reported in adult literature (Hargus et al., 2010). Taken together with the increase in non-reactivity, the increased ignoring of emotions in this case could be explained by letting go of negative emotions in emotional situations. This is further supported by the increase in expressive behaviours at follow-up in TG.

Although children in ACG showed an increase in non-reactivity in dyad assessments after SEL training, this non-reactivity change was not higher than in TG. Still, the ACG showed a tendency of less awareness of emotions and more reacting to emotion compared to TG, suggesting that the increase in non-reactivity was not large enough to override other responses to emotions. The pattern of less awareness of emotions and more reacting in ACG after SEL training was continuous up to 6-month follow up whilst emotional non-reactivity showed a decrease trend, suggesting (in line with previous research) that the change to more non-reactivity after SEL training in ACG was not stable (Schlesier et al., 2019).

Not as expected, children in NIG increased in emotional awareness and showed a reduction in ignoring emotions at 6-month follow up. It is possible that these changes reflect a developmental trajectory in emotion processing or a protective role of Asian culture in which emotional control, harmony relationship and emotional experience balance are highly valued (Tsai et al., 2007). Further research on the impact of cultural context on developmental emotion processing and regulation trajectories is needed.

This study has several limitations. The translation-and-back-translation of self-reports from English to Vietnamese could have impacted on internal reliabilities of these measures. Validated measures should be developed for further research. Another limitation

is that the SEL for ACG was delivered by external trainers in fixed sessions every week whereas mindfulness training was delivered by pupils' own schoolteachers. This difference could have impacted on the results (Carsley et al., 2018).

Conclusion

This is the first study to investigate the acceptability and effects of a mindfulness curriculum on emotion regulation in Vietnamese children and to use the SenseMaker methodology for gaining more comprehensive understanding of such effects from a cross-cultural perspective. The findings supported acceptability of school-based mindfulness training delivery in an Eastern culture and support employment of the SenseMaker approach in future research. The mindfulness training seems to have supported adaptive emotion regulation in children via increased emotional non-reactivity together with a trend of letting go of emotions and more emotional expression, as assessed by the SenseMaker. However, the study did not detect any effects of mindfulness training on emotion regulation and well-being measured by self-reports. This highlights the potential of using SenseMaker in detecting intervention effects in developmental research on mindfulness and emotion regulation.

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Appendix

Example of SenseMaker

Participant code:

Pre

Post

Follow up

Introductory / Explanatory Paragraphs of Text

When you are experiencing something a little bit difficult, what do you do/how do you deal with it? Can you give me an example?

NB. Any component / element in this template is optional / customisable / configurable and are only given as a range of possible options. All instructions can be re-written to any level of detail required. Any text contained in this document are for demonstration purposes only; they may be replicated for your unique use but are not meant to be definitive for your project.

Please share your story (audio recording)

Please give your story a title

--

Place a bubble in each triangle to a position that best describes your story. The closer the bubble is to each corner, the stronger the corner describes your experience.

For example, a mug of bubble tea includes milk tea, pearls, and ice cubes. When you have a mug of bubble tea, which ingredient would you prefer to have more than others, milk tea, or pearls, or ice cubes?

When you have a mug of bubble tea, which ingredients would you prefer to have more than others, milk tea, or pearls, or ice cubes?

N / A ☐

Now we start! Remember the closer the bubble is to each corner, the stronger the corner describes your experience.

1. In my story, I noticed my...

2. In my story, when I experienced emotions...

3. In my story, when I thought about my emotions (feelings)

4. In my story, with regard to my responses,

5. In my story, with regard to my body sensations,

6. In my story, I feel comfortable to show my emotions with

7. In my story, I hid my emotions because

8. The first person I would like to tell/share my story with is

Place a bubble along the scale towards the description that best fits your experience. The closer the bubble is to each side, the stronger the side describes your experience

1. Overall, how quickly do you react to your emotions?

React straight away without thinking

I don't react, I always pause

N/A ☐

2. How often do you show your emotions?

I never show my emotions

I always show my emotions

N/A ☐

3. How do you hide your emotions?

I mask or conceal the emotion I am experiencing with a different one

I keep my expression face neutral as much as I can

N/A ☐

4. To what extent do you notice your experience and what is happening in your own feelings, thoughts and body sensations when you are in emotional situation?

I do not notice what is happening in my own feelings, thoughts, body sensations at all

I notice what is happening in my own feelings, thoughts, body sensations very much

N/A ☐

5. To what extent do you notice what is happening around you when you are in emotional situation?

I do not notice what is happening around me and people around me react at all

I notice what is happening around me and people around me react very much

N/A ☐

We continues... Remember the closer the bubble is to each side, the stronger the side describes your experience

6. How easy is it for you to share toys or stationery with your classmates?

It is not easy for me to share toys/stationery with my classmates

It is very easy for me to share toys/stationery with my classmates

N/A ☐

7. How easy is it for you to find/make friend(s) with peers at school?

It is very difficult for me to find or make friend with peers at school

It is very easy for me to find or make friend with peers at school

N/A ☐

8. How do you get along with other children at school?

I do not get along at all with other children at school

I get along very well with other children at school

N/A ☐

9. What do you often do in break times at school?

I often play alone during break times

I often play games with other children during break time

N/A ☐

10. Are there any other children who like to play with you at school?

There are not any children who like to play with me at school

There are many children who like to play with me at school

N/A ☐

Some multiple-choice questions about your new learning activities at schools.

N/A ☐

Is there any new activity in your school? What is it?

☐	No
☐	Yes
☐	Mindfulness
☐	Emotion and social skills

Do you like that new activity in school?

☐	Not at all
☐	Mostly not
☐	Mostly yes
☐	Very much

Do you want to continue learning emotion and social skills/ practice mindfulness?

☐	Definitely no
☐	Mostly not
☐	Mostly yes
☐	Definitely yes

How often do you practice emotion and social skills outside classroom/ practice mindfulness at home?

☐	Never
☐	Few times a month
☐	Few times a week
☐	Every day

Some multiple-choice questions about yourself.

What is your first language?

☐	Vietnamese
☐	English
☐	Other

What is your age?

☐	8
☐	9
☐	10
☐	11
☐	12

Are you:

☐	Boy
☐	Girl
☐	Prefer not to say

Notes for researchers (Children group and time point):

☐	TG
☐	ACG
☐	NIG

☐	Pre-test
☐	Post-test
☐	Follow-up