Effectiveness of second step program in fostering social-emotional skills in young children: a study in Japan

Rikuya Hosokawa[1]* , Riho Tomozawa[1] and Megumi Fujimoto[1,2]

Abstract

Background Interest in social-emotional skills in the context of school maladjustment is growing, and social-emotional learning can help develop such skills. Second Step is a social-emotional skills approach prevalent in several countries. In Asian countries, including Japan, preventive interventions for school maladjustment in young children are scarce, and their effectiveness is not adequately validated. This study examines the effectiveness of the social-emotional learning "Second Step program" among children aged 4 to 5 years.

Methods In 2022, the Second Step program was implemented on a class-by-class basis for children aged 4 to 5 years enrolled in middle grades of a kindergarten in Japan. The program included 25 sessions, each lasting one hour on average, approximately once a week. To test the effectiveness of the program, kindergarten teachers assessed the children's social skills. Parents assessed their children's behaviors. Data of 73 children in the intervention group and 91 in the control group were analyzed. The intervention group participated in the Second Step program, while the control group did not participate in any program. Evaluations were conducted before and after the intervention program.

Results Children in the intervention group displayed significantly greater assertiveness, self-control, and cooperation scores following program implementation compared with those in the control group. They also showed significantly lower scores on behavioral problems compared with those in the control group and before the program. The intervention had a meaningful impact on both social competencies and behavioral outcomes. Specifically, the effect sizes for social competencies in the intervention group were moderate to large, reflecting substantial improvements.

Conclusions The social-emotional learning Second Step program implemented on a classroom basis may be effective in early childhood. An early approach targeting kindergarten-aged children is necessary to prevent school maladjustment.

Keywords Second step, Social-emotional skills, Children, Japan

*Correspondence:
Rikuya Hosokawa
hosokawa.rikuya.4r@kyoto-u.ac.jp
[1] Department of Human Health Sciences, Graduate School of Medicine, Kyoto University, 53 Shogoin-kawahara-cho, Sakyo-ku, Kyoto 606-8507, Japan
[2] Faculty of Nursing Science, Osaka Seikei University, Osaka 533-0007, Japan

Background

There is a growing scholarly interest in kindergarten-aged children's social-emotional skills in the context of school maladjustment [1]. Although these skills contribute significantly to school readiness, existing findings are inconsistent and indicate an indirect relationship. Emotional knowledge and social problem-solving skills have been associated with enhanced social competence, fewer behavioral problems [2–4], and improved academic

Hosokawa *et al. BMC Pediatrics*   (2025) 25:276

Page 2 of 13

performance [5]. Social-emotional competence is important for school readiness as it promotes adaptive learning behaviors, such as cooperation, emotion management, motivation in challenging tasks, and positive engagement with teachers and peers [6, 7].

Skills necessary for academic performance and social functioning are developed during the critical years of childhood. Social-emotional skills—also called non-cognitive skills—include understanding, identifying, and regulating emotions; showing empathy; regulating behavior; cooperating with others; establishing positive peer interactions; and achieving goals [8–10]. Central to the development of these skills is the quality of the early childhood environment, including adequate nutrition, health, and reciprocal and nurturing interactions with caregivers (especially early childhood educators) [11].

Kindergarten, where children spend much of their early childhood years, is an important environment for the development of social-emotional skills, and research has focused on enhancing these abilities in early childhood education and care. Numerous recent studies have noted that acquiring social-emotional abilities during this life stage is important for long-term child development outcomes, including social adjustment and academic achievement in kindergarten and elementary school, as well as long-term school attendance and functioning in adulthood [12]. These skills have been categorized in terms of self-regulation, which includes aspects of social behavior and neurocognitive coordination—such as attention, emotion and arousal regulation, and information processing—and the ability to engage positively with peers and teachers [13, 14]. Furthermore, independent of the general intelligence quotient, these qualities facilitate competency [15].

According to current research, rather than focusing on specific academic skills (e.g., counting and letter recognition) to promote school readiness, a developmental/psychological approach involving basic regulatory processes could promote learning ability, particularly in children experiencing sociodemographic stress [16]. This is supported by kindergarten teachers emphasizing social and behavioral abilities above arithmetic and reading skills for children entering elementary schools [17]. Additionally, problems in transitioning from early childhood to school age may be related to the poverty cycle, with lower socioeconomic status families being more vulnerable [18, 19]. Children from disadvantaged backgrounds, such as those with lower family income and parental education, tend to enter school later owing to the delayed development of social and behavioral skills [20–22]. While the importance of kindergarten support has been emphasized, the types of programs that might effectively enhance social-emotional development remain unclear. Kindergarten programs targeting low-income families have been implemented in several countries, and their effectiveness has been validated [23]. In Japan, school readiness interventions are limited, and a universal approach is needed to implement effective measures.

The Collaborative for Academic, Social, and Emotional Learning, a non-profit organization based in the USA, was founded in 1994 to put into practice the concept of social-emotional learning (SEL) [24, 25]. It has identified five competencies that children must develop: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. Several universal SEL programs have been developed, and their effectiveness has primarily been reported for implementations in Europe and the USA, where studies have highlighted positive outcomes in fostering children's social-emotional skills and reducing behavioral problems in various educational settings [26, 27]. These findings underscore the importance of context-specific adaptations when implementing such programs in non-Western regions [26–30]. More than 20 years of rigorous scientific research has shown that high-quality, well-implemented SEL has a positive impact on the school environment and promotes many academic, social, and emotional benefits for students [31]. SEL teaches students how to identify and manage their emotions, and how to deal with uncontrollable emotions. One such SEL-focused initiative is Second Step [32, 33], an educational program devised by the Committee for Children, a non-profit organization based in Washington state, USA.

Second step

"Second Step Elementary classroom kits for kindergarten" (Second Step Early Learning) is a kindergarten curriculum [32, 34]. The program's primary aim is to prevent violence, achieved by encouraging the development of social skills and positive human values. Children's major transition to elementary school necessitates the acquisition of new abilities such as impulse control, concentration, and following rules. This research-based curriculum assists children in developing the competencies and confidence necessary to adapt to learning demands. The program is based on an extensive assessment of developmental literature in areas including social-emotional skills, self-regulation, and contributions to school readiness [32–34]. It is unique, integrating activities and instructions on emotion recognition, empathy, and social problem-solving; self-regulation skills such as self-talk and learning to calm down; and brain games to start and stop activities based on verbal and visual cues. The program's intervention component includes previously developed interventions with promising results, such as the Promoting Alternative Thinking Strategies curriculum [35].

Teachers receive prior training in the program, and a team supports them to ensure correct delivery. The team responds to each question asked by the teachers regarding the program. Second Step training is facilitated in small groups. Teachers begin with a study of the Second Step principles of SEL, followed by an explanation of the Second Step technical content, discussion, and role-playing with actual materials.

The 25-week curriculum is structured into four major units, with one group activity each week to introduce and practice skills. The four units are 1) learning skills (listening, focusing, paying attention, using self-talk to remember and follow directions, and being assertive); 2) mutual understanding (being empathetic, identifying one's own and others' feelings and others' perspectives, and caring for and helping others); 3) handling emotions (understanding strong emotions, identifying own emotions when they are strong, and specific strategies for calming down); and 4) problem solving (joining in play, inviting friends to play, playing fairly, calming down, solving social problems, and understanding problem-solving steps). Faculty members qualified to implement multiple Second Step sessions are faithful to the program, regularly checking in with each other.

The curriculum implemented in the Second Step program aims to build foundational social-emotional skills in children, including self-regulation, emotion recognition, and prosocial behaviors. The curriculum is structured to align with developmental milestones and is delivered through age-appropriate activities. Teachers deliver thematic lessons progressively to enhance children's skills in managing emotions, resolving conflicts, and fostering empathy. Each lesson incorporates visual aids, storytelling, and interactive discussions, ensuring children engage with the content meaningfully [36].

Teacher training plays a critical role in the successful implementation of the Second Step program. Participating teachers attend comprehensive workshops and receive continuous support to ensure fidelity to the program's principles. These workshops focus on equipping educators with skills in emotional coaching, behavioral reinforcement, and classroom management strategies. By understanding the foundational framework of SEL, teachers are better prepared to model desired behaviors and integrate SEL principles into daily interactions with children [37]. Teachers are also encouraged to reflect on their practices and collaborate with peers to refine their approach, ensuring a consistent and supportive learning environment.

Children are taught directly through the structured curriculum as well as through emotional support, positive behavior reinforcement, and modeling strategies. For example, teachers prioritize reinforcing positive over negative behaviors and guide children in employing calming strategies to control their emotions. While there is no prescribed script for daily activities, teachers provide opportunities for children to practice their newly acquired skills in the classroom and observe their application in real-life scenarios. Additionally, the program emphasizes parental involvement by providing weekly handouts to parents, enabling them to reinforce the concepts their children have learned and practice specific activities at home [38].

The curriculum comprises a teacher's manual, two puppets, and 28 large weekly theme cards with colored photos of kindergarteners in situations related to the relevant theme and descriptions of each day's activities. It provides resources to support and reinforce skills throughout the week, including a CD containing songs related to the theme and posters to put up in the classroom.

Second Step has been evaluated in several countries and its effects on impulse control, communication skills necessary for group living, and self-regulation in social life have been reported [39–41]. More specifically, a meta-analysis presents findings from 24 primary studies of Second Step SEL programs, with implementation studies conducted across various regions, including the USA, Europe, Asia, and South America. These studies examined program content knowledge and prosociality outcomes across different research designs, such as randomized controlled trials, quasi-experimental studies, and single-arm repeated measures studies. Students who participated in the Second Step program demonstrated significant increases in program content knowledge, indicating successful acquisition of the targeted SEL competencies. While some studies report improvements in prosocial outcomes, no statistically significant overall effect of program participation on prosocial behaviors was found. This discrepancy may be influenced by variations in study design, measurement tools, and sample characteristics. Furthermore, evidence suggests the possibility of publication bias in studies reporting knowledge outcomes, whereas no such bias was detected in those reporting prosocial or antisocial outcomes. These findings underscore the importance of distinguishing between program-specific knowledge gains and behavioral outcomes, providing nuanced insights for both researchers and practitioners. Our study complements broader meta-analyses of SEL programs by offering targeted estimates of the Second Step program's impact across various student outcomes [39, 40]. In addition, a separate meta-analysis summarized the effects of depression prevention programs on youth and examined participant, intervention, provider, and study design characteristics associated with larger effects. Overall, 47 trials evaluating 32 prevention programs were

Hosokawa *et al. BMC Pediatrics*   (2025) 25:276

Page 4 of 13

identified, yielding 60 intervention effect sizes. Although the average pre–post and pre–post effects on depressive symptoms were small, 13 (41%) prevention programs produced significant reductions in depressive symptoms, and four (13%) produced significant reductions in the risk of developing depressive disorders compared with the control group. Greater effects were seen in programs targeting high-risk individuals in samples with more women, samples targeting older adolescents, programs with shorter durations and homework assignments, and programs delivered by professional interventionists. Intervention content (e.g., focus on reducing negative cognitions or problem-solving training) and design features (e.g., random assignment or use of structured interviews) were unrelated to effect size. The results suggest that depression prevention efforts would produce higher yields by incorporating factors associated with greater intervention effectiveness (e.g., use of selective programs of shorter duration that include homework). Studies have shown that early childhood preventive interventions significantly affect mental health not only at school age but also in adolescence and adulthood [42, 43]. However, preventive SEL interventions for young children are uncommon in Asian countries, including Japan, and the effectiveness of Second Step for this age group has not been thoroughly evaluated. Therefore, to drastically minimize school maladjustment, we need to examine the effectiveness of Second Step SEL in young children.

The present study
This study assessed the effectiveness of the Second Step program in Japan by evaluating kindergarten children's social-emotional skills and behaviors before and after its completion. Second Step was to be implemented as a school initiative at the targeted kindergarten. We expected that children in the intervention group would have significantly higher social-emotional skills and lower problem behaviors compared with the control group. The research question for this study is whether Second Step works for Japanese kindergarten children.

Methods
Several kindergartens implemented the Second Step program for children aged 4 to 5 years as part of their daily education. Subsequently, we examined the program's effectiveness. To date, while Second Step has been introduced in Japan, its effectiveness has not been properly verified. To ensure the validity of our evaluation, we confirmed that the program had not been previously implemented in the participating groups and that teachers in both intervention and control groups were not familiar with it. A pre–post assessment was conducted using the measurements described below.

Participants
The participants were kindergarten children aged 4 to 5 years. The number of children who participated in the study was 73 of 117 in the intervention group and 91 of 119 in the control group. In addition, all five teachers in the intervention group and all seven in the control group participated in the study (Fig. 1). The data of 73 children in the intervention group and 91 in the control group were analyzed. The intervention and control groups comprised two and three facilities, respectively. These kindergartens were located in Kyoto City, Japan. The program was implemented on a kindergarten-by-kindergarten basis.

The decision to implement the program was made independently by each kindergarten principal as part of their institution's extracurricular activities. This practice reflects the broader cultural and operational context of early childhood education in Japan, where principals play a pivotal role in deciding the scope of activities provided at their facilities [44]. As a result, the researchers did not assign intervention conditions, which introduces the potential for self-selection bias.

Specifically, kindergartens whose principals opted to implement the program may have had certain pre-existing characteristics differentiating them from those that did not, such as an institutional emphasis on SEL, higher levels of parental engagement, or more resources dedicated to extracurricular programs. These factors could have influenced the observed outcomes, limiting the generalizability of the findings to other educational contexts. Self-selection into educational interventions has been noted in prior studies as a factor that can both amplify and obscure intervention effects [45, 46].

To mitigate this limitation, future research could employ strategies such as random assignment at the cluster level or propensity score matching to reduce baseline differences between participating and non-participating kindergartens. Nevertheless, the findings from the current study provide valuable preliminary evidence of the program's effectiveness in real-world educational settings, which is an essential step toward broader implementation and scalability.

Participant demographics at T1 (Baseline)
The participants' demographics at T1 are presented in Table 1 and Fig. 1. The average age of the children was 4.94 years (standard deviation = 0.30) for the intervention group and 4.92 years (standard deviation = 0.28) for the control group. There were 43 (58.90%) and 50 (54.95%) boys in the intervention and control groups, respectively. A chi-square test revealed no significant differences in attributes between the groups.
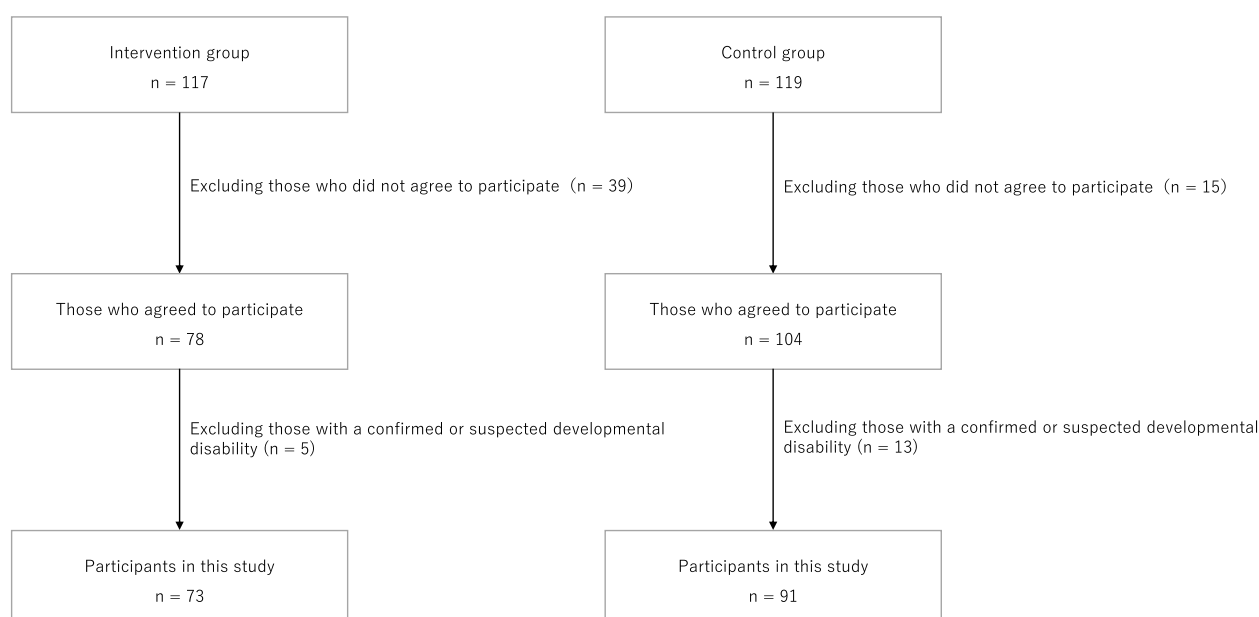
Fig. 1 Participants' demographic characteristics

Table 1 Participant characteristics at T1

		Intervention group (*n* = 73)		Control group (*n* = 91)		
	N	*N*	*%*	*N*	*%*	*p*
Child's sex						
Male	93	43	58.90	50	54.95	.611
Female	71	30	41.10	41	45.05	
Family composition						
Single-parent family	6	2	2.74	4	4.40	.575
Two-parent family	158	71	97.26	87	95.60	
Annual household income (million JPY)						
< 4	25	13	18.84	12	14.29	.243
≥ 4–8	78	30	43.48	48	57.14	
≥ 8	50	26	37.68	24	28.57	
Maternal educational level						
Middle or high school	21	12	16.67	9	10.34	.169
Junior college or vocational school	51	18	25.00	33	37.93	
University or graduate school	87	42	58.33	45	51.72	
Paternal educational level						
Middle or high school	27	11	15.94	16	18.82	.703
Junior college or vocational school	23	9	13.04	14	16.47	
University or graduate school	104	49	71.01	55	64.71	

T1, before program implementation (baseline), *JPY* Japanese yen

Intervention

The study followed a structured sequence, beginning with participant recruitment and consent, followed by baseline assessments conducted by trained teachers. Intervention sessions were delivered over eight weeks, with fidelity monitored through weekly teacher check-ins. Post-intervention assessments mirrored the baseline process.

Hosokawa *et al. BMC Pediatrics* (2025) 25:276

Page 6 of 13

The decision to implement the Second Step program was made on a kindergarten-by-kindergarten basis. Two of the five kindergartens elected to implement the program while three opted not to, allowing for follow-up surveys to enable long-term comparisons [18]. The Second Step program employed in this study was Course 1, designed for 4–8-year-old children. This program focused on fostering social-emotional skills through modules such as "Mutual Understanding" (expressing one's own feelings and empathizing with others' feelings to create relationships based on mutual understanding and care) and "Problem Solving" (tackling difficult situations positively, developing the ability to solve problems flexibly, and creating smooth relationships) [47]. Although its primary goal was to prevent violence, the program also aimed to promote the positive development of social-emotional skills and human qualities through social skills learning [48].

Before the program's implementation, kindergarten class teachers underwent Second Step training. This training, provided in small groups, began with an introduction to the principles of SEL, followed by detailed explanations of the Second Step program's technical content. Teachers engaged in discussions and role-playing sessions using the actual educational materials [49]. This comprehensive training ensured that the facilitators were well equipped to deliver the program effectively and consistently. The training sessions were conducted in accordance with the guidelines established by the Committee for Children, which developed the Second Step program.

The intervention itself was carried out over 25 sessions, each lasting approximately 20 min. Sessions were divided into four chapters: Chapter 1, Learning Skills; Chapter 2, Empathy; Chapter 3, Handling Emotions; and Chapter 4, Problem Solving. During the sessions, Second Step practitioners actively encouraged children to express their feelings and empathize with others by using visual aids depicting situations that might occur in their daily lives. The program was facilitated by graduates of the Second Step course, who had completed the prescribed lectures and role-playing sessions stipulated by the program's developers. To ensure quality and consistency, multiple facilitators were involved and all educational materials were available in Japanese.

The control group did not participate in the Second Step intervention. This distinction allowed for a comparison of the program's effectiveness in fostering social-emotional skills between children who participated in the intervention and those who did not.

Measurement

Social skills were assessed based on teachers' evaluations, while behavior problems were reported by parents through standardized questionnaires, ensuring perspectives from both school and home environments. This approach aligns with previous research emphasizing the importance of incorporating multiple informants when assessing children's social-emotional skills and behavior to capture a comprehensive understanding of their functioning across different contexts [50, 51].

Social-emotional skills

Children's social-emotional skills were assessed through teacher-reported measures [52, 53]. Specifically, kindergarten teachers, who interact closely with children in structured and unstructured settings, provided their evaluations. This approach is consistent with previous research that highlights the reliability of teacher assessments in capturing children's social-emotional competencies, as teachers observe these behaviors across various contexts in their daily interactions [54, 55]. The social skills measure comprises 24 items, each rated on a 3-point Likert scale (0 = never, 1 = sometimes, 2 = very often). The measure is divided into three subscales: assertiveness (8 items), self-control (8 items), and cooperation (8 items). Subscale scores are calculated by summing the eight corresponding items, resulting in a range of 0 to 16 for each subscale. These variables are based on the Social Skills Rating System and are positively correlated [56]; the Social Skills Rating System is one of the most extensively used social skills instruments, validated by the National Institute of Child Health and Human Development [57, 58]. Items are rated on a 3-point Likert scale (0 = never, 1 = sometimes, 2 = very often), with higher scores indicating greater social competence. Internal consistency and construct validity were adequate for the subscales. To ensure the instruments' reliability, we assessed their internal consistency using Cronbach's alpha. The subscales' internal consistency at T1 was as follows: assertiveness; 0.80, self-control; 0.89, and cooperation; 0.93. The subscales' internal consistency at T2 was 0.82 for assertiveness, 0.88 for self-control, and 0.94 for cooperation.

Behavioral problems

The Strengths and Difficulties Questionnaire [59] was used to assess children's behavior before and after the intervention. The instrument comprises 25 items, each rated on a 3-point Likert scale (0 = not true, 1 = somewhat true, 2 = certainly true), and includes five subscales: emotional symptoms, conduct problems, hyperactivity/inattention, peer problems, and prosocial behavior. We calculated the total difficulties score as the sum of the first four subscales, consistent with established scoring methods [60]. The total difficulties score thus ranges from 0 to 40, with higher scores indicating greater

Hosokawa *et al. BMC Pediatrics*   (2025) 25:276

Page 7 of 13

difficulties. This approach aligns with standard scoring procedures and ensures comparability with prior research. The Japanese version, with high reliability and validity, was used in this study [61]. Twenty items from the instrument were used to assess behavioral and emotional problems, rated on a 3-point Likert scale across the following subscales: emotional symptoms, conduct problems, hyperactivity/inattention, and peer problems. The total score of these four subscales was used. Higher subscale scores imply more emotional and behavioral problems. As our aim was to assess 20 items of behavior problems related to school adjustment, we did not assess the five items of prosociality. Regarding reliability, the internal consistency for behavior problems at T1 and T2 was 0.84 and 0.87, respectively.

Demographics
Parents reported information on their family structure (single-parent or two-parent family), household income (< 4 million Japanese yen [JPY], ≥ 4–8 million JPY, ≥ 8 million JPY), and parents' educational level (middle school/high school, junior college/vocational school, university, or graduate school).

Data analysis
A chi-square test was employed to compare the target attributes of the intervention and control groups at T1 (baseline). To conduct the program evaluation, a pre–post assessment was conducted. The skills and behaviors of the two groups were then compared using an unpaired t-test. Next, we used a paired t-test to assess changes in the two groups' skills and behaviors between T1 and T2 (after program completion). In addition, to enhance the statistical robustness of the results, we calculated effect sizes to interpret the magnitude of the observed differences and associations. According to Cohen's (1988) benchmarks, values of 0.2, 0.5, and 0.8 represent small, medium, and large effects, respectively [62]. The use of these measures is consistent with established practices in psychological and educational research [63, 64]. Effect sizes were interpreted alongside statistical significance to highlight practical relevance, which is particularly important in SEL interventions [65]. These metrics facilitate comparisons with previous studies, thereby supporting generalizability and application in policy contexts. All analyses were conducted using SPSS Statistics software version 29 (IBM Corp., Armonk, NY, USA).

Statement of ethics
All 4–5-year-old children in the participating kindergarten classes took part in the Second Step program because it is a structured initiative integrated into the kindergarten's regular curriculum. However, participation in the evaluation of children's social-emotional skills and behavioral problems was voluntary. Children's parents were informed about the evaluation and were given the opportunity to opt out. As a result, while all children participated in the program as part of their educational activities, only those whose parents provided consent were included in the evaluation. This approach aligns with ethical practices in early childhood education research, which emphasize the importance of parental consent and the voluntary nature of participation in assessments [66, 67]. For children's evaluation, the parents were informed at the beginning of the study about its purpose and the relevant procedures, as well as the voluntary nature of participation. Parents provided written informed consent on behalf of their children prior to the study. Ethical approval was obtained from the Kyoto University Ethics Committee (R3657).

Results
Changes in social competencies (Intervention vs. Control Group)
Changes in social competencies (intervention vs. control group) are shown in Figs. 2, 3 and 4. The differences between the groups were examined using an independent t-test. At T1, there was no statistically significant difference between them. However, at T2, the intervention group displayed significantly higher assertion (Fig. 2), self-control (Fig. 3), and cooperation (Fig. 4) scores than the control group.

Changes in social competencies (T1 vs. T2)
Changes in social competencies (T1 vs. T2) are shown in Table 2. The differences between T1 and T2 were examined using a paired-sample t-test. In the intervention group, social competencies at T2 were significantly higher with respect to assertion, self-control, and cooperation than at T1. However, no significant differences were observed in the control group. Regarding the effect size of social competencies, it was moderate or higher in the intervention group.

Changes in Behavior (Intervention vs. Control Group)
Changes in behavioral problems (intervention vs. control groups) are shown in Fig. 5. The differences between the groups were examined using an independent t-test. At T1, there was no significant difference for the intervention group compared with the control group. However, at T2, the intervention group had
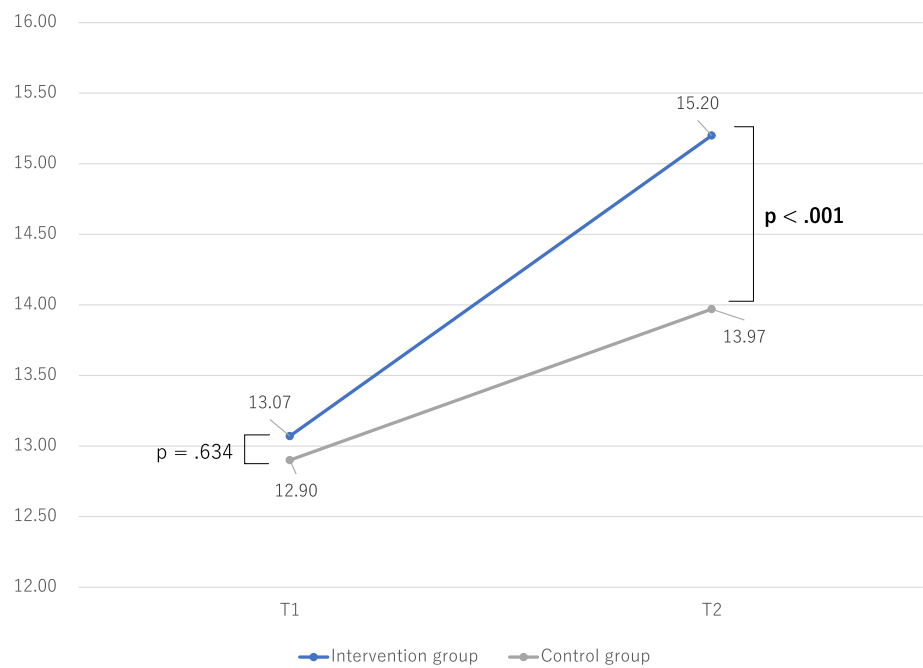
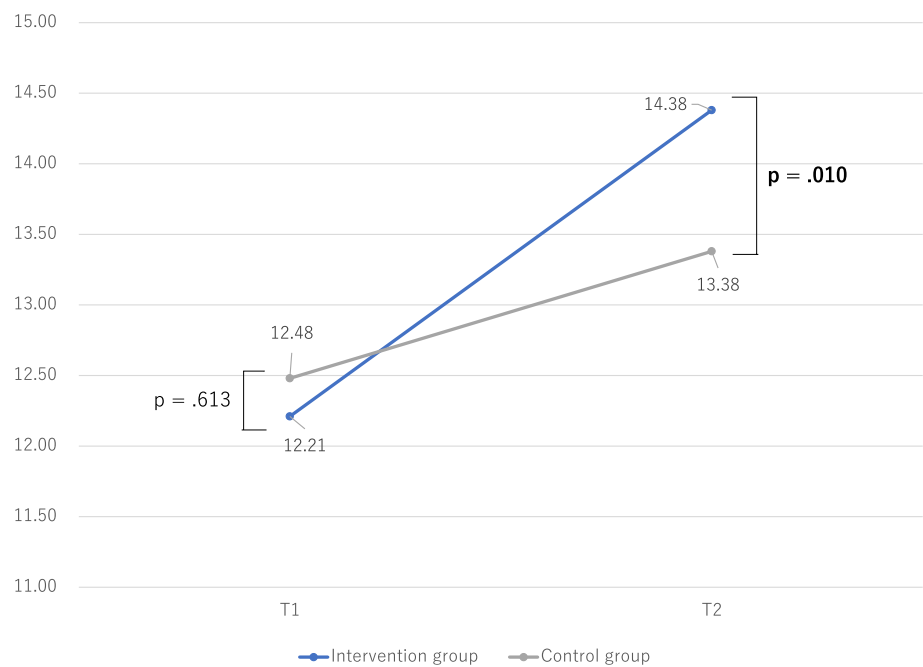**Fig. 2** Changes in social competence: assertiveness

Fig. 3 Changes in social competence: self-control

significantly lower behavioral problem scores than the control group.

Changes in behavior (T1 vs. T2)

Changes in behavior (T1 vs. T2) are shown in Table 3. The differences were examined using a paired-sample t-test. In the intervention group, behavioral problem scores at T2 were significantly lower than at T1. No
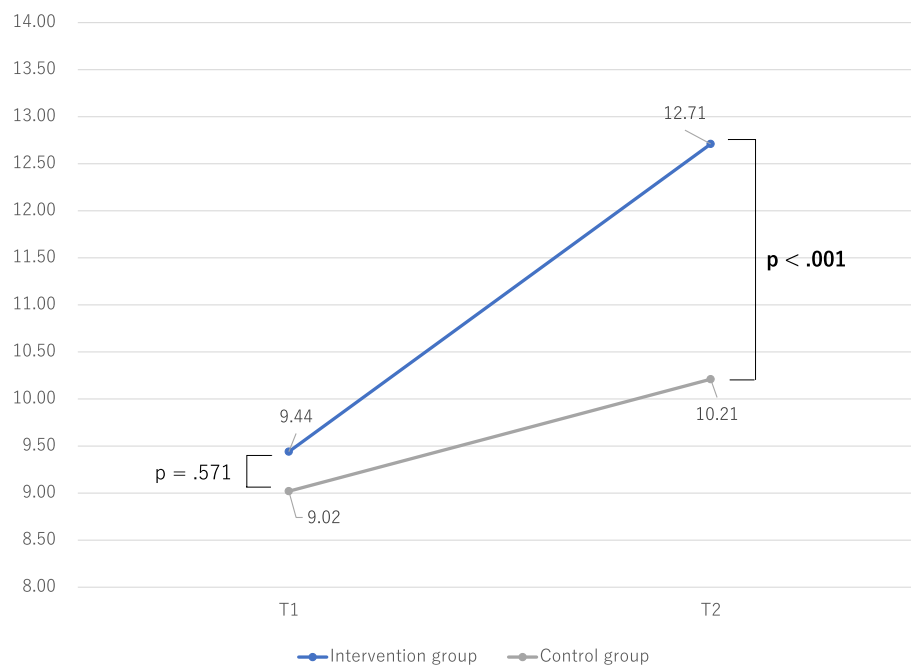
Hosokawa *et al. BMC Pediatrics*   (2025) 25:276

Page 9 of 13

Fig. 4 Changes in social competence: cooperation

significant changes in behavioral problems were observed in the control group. Regarding the effect size of behavior, it was moderate in the intervention group.

To evaluate the intervention's effectiveness, we calculated Cohen's d for pre- and post-intervention differences between groups. The effect sizes indicated a moderate to large impact of the intervention on social-emotional skill development.

Discussion

This study evaluated the effects of a program (Second Step) aimed at promoting social-emotional skills in kindergarten children. Participating children exhibited significantly improved social-emotional skills and significantly reduced behavioral issues compared with those at baseline. The results indicate that the intervention had a meaningful impact on both social competencies and behavioral outcomes. Specifically, the effect sizes for social competencies in the intervention group were moderate to large, reflecting substantial improvements. Behavioral outcomes in the intervention group also showed moderate effect sizes, suggesting significant progress in reducing problematic behaviors. These findings are consistent with prior research on SEL interventions. For instance, Durlak et al. [48] reported that such programs typically achieve moderate effect sizes in social and behavioral domains, emphasizing their efficacy in fostering social competencies and reducing maladaptive behaviors. This consistency across studies underscores the reliability of the intervention's impact.

Social-emotional skill development during the kindergarten years is critical for academic success and for positive functioning in elementary school, adolescence, and adulthood [22, 68, 69]. This is one of the few studies on a kindergarten curriculum that has been universally employed across kindergarten classes in Asia.

As kindergarteners spend much of their day at school, this environment is ideal for providing mass interventions and is a good platform for identifying and providing support to children who need it. Selective and universal program approaches are currently used to implement preventive interventions. In a selective approach, individuals or groups with significantly higher than average risk of developing mental health disorders are selected based on knowledge of the associated risk factors. By contrast, regardless of the participants' level of risk, a universal approach is used with an entire population or classroom. Generally, universal interventions are designed to promote overall mental health and well-being. Teachers provided learning about the principles of the Second Step of SEL, followed by role-playing with other children, using real-life materials. Through this hands-on learning, the effectiveness of the program was observed. As expected, children in the intervention group showed significantly higher social-emotional skills and fewer problem behaviors than the control group.

Hosokawa *et al. BMC Pediatrics*   (2025) 25:276

Page 10 of 13

Table 2 Changes in social competencies (T1 vs. T2)

	Intervention group				Control group			
	M	*SD*	*Cohen's d*	*p*	*M*	*SD*	*Cohen's d*	*p*
Assertion								
T1	13.07	*1.95*	1.172	<.001	12.90	*2.58*	0.453	<.001
T2	15.20	*1.41*			13.97	*1.56*		
Self-control								
T1	12.21	*3.11*	0.743	<.001	12.48	*3.64*	0.392	<.001
T2	14.38	*2.37*			13.38	*2.43*		
Cooperation								
T1	9.44	*4.98*	0.782	<.001	9.02	*4.49*	0.273	.011
T2	12.71	*4.03*			10.21	*3.58*		

T1, before program implementation (baseline), T2, after program completion, *M* Median, *SD* Standard deviation

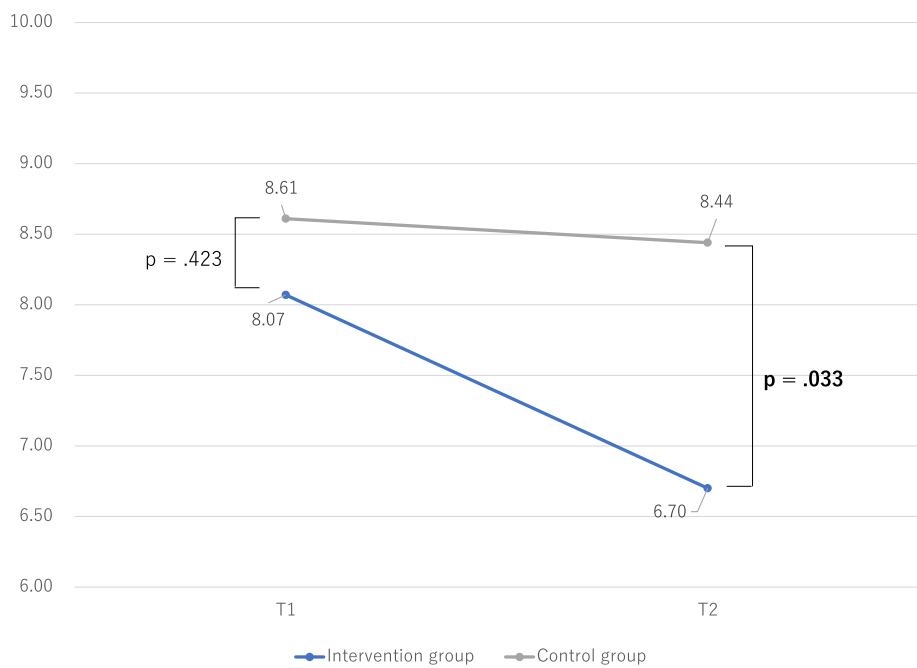**Fig. 5** Changes in behavior: behavioral problems

Table 3 Changes in behavior (T1 vs. T2)

	Intervention group				Control group			
	M	*SD*	*Cohen's d*	*p*	*M*	*SD*	*Cohen's d*	*p*
T1	8.07	*3.80*	0.597	<.001	8.61	*4.54*	0.042	.703
T2	6.70	*3.85*			8.44	*5.19*		

T1, before program implementation (baseline), T2, after program completion, *M* median, *SD* standard deviation

Limitations

While this study has considerable strengths, including comparisons with a control group and independent evaluations by teachers and parents, it has some limitations. First, it is not a randomized study. However, because all kindergartens are officially licensed facilities and the

overall quality indicators were adequate, the baseline criteria were reliable before the experimental curriculum was implemented. Thus, the effects may be significant in other comparison groups (such as children who do not attend kindergarten or attend schools with subpar environments). Despite the Second Step program's widespread adoption and robust theoretical and empirical grounding, few published randomized trials have examined its efficacy.

Second, threats to validity cannot be completely excluded for pre–post-trial designs. Therefore, while this study's results are promising, follow-up studies are needed.

Third, the analysis relied primarily on teacher and parent reports. Although practical constraints make it difficult to include other measures of treatment outcomes in a community mental health setting, it is recommended that strategies for assessing treatment outcomes—such as child-, teacher-, and observational reports—are used in future research. Nevertheless, Second Step is a manualized program and the intervention was unlikely to deviate significantly from its intended structure. Furthermore, it is recommended that future studies include a larger sample to assess moderators of treatment outcomes more consistently. While our findings provide valuable insights into the effectiveness of the intervention within the specific context of the studied kindergarten programs, caution should be exercised in generalizing these results to all kindergarten settings. Educational environments can vary significantly in terms of curriculum design, teacher qualifications, and cultural factors, which may influence the applicability of our results elsewhere. Future research should consider these variables to determine the broader applicability of such interventions.

Lastly, the study's limitations include the self-selection of participants into the intervention group, which may limit generalizability. Additionally, non-blind ratings by teachers who conducted both pre- and post-assessments may have introduced biases [70]. Furthermore, the absence of objective fidelity measures represents another limitation that future research should address [71]. Overall, the findings of this study provide optimistic directions for young children's social-emotional skill development despite the limitations.

Conclusions
This study evaluated the effectiveness of Second Step, a universal preventive intervention program for kindergarten children aimed at developing their social-emotional skills. It was hypothesized that these competencies would improve after the intervention. This hypothesis was supported, with the intervention group reporting improved self-control and cooperation compared with the control group before and immediately after the intervention. Despite its uniqueness as a child-centered intervention program and although further research is needed, direct intervention with children appears to be an effective strategy for improving social competence.

Declarations

Ethics approval and consent to participate
The Kyoto University Graduate School and Faculty of Medicine Ethics Committee approved this study. The study was conducted following the principles of the Declaration of Helsinki. The participating children's parents were informed at the beginning of the study about the purpose and relevant procedures and that cooperation was voluntary. Parents provided written informed consent for themselves and on behalf of their children, with the understanding that this study would comprise both baseline and follow-up surveys, which was approved by the Kyoto University Ethics Committee (R3657).

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

References
1. Rhoades BL, Warren HK, Domitrovich CE, Greenberg MT. Examining the link between preschool social–emotional competence and first grade academic achievement: the role of attention skills. Early Child Res Q. 2011;26(2):182–91. https://doi.org/10.1016/j.ecresq.2010.07.003.
2. Denham SA, Blair KA, DeMulder E, Levitas J, Sawyer K, Auerbach-Major S, et al. Preschool emotional competence: pathway to social competence? Child Dev. 2003;74(1):238–56. https://doi.org/10.1111/1467-8624.00533.
3. Denham SA, Way E, Kalb SC, Warren-Khot HK, Bassett HH. Preschoolers' social information processing and early school success: the challenging situations task. Br J Dev Psychol. 2013;31(2):180–97. https://doi.org/10.1111/j.2044-835X.2012.02085.x.

4. Smith M. Social and emotional competencies: contributions to young African-American children's peer acceptance. Early Educ Dev. 2001;12(1):49–72. https://doi.org/10.1207/s15566935eed1201_4.

5. Garner PW, Waajid B. Emotion knowledge and self-regulation as predictors of preschoolers' cognitive ability, classroom behavior, and social competence. J Psychoeducational Assess. 2012;30(4):330–43. https://doi.org/10.1177/0734282912449441.

6. Coolahan K, Fantuzzo J, Mendez J, McDermott P. Preschool peer interactions and readiness to learn: relationships between classroom peer play and learning behaviors and conduct. J Educ Psychol. 2000;92(3):458–65. https://doi.org/10.1037/0022-0663.92.3.458.

7. Denham SA, Bassett HH, Zinsser K, Wyatt TM. How preschoolers' social–emotional learning predicts their early school success: developing theory-promoting, competency-based assessments. Infant Child Dev. 2014;23(4):426–54. https://doi.org/10.1002/icd.1840.

8. Eisenberg N, Spinrad TL, Eggum ND. Emotion-related self-regulation and its relation to children's maladjustment. Annu Rev Clin Psychol. 2010;6:495–525. https://doi.org/10.1146/annurev.clinpsy.121208.131208.

9. Heckman JJ, Rubinstein Y. The importance of noncognitive skills: lessons from the GED testing program. Am Econ Rev. 2001;91(2):145–9. https://doi.org/10.1257/aer.91.2.145.

10. Chernyshenko OS, Kankaraš M, Drasgow F. Social and emotional skills for student success and well-being: conceptual framework for the OECD study on social and emotional skills. In: OECD Education Working Papers. 2018. https://doi.org/10.1787/db1d8e59-en.

11. Bruce J, Gunnar MR, Pears KC, Fisher PA. Early adverse care, stress neurobiology, and prevention science: lessons learned. Prev Sci. 2013;14(3):247–56. https://doi.org/10.1007/s11121-012-0354-6.

12. Reynolds AJ, Temple JA. Cost-effective early childhood development programs from preschool to third grade. Annu Rev Clin Psychol. 2008;4:109–39. https://doi.org/10.1146/annurev.clinpsy.3.022806.091411.

13. Bierman KL, Nix RL, Greenberg MT, Blair C, Domitