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ORIGINAL PAPER

Effectiveness of the Mindfulness-Based *OpenMind-Korea* (OM-K) Preschool Program

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Abstract

Objectives Preschool years provide a window of opportunity to enhance attentional flexibility, increase inhibitory control, build resilience, and strengthen emotion regulation in children. We assessed the effectiveness of a mindfulness-based social-emotional learning program—*OpenMind-Korea* (OM-K)—on preschool children's emotion regulation, resilience, and prosocial behaviors.

Method In a two-arm randomized controlled trial, two of four preschools were randomly assigned to the intervention condition and two to the control condition. The teachers in the intervention condition implemented the OM-K program ($n = 42$ children), and the teachers in the control condition provided instruction as usual ($n = 41$ children).

Results At baseline (pre-intervention), the children in the control condition were rated as being significantly better on all outcome variables than those in the intervention condition. Although children in the intervention condition improved on all outcome variables, the children in the control condition continued to be rated higher on all outcome variables at the first post-intervention assessment. However, the children in the intervention condition were rated with significantly higher scores than the children in the control condition at the second and third post-intervention assessments. The children in the intervention condition were rated with significantly higher scores on lability/negativity, resilience, and prosocial behaviors. Although the ratings for adaptive regulation were higher for the children in the intervention condition than those in the control condition, the ratings did not reach statistical significance.

Conclusions This study suggests that implementing the OM-K program in preschools may enhance the children's emotion regulation (adaptive regulation, lability/negativity), resilience, and prosocial behavior (helping, sharing, cooperation, and comfort to others).

Keywords OpenMind-Korea · Social-emotional learning · Preschool · Mindfulness · Emotion regulation

In terms of neural plasticity, early childhood is an important developmental period during which children learn self-regulation skills (Fjell et al. 2012; Posner and Rothbart 2009). Self-regulation refers to the child's volitional control of attention, thoughts, emotions, and action. Increasing demands are placed on preschool children's self-regulation and social skills as they transition to kindergarten (Rimm-Kaufman et al. 2000). Preschool children who have inadequate self-regulation skills are at risk for low academic engagement, poor academic outcomes, and peer rejection (Blair 2002; Ladd et al. 2006), and behavioral difficulties (Raver et al. 2009). Given that preschool years are a period when specific brain regions are particularly modifiable, it offers a window of opportunity to provide enrichment and training that enhance attentional flexibility, inhibitory control, and effective emotional regulation when faced with adverse events or situations (Dickinson et al. 2006; Ursache et al. 2012).

A number of preschool programs have been developed that focus on specific aspects of self-regulation. For example, the Research-Based Developmentally Informed (REDI) Head Start program (Bierman et al. 2008a, b) includes language

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and emergent literacy instruction as well as social-emotional skills (emotional regulation and self-awareness) from the PATHS curriculum (Domitrovich et al. 2007). The Chicago School Readiness Project (CSRP; Raver et al. 2009) was developed to enhance preschool children's school readiness by focusing on emotional and behavioral self-regulation skills (Raver et al. 2011). The Tools of the Mind curriculum (Tools; Bodrova and Leong 2007) specifically focuses on the development of children's executive function in an effort to enhance their learning and engagement (Diamond et al. 2007). Each of these programs share a common focus in that they endeavor to provide a predictable classroom structure which promotes self-directed learning by the children. Overall, these three programs have demonstrated increased self-regulation and school readiness and two of these programs (i.e., REDI and CSRP) have reported enhanced academic achievements in preschool children.

Social-emotional learning (SEL) programs that foster self-regulation provide another approach to primary prevention in preschool and kindergarten children (Zins et al. 2004). These programs focus on enhancing the "students' capacity to integrate skills, attitudes, and behaviors to deal effectively and ethically with daily tasks and challenges" (Collaborative for Academic, Social and Emotional Learning [CASEL] 2017). Generally, SEL programs include these five competencies: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (Collaborative for Academic, Social and Emotional Learning 2013). Teachers using SEL programs are emotionally supportive of the children and use positive strategies to deal with their behavioral challenges, thereby establishing a positive learning climate in their classrooms (Cohen 2006). Meta-analytic reviews of outcome research suggest that SEL programs are generally more effective than control classrooms across a large number of student variables, including social and emotional skills, positive social behaviors, attitudes toward self and others, and improved academic performance as well as decreased antisocial behavior (Durlak et al. 2011; Sklad et al. 2012).

In addition to enhancing students' academic performance and resilience through self-regulation, primary prevention programs have also focused on challenging behaviors and childhood affective disorders (Semple et al. 2017). These programs focus on developing mindfulness skills because of their purported protective effects on children's mental health, as well as boosting their social and emotional well-being (Carsley et al. 2018; Weare 2015). Mindfulness in this context is "the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience" (Kabat-Zinn 2003, p. 145). As noted by Felver et al. (2013, p. 537), "pairing SEL programs with mindfulness technology is a natural fit," because mindfulness overlaps with key aspects of SEL, such as emotion awareness and regulation (Weare 2013). A common way of doing this is to systematically incorporate mindfulness-based practices within an existing SEL program, such as the Strong Kids (Merrell et al. 2007a, b) and Strong Teens (Merrell et al. 2007c) curricula (Gueldner and Feuerborn 2016). While most of these integrated programs are for children and adolescents in grade school (Feuerborn and Gueldner 2019), a few programs have been designed specifically for preschool and kindergarten children for which outcome data are available (e.g., Flook et al. 2010; Jackman et al. 2019; Lim and Qu 2017; Moreno-Gómez and Cejudo 2019; Poehlmann-Tynan et al. 2016).

The OpenMind (OM) program for preschool children combines mindfulness-based practices with SEL competencies (Jackman et al. 2019). The program includes a series of mindfulness-based practices taught both in a bottom-up format (e.g., by daily practice of foundational activities, such as meditation) and a top-down format (e.g., during play, transitions, work time, social interactions). The activities are aligned with the developmental level and interests of 3- to 5-year-old children. The program is meant to be integrated with any standard preschool curriculum. An initial evaluation indicated the OM program is feasible as an adjunctive program can be easily integrated with an existing preschool curriculum and acceptable to the preschool teachers who implemented the program (Jackman et al. 2019). Preliminary outcome evaluation indicated perceived benefits to the children that included increases in self-regulation, inhibitory control, body and emotional awareness, self-calming behaviors, and empathy and awareness of feelings of others (Jackman et al. 2019).

The OpenMind-Korea (OM-K) program is a culturally adapted version of the OM program (Jackman et al. 2017). Following implementation in three Korean preschools, teachers rated the program highly in terms of acceptability and feasibility of implementation at their schools (Kim et al. 2019a). Furthermore, parents of the children in one of the preschools implementing the OM-K program rated the social validity of the program as being simple to use, acceptable, effective, and without unintended adverse effects (Kim et al. 2019b). The aim of the present study was to evaluate the effectiveness of the OM-K program with 3- to 5-year-old children in a randomized controlled trial in Korean preschools. We hypothesized that preschool children in the intervention group participating in the OM-K program would have significantly enhanced emotional regulation, resilience, and prosocial behaviors when compared to the children in the control group.

Method

Participants

We invited local preschool principals to implement a mindfulness-based SEL program in their preschools. Four

preschools were included in the present study. The parents and teachers at these preschools were fully informed about the program, and all provided written consent for participation. Two preschools were randomly assigned to the intervention group (Preschool A and Preschool B) and the other two to the control group (Preschool C and Preschool D). All students aged 3 years in March 2017 were enrolled in the study. There were 42 children in the intervention group and 41 children in the control group. The intervention group had 18 boys (42.9%) and 24 girls (57.1%), while the control group had 27 boys (65.9%) and 14 girls (34.1%). Table 1 presents further demographics on the teachers and preschool children in both groups during the period of the study.

We conducted a post hoc G*Power analysis to assess whether this study had the sample size needed to detect a significant interaction effect (Faul et al. 2009). We chose a repeated-measures ANOVA, within-between interaction (4 × 2) and entered an alpha = 0.05, power = 0.80, $N = 82$, effect size $f = .22$, and non-sphericity correct $\varepsilon = 0.849$, based on the smallest effect size the findings of the present study yielded. This resulted in power = 0.989, which indicates that the sample size ($N = 82$) was more than adequate for the main objective of the present study.

Procedures

All preschools in Korea use the Nuri Curriculum, a standard national curriculum for children 3 to 5 years old. The mindfulness-based OM-K program was integrated with the Nuri Curriculum in the intervention group classrooms. The control group classroom used just the Nuri Curriculum.

Intervention Group The OM-K curriculum consisted of two key daily practices: guided meditation and nine mindfulness-based activities. At 10 a.m. each school day, all teachers and students engaged in an 8-min guided Samatha meditation with the sound of the bell as the object of meditation. The pre-recorded guided meditation was provided through the preschool's internal announcement system, with the instructions delivered by a Korean priest from the Won Buddhist lineage. This priest also provided additional on-site instructions in meditation and yoga to the teachers, as needed.

The original OM program was forward translated into Korean and back translated into English to assure alignment with the original OM curriculum. In addition, the translation was contextualized within the Korean culture and educational system. The resulting OM-K program manual included nine daily mindfulness activities: Samatha Meditation, Lovingkindness, Yoga, Gratitude and Interconnection Activities, Kindness and Compassion Reporting, Feelings Finder, Super Me, Are You Present for Me? and Soles of the Little Feet. The intervention group teachers were provided an initial 8-h training on the OM-K activities based on the OM-K program manual. Training included demonstration, modeling, and direct instructions, and return-demonstration by the teachers. The training was provided in English and translated into Korean because the teachers were fluent only in Korean. The teachers were instructed to competency in all nine daily mindfulness activities. Every 2 weeks thereafter, further training on implementing the OM-K daily activities was provided by a Korean researcher trained in the OM-K program. The researcher discussed with the teachers any difficulties they were having and provided guidance on how to overcome or lessen their difficulties. In addition, the teachers were provided an opportunity to share their experiences with fellow intervention group teachers during regular teacher education sessions. A second Korean researcher was responsible for observing the classrooms once a week, and for providing feedback and support to the teachers and school principals.

The teachers were encouraged to integrate the OM-K activities with the Nuri Curriculum throughout the day. The essence of the integrated program was to encourage the preschool children to be mindfully engaged during academic, social interaction, and play activities to promote mindful attention and awareness, acceptance, resilience, and social-emotional capabilities. The teachers were instructed to use the mindfulness activities in a variety of ways to meet classroom needs of the children.

Table 1 Information on teachers and preschool children

		Mar 2017–Feb 2018		Mar 2018–Feb 2019		
		Teacher's age	Number of children	Teacher's age	Number of children	Number of teachers
Intervention Group	Preschool A	25	14	29	13	4
		25	15	27	14	
	Preschool B	35	16	28	15	2
Control Group	Preschool C	25	9	27	9	2
	Preschool D	29	15	30	15	4
		28	17	29	17	
Totals			86[a]		83	

[a] Data were not included for three children who were transferred mid-2017

Control Group The control group used only the Nuri curriculum, the standard curriculum for preschools in Korea. No changes were made to the teaching content in the control classrooms. The teachers and students in the control group did not receive instructions in either the 8-min meditation practices or the nine mindfulness-based activities in the OM-K curriculum.

Measures

Four evaluations were scheduled: pre-test or baseline evaluation (March 2017 [Time 1]); first post-intervention evaluation (February 2018 [Time 2]); second post-intervention evaluation (September 2018 [Time 3]), and third post-intervention evaluation (February 2019 [Time 4]). Teachers rated each student in their class on the following measures:

Emotional regulation The Korean version (Kim 2007) of the Emotion Regulation Checklist (ERC; Shields and Cicchetti 1997) was used to measure emotion regulation in the students. ERC, which reliably discriminates between well-regulated and dysregulated children, consists of 24 questions. In this study, the items were rated on a 5-point Likert scale (1 = never, 2 = sometimes, 3 = often, 4 = almost always, 5 = always). The questions assess the intensity, lability, flexibility, and appropriateness of a child's positive and negative emotions. The ERC has two subscales, adaptive regulation (9 items) and lability/negativity (15 items). The adaptive regulation subscale provides a measure of appropriate emotional expression, empathy, and emotional self-awareness. Higher score on this subscale indicates good emotion regulation. The lability/negativity subscale provides a measure of inflexibility, lability, and emotional dysregulation. Higher score on this subscale indicates emotional dysregulation. Cronbach's alpha for the adaptive regulation subscale for the current study was 0.83 and that of the lability subscale was 0.95.

Resilience The Korean Personality Rating Scale for Children, which has been standardized for children aged 3 to 17 years, has a resilience scale and 10 clinical scales (KPRC; Cho et al. 2006). This 16-item resilience scale is designed to measure children's coping ability and adaptative potential. In this study, the items were rated on a 5-point Likert scale that measure confidence and ease, smooth and intimate interpersonal relationships, patience, concentration, and tolerance. Higher total score indicates the child is more flexible and responsive to the environment. Cronbach's alpha for the current study was 0.91.

Prosocial behaviors The Korean version (Lee 1996) of the Modified Professional Behavioral Questionnaire (Mod-PBQ; Doescher 1986) was used to assess classroom teacher's perception of the children's prosocial behaviors. The Korean version, which has four subscales, requires teachers to respond to five items per subscale: helping, sharing, cooperation, and comfort to others. The items are rated on a 5-point Likert scale. Higher score on each subscale indicates greater prosocial behaviors. For the current study, Cronbach's alpha for the help, sharing, cooperation, and consoling subscales were 0.88, 0.87, 0.82, and 0.83, respectively. Cronbach's alpha of the complete scale was 0.95.

Data Analyses

The analyses were performed using IBM SPSS 26. Independent *t* tests were run to examine differences between the intervention group and the control group on each of the outcome variables at baseline. A mixed-model ANOVA (4 × 2) was performed to determine intervention effects over time on outcome variables, with four repeated measures across time (pre-, post 1-, post 2-, and post 3-intervention) as within-subjects factor and two groups (intervention vs control) as between-subjects factor (Tabachnick and Fidell 2001). Missing values in the dataset were treated with the EM algorithm in SPSS 26. Testing of simple main effect for group was carried out by examining differences between groups at each time point if an interaction effect was significant. Post hoc tests were expected to show intervention effects if an interaction effect was significant. *F* values and partial eta squared (η^2) were computed for a mixed-model ANOVA, whereas *t* values and Cohen's *d*s were computed for direct *t* test comparisons. Partial eta squared (η^2) = 0.01 was considered a small effect size, 0.06 medium, and 0.14 large, whereas Cohen's $d = 0.2$ was considered small, 0.5 medium, and 0.8 large (Cohen 1988).

There was one outlier, which had a studentized residual value of − 5.46 for the adaptive regulation subscale. This outlier reflected missingness occurred at the instrumental level across all outcome measures at Time 4 [T4]. Therefore, this case was removed from analyses. Outcome variables were normally distributed for the large majority combinations of the levels of the between- and within-subjects factors, as assessed by Shapiro-Wilk's test ($p > .05$). As the current sample size ($n = 82$) is not too small and ANOVAs are considered to be reasonably robust to deviations from normality, analyses were carried out with variables that included a minority combinations of the levels showing non-normality (e.g., lability, control × time 1) without transformation to keep the original data for clarity. Levene's test of homogeneity of variances and Box's test of equality of covariance matrices were used to assess homogeneity of variances and covariances ($p > .05$). Mauchly's test of sphericity was used to assess whether the assumption of sphericity was met for the two-way interaction term. When the assumption of sphericity was violated, the results using a Greenhouse-Geisser correction were reported (Pallant 2007).

Results

Pre-Implementation Characteristics

There were statistically significant group differences at baseline with medium to large effect sizes. The control group had uniformly higher scores than the intervention group on all outcome measures. Compared to the intervention group, the control group showed higher scores on Adaptive regulation ($t(80) = -2.31$, $p < 0.05$, $d = .51$), Resilience ($t(80) = -5.07$, $p < 0.001$, $d = 1.12$), Sharing ($t(80) = -2.41$, $p < 0.05$, $d = .53$), Cooperation ($t(80) = -2.45$, $p < 0.05$, $d = .54$), and Consoling ($t(80) = -3.48$, $p < 0.01$, $d = .77$) at baseline. The control group also showed higher scores on Help ($t(80) = -1.51$, $p > 0.05$, $d = .33$) than the intervention group but without reaching statistical significance. Lastly, the control group had lower scores on Lability ($t(80) = 5.72$, $p < 0.001$, $d = 1.26$) than the intervention group with a large effect size. In other words, the control group consistently performed better than the intervention group on the outcome measures prior to implementation of the OM-K program.

Effects of the OM-K Program

A statistically significant interaction between the intervention and time was found for all outcome variables, with medium to large effect sizes (see Fig. 1).

Adaptive regulation There was a statistically significant interaction between the time and intervention on adaptive regulation scores, $F(2.55, 203.82) = 5.02$, $p < .01$, $\eta^2 = .06$. The control group showed significantly higher adaptive regulation scores than the intervention group at both Time 1, $F(1, 80) = 5.34$, $p < .05$, $\eta^2 = 0.06$ and Time 2, $F(1, 80) = 5.02$, $p < .001$, $\eta^2 = 0.16$. However, such group differences were not found at Time 3 and Time 4. Table 2 presents means, standard deviations (SDs), and Cohen's *d* effect sizes estimated between Time 1 and Time 2, Time 1 and Time 3, and Time 1 and Time 4. Figure 1 shows means of outcome variables that two groups showed at four time points. Adaptive regulation in the intervention group significantly increased at Time 2, Time 3 and Time 4, compared to Time 1 with medium to large effect sizes. For the control group, a significant increase was found at Time 2 and Time 3 when compared to baseline.

Lability/negativity There was a statistically significant interaction between the time and intervention on lability scores, $F(2.47, 197.53) = 54.41$, $p < .001$, $\eta^2 = 0.41$. A statistically significant group difference was found in lability scores at all four time points. The control group showed significantly lower lability scores than the intervention group at both Time 1, $F(1, 80) = 32.66$, $p < .001$, $\eta^2 = 0.29$ and Time 2, $F(1, 80) = 36.46$, $p < .001$, $\eta^2 = 0.31$. The intervention group, however, showed significantly lower lability scores than the control group at both Time 3, $F(1, 80) = 4.18$, $p < .05$, $\eta^2 = 0.05$ and Time 4, $F(1, 80) = 11.44$, $p < .01$, $\eta^2 = 0.13$. Lability in the intervention group significantly reduced at Time 3 ($t(40) = 4.46$, $p < 0.01$) and Time 4 ($t(40) = 6.93$, $p < 0.01$) compared to Time 1, both with large effect sizes, whereas lability scores significantly increased for the control group at Time 2 ($t(40) = -5.41$, $p < 0.01$) and Time 3 ($t(40) = -5.15$, $p < 0.01$), when compared to the baseline.

Resilience There was a statistically significant interaction between the time and intervention on resilience scores, $F(2.44, 194.94) = 30.12$, $p < .001$, $\eta^2 = .27$. The control group showed significantly higher resilience scores than the intervention group at Time 1, $F(1, 80) = 25.66$, $p < .001$, $\eta^2 = 0.24$ and Time 2, $F(1, 80) = 43.36$, $p < .001$, $\eta^2 = 0.35$. No statistically significant group difference was found at Time 3, $F(1, 80) = 0.68$, $p = .41$, $\eta^2 = 0.01$. The intervention group showed significantly higher resilience scores than the control group at Time 4, $F(1, 80) = 7.32$, $p < .01$, $\eta^2 = 0.08$. Resilience in the intervention group significantly increased at Time 3 ($t(40) = -4.29$, $p < 0.01$) and Time 4 ($t(40) = 6.96$, $p < 0.01$) compared to Time 1, both with large effect sizes. In contrast, a significant decrease on resilience was found in the control group at Time 3 ($t(40) = 2.16$, $p < 0.05$) and Time 4 ($t(40) = 2.20$, $p < 0.05$) when compared to the baseline.

Help There was a statistically significant interaction between the time and intervention on help scores, $F(2.39, 191.11) = 11.48$, $p < .001$, $\eta^2 = 0.13$. A statistically significant group difference was found at Time 2, $F(1, 80) = 5.54$, $p < .05$, $\eta^2 = 0.07$; Time 3, $F(1, 80) = 6.38$, $p < .05$, $\eta^2 = 0.07$; and Time 4, $F(1, 80) = 7.43$, $p < .01$, $\eta^2 = 0.09$. Help scores in the intervention group significantly increased at Time 3 ($t(40) = -5.20$, $p < 0.01$) and Time 4 ($t(40) = -5.59$, $p < 0.01$) compared to Time 1, both with large effect sizes. A significant increase on help scores was found in the control group at Time 2 ($t(40) = -2.54$, $p < 0.05$).

Sharing There was a statistically significant interaction between the time and intervention on sharing scores, $F(2.04, 163.54) = 26.64$, $p < .001$, $\eta^2 = 0.25$. The control group showed significantly higher sharing scores than the intervention group at both Time 1, $F(1, 80) = 5.80$, $p < .05$, $\eta^2 = 0.07$ and Time 2, $F(1, 80) = 15.20$, $p < .001$, $\eta^2 = 0.16$. The intervention group showed significantly higher sharing scores than the control group at Time 3, $F(1, 80) = 7.88$, $p < .01$, $\eta^2 = 0.09$ and Time 4, $F(1, 80) = 18.02$, $p < .001$, $\eta^2 = 0.18$. Sharing scores in the intervention group significantly increased at Time 2 ($t(40) = -3.56$, $p < 0.01$), Time 3 ($t(40) = -7.03$, $p < 0.01$) and Time 4 ($t(40) = -7.75$, $p < 0.01$) compared to Time 1, both with medium to large effect sizes. In contrast, a significant decrease on sharing scores was found in the control

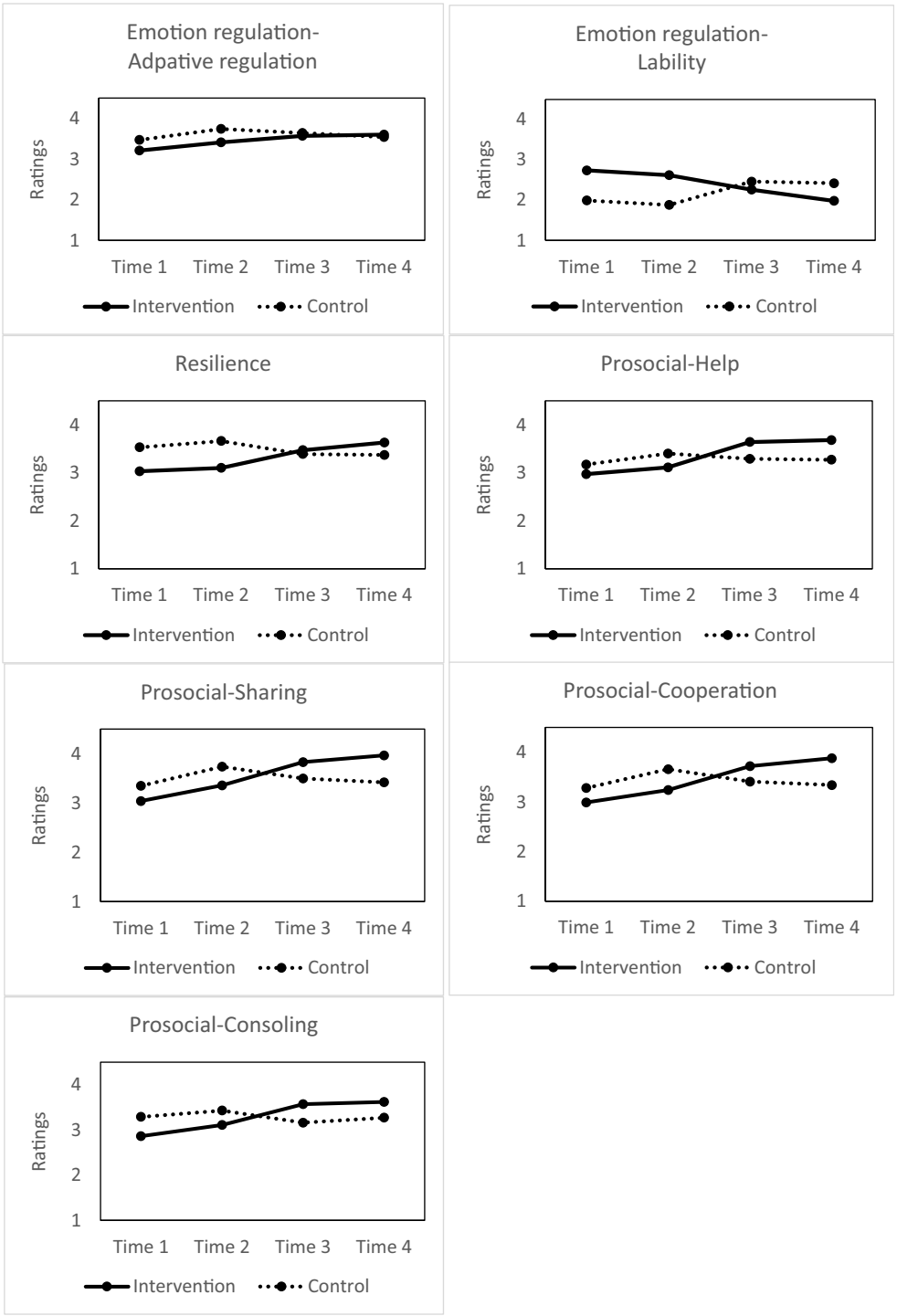

Fig. 1 Means of outcome variables by group at four time points

group at Time 2 ($t(40) = -6.28$, $p < 0.01$) when compared to the baseline, with a large effect size.

Cooperation There was a statistically significant interaction between the time and intervention on cooperation scores, $F(2.22,\ 177.66) = 23.35$, $p < .001$, $\eta^2 = 0.23$. The control group showed significantly higher cooperation scores than the intervention group at both Time 1, $F(1,\ 80) = 5.99$, $p < .05$, $\eta^2 = 0.07$ and Time 2, $F(1,\ 80) = 15.60$, $p < .001$, $\eta^2 = 0.16$. The intervention group showed significantly higher cooperation scores than the control group at Time 3, $F(1,\ 80) = 4.69$, $p < .05$, $\eta^2 = 0.03$ and Time 4, $F(1,\ 80) = 12.74$, $p < .01$, $\eta^2 = 0.14$. Cooperation in the intervention group significantly increased at Time 2 ($t(40) = -2.82$, $p < 0.01$), Time 3 ($t(40) = -6.52$, $p < 0.01$) and Time 4 ($t(40) = -8.20$, $p < 0.01$) compared to Time 1, with medium to large effect

Table 2 Means and standard deviations (SD) of outcome variables. Means, standard deviations (SD), and Cohen's *d* effect sizes estimated between Time 1 and Time 2, Time 1 and Time 3, and Time 1 and Time 4

Outcome measures	Group	T 1 Mean (SD)	T 2 Mean (SD)	T 1–2 *d*	T 3 Mean (SD)	T 1–3 *d*	T 4 Mean (SD)	T 1–4 *d*
Emotion regulation								
Adaptive regulation	Intervention	3.21 (0.53)	3.41 (0.43)**	0.40	3.57 (0.51)**	0.67	3.60 (0.42)**	0.78
	Control	3.47 (0.43)	3.74 (0.34)**	0.70	3.64 (0.42)*	0.40	3.54 (0.49)	0.15
Lability/negativity	Intervention	2.74 (0.63)	2.62 (0.50)	0.21	2.26 (0.44)**	0.89	1.98 (0.53)**	1.31
	Control	1.99 (0.55)	1.88 (0.61)	0.19	2.46 (0.46)**	0.93	2.42 (0.65)**	0.75
Resilience								
	Intervention	3.03 (0.46)	3.10 (0.39)	0.17	3.47 (0.55)**	0.86	3.63 (0.42)**	1.36
	Control	3.53 (0.42)	3.66 (0.36)	0.31	3.39 (0.44)*	0.35	3.37 (0.46)*	0.36
Prosocial behavior								
Help	Intervention	2.97 (0.70)	3.11 (0.48)	0.24	3.64 (0.63)**	1.02	3.68 (0.63)**	1.08
	Control	3.17 (0.48)	3.40 (0.61)*	0.42	3.29 (0.65)	0.21	3.27 (0.73)	0.17
Sharing	Intervention	3.04 (0.61)	3.36 (0.47)**	0.59	3.83 (0.49)**	1.43	3.97 (0.48)**	1.68
	Control	3.35 (0.55)	3.74 (0.39)**	0.81	3.50 (0.60)	0.25	3.42 (0.67)	0.11
Cooperation	Intervention	2.99 (0.59)	3.24 (0.46)**	0.49	3.72 (0.59)**	1.25	3.88 (0.56)**	1.55
	Control	3.28 (0.49)	3.66 (0.49)**	0.78	3.41(0.73)	0.21	3.34 (0.78)	0.10
Consoling	Intervention	2.86 (0.61)	3.11 (0.44)**	0.47	3.57 (0.55)**	1.22	3.62 (0.52)**	1.35
	Control	3.29 (0.49)	3.43 (0.52)	0.28	3.16 (0.60)	0.23	3.27 (0.71)	0.04

Time 2 = Post-intervention 1, Time 3 = Post-intervention 2, Time 4 = Post-intervention 3

*$p < 0.05$; **$p < 0.01$ for all *t* test comparisons against Time 1 (baseline)

sizes. A significant increase on cooperation was found for the control group at Time 2 ($t(40) = -5.22$, $p < 0.01$) when compared to the baseline, with a large effect size.

Consoling There was a statistically significant interaction between the time and intervention on consoling scores, $F(2.42, 193.60) = 20.49$, $p < .001$, $\eta^2 = 0.20$. The control group showed significantly higher consoling scores than the intervention group at both Time 1, $F(1, 80) = 12.13$, $p < .01$, $\eta^2 = 0.13$ and Time 2, $F(1, 80) = 8.88$, $p < .01$, $\eta^2 = 0.10$. The intervention group showed significantly higher consoling scores than the control group at Time 3, $F(1, 80) = 10.43$, $p < .001$, $\eta^2 = 0.12$ and Time 4, $F(1, 80) = 6.89$, $p < .05$, $\eta^2 = 0.08$. Consoling in the intervention group significantly increased at Time 2 ($t(40) = -3.23$, $p < 0.01$), Time 3 ($t(40) = -5.90$, $p < 0.01$) and Time 4 ($t(40) = -7.22$, $p < 0.01$) compared to Time 1, with medium to large effect sizes. In contrast, no significant changes on consoling was found in the control group at any time point when compared to the baseline.

Discussion

The OM-K program has been shown to be feasible to implement in preschool classrooms, acceptable to preschool teachers, and rated as a socially valid program by parents whose children participated in the program (Kim et al. 2019a, b). In the present study, we investigated the effectiveness of the OM-K program in a randomized controlled trial. We hypothesized that preschool children in the intervention group would have significantly enhanced emotion regulation (i.e., adaptive regulation and lability/negativity), resilience, and prosocial behavior (i.e., help, sharing, cooperation, cooperation, and consoling) when compared to the children in the control group. Overall, there were significant differences between the intervention and control group scores over time across all outcome variables. At baseline (Time 1), the control group children showed higher levels of emotional regulation, resilience, and prosocial behavior. The control group children continued to outperform the intervention group children at the first evaluation (Time 2) following the implementation of the OM-K program. By the second evaluation (Time 3) following the implementation of the OM-K program, the intervention group children began to show significantly higher levels of emotional regulation, resilience, and prosocial behavior. The progression in enhanced performance by the intervention group children continued through to the third evaluation (Time 4) following implementation of the OM-K program. There was one exception: the control group children performed significantly better on adaptive regulation at Time 1

and Time 2, but the difference disappeared at Time 3 and Time 4. However, the same pattern of findings was evident even for adaptive regulation—the intervention group children showed an increasing trend from Time 1 to Time 4 but there was a decrease in the scores for the control group children at Time 3 and Time 4.

The data from the present study show that children in the intervention group had lower scores on all outcome measures at baseline but displayed an increasing trend following intervention with the OM-K program. The children in the control group had higher scores at the first two evaluations (Time 1 and Time 2) but decreasing scores thereafter (Time 3 and Time 4). The data could be interpreted in multiple ways. First, the baseline (Time 1) difference was simply too large for the children in the intervention group to overcome following initial training in the OM-K program during the first year (i.e., by Time 2). Second, given that the children were only 3 years old at baseline, the slow arrival of intervention effects may have been due to their limited cognitive capacity to fully master the meditation and mindfulness-based activities. With further cognitive maturity enabling mastery of meditation and mindfulness-based activities at a deeper level resulted in significantly higher scores on all but one outcome variable. Third, the cumulative effects of mindfulness-based training over time may have assisted not only mastery but also application within the rhythm of daily classroom activities, thus enhancing the children's emotion regulation, resilience, and prosocial behaviors.

The significant findings in the present study are consistent with the emerging literature on the effectiveness of preschool programs, such as the REDI Head Start program (Bierman et al. 2008a, b), the Chicago School Readiness Project (Raver et al. 2009), and the Tools of the Mind curriculum (Bodrova and Leong 2007). These programs have demonstrated not only increased self-regulation but also enhanced academic achievements in preschool children. In other preschool programs, especially those based on the concept of SEL, the children consistently outperformed children in control classrooms across a wide variety of outcomes, including social and emotional skills, positive social behaviors, and academic skills (Durlak et al. 2011, 2015; Sklad et al. 2012).

One likely advantage of the OM-K program is the inclusion of mindfulness as the basis of the program. In most preschool programs, the teacher is the instrument of change through instructional control of the students' learning. Programs based on teacher-directed learning enhance the children's capacity to learn cognitive and social skills by initially fostering rule-governed behavior that is slowly replaced by contingency shaping of academic and social skills. Mindfulness enables the children's learning to arise from within, thus fostering self-determination of their behavior. When the children engage in the daily practice of Samatha meditation, they digest and metabolize mindfulness enabling them to embody mindfulness across academic learning and socialization contexts. This embodiment of mindfulness enables them to self-regulate their emotions in unpleasant or conflict situations. For example, in the present study, the children's adaptive regulation steadily increased over time and their lability/negativity significantly decreased, suggesting increased inhibitory control of their challenging behaviors. In addition, these results suggest that early exposure to meditation and mindfulness-based activities may enrich preschool children's emotional development, with the possibility of downstream effects if they continue with mindfulness practice as they grow older. Of course, this would require longitudinal study of such children against an active control condition to determine what benefits accrue in the long term.

One of the key aspects of the OM-K program that may have contributed to its effectiveness is the use of age-related materials and activities. For example, with 3-year-old children, the "Hoberman Ball" and "Lotus Breathing" provide a simple but practical way to focus on their breathing when faced with unpleasant situations, thus helping them to quick stabilize their emotions. The "Feelings Finder Practices" help children who have some difficulty in expressing their emotions or those who need to improve their awareness of the emotions of others. The "Soles of the Little Feet" help the children to deal with difficult emotions through enhanced inhibitory control. The "Super Me" practices offer a way of giving specific positive recognition, praise, and reinforcement for prosocial behaviors. In essence, each of the OM-K mindfulness-based activities assist the children to regulate their emotions and act in socially adaptive and desirable ways. Other activities, such as "Lovingkindness Practices", "Gratitude and Interconnectedness," and "Kindness and Compassion Reporting" are positive, character-building practices that enhance children's awareness of their interconnectedness with all sentient beings.

The results showed that children in the intervention group were rated as being more resilient at the end of the study than the children in the control group. This is a finding of some importance because resilient children demonstrate more psychological flexibility (Kashdan 2010), which is associated with enhanced psychological health and lower psychopathology. In addition, educational resilience is conducive to academic performance as evidenced by the growth of school-based interventions for strengthening resilience in children (Ungar et al. 2019). Furthermore, children in the intervention group showed improvement in general prosocial behaviors, including all four subcomponents (i.e., help, sharing, cooperation, and comfort to others). In contrast, children in the control group showed no significant increase in two components (i.e., help and comfort to others) and significant decrease in the other two (i.e., sharing and cooperation). These findings align well with other school-based mindfulness programs with older children showing increases in prosocial behavior (e.g., Flook et al. 2015; Viglas and Perlman 2018). Research

indicates that once young children master prosocial behavior, it stays with them through to adulthood (Rose-Krasnor and Denham 2009), suggesting that it is a foundational skill that is reinforced across time in social interactions.

A key strength of the OM-K program lies in the fact that teachers and children meditate together each school day for 8 min. This is in addition to the teachers and children engaging in mindfulness-based activities throughout the day when used adjunctively with the Nuri curriculum—the mandatory Korean national preschool program. This pairing of teachers and students meditating together is probably helpful to the children in more than one way. First, when students see their teacher meditating, they are more motivated to emulate the practice. Second, mirror neurons may come into play when teachers and students meditate together (Mafessoni and Lachmann 2019). Mirror neurons fire in the brain of the teacher when she meditates and when the students observe the teacher meditating this observation causes the mirror neurons to fire in the brains of the children. That is, the neurons in the children's brains "mirror" the behavior of the teacher. Furthermore, there is suggestive evidence that the mirror neuron system may be involved in empathy (Decety and Jackson 2004; Gallese 2001), a variable targeted by the mindfulness-based practices embedded in OM-K. Third, a little more speculative than the other two explanations, involves behavioral social synchrony—the coordination of behavior in social groups (Kinreich et al. 2017) or neural synchrony in romantically interacting couples (Bernhardt and Singer 2012). The genesis of behavioral social synchrony lies with mother-infant bonding during periods of social and physical contact (Santamaria et al. 2020). The suggestion is that when teachers and students meditate together, behavioral social synchrony heightens the effects of the meditation on the teacher and students.

Limitations and Future Research Directions

This study is not without limitations. The preschool participants were from only one region of Korea, which means further research is needed to determine the generalizability of the present findings to other regions of Korea and to other countries. The study suffers from common method bias, a well-documented shortcoming in research based on self-reported measures. In the present study, given that all ratings were completed by the children's teachers, there could have been reporting bias (e.g., response style and/or social desirability). Future research should use multiple methods for data collection.

As mentioned above, there was a significant difference between the experimental and control conditions in the pre-treatment phase of the study, with significantly higher scores on all variables in the control condition. Although the most plausible source of this difference is due to the randomization process, it may nevertheless have offered some advantage to the control condition and contributed to the smaller overall difference between the two groups across time, thus acting against the hypothesis that the experimental group would show larger gains on the outcome variables.

Although this was a two-arm randomized controlled trial, which assessed the difference between an intervention and a control condition, the two groups were not fully comparable in terms of the instructions received by the children. The OM-K group received additional programs, thus tilting the outcome in favor of this group of children by the mere fact that they received additional training. Thus, future research could incorporate a third arm in the intervention design that includes a second active intervention that controls for the additional instruction provided through the OM-K program. The control group would necessarily have to remain as teaching-as-usual.

In sum, this study showed that pre-school children's emotion regulation, resilience, and prosocial behaviors can be enhanced through a mindfulness-based social-emotion learning program, the OM-K.

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Author Contributions EK designed and executed the study and wrote the first draft of the paper; MMJ developed the OM program; SJ translated the OM program into Korean and collaborated in its implementation; JO collaborated in the implementation of the program; SK enabled the implementation of the OM-K program and provided research support; CLM provided initial training on the OM-K program to the teachers; YSH undertook the statistical analysis and writing of the data analysis and results sections; and NNS collaborated in all phases of the study.

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Compliance with Ethical Standards

Conflict of Interest MMJ is the developer of the OM program. The remaining authors declare that they have no conflict of interest.

Ethical Approval The Institutional Review Board at Wonkwang University provided ethical approval for the research component of the OM-K program. All procedures performed in this study were in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from the four preschools, all parents, and assent from the children.

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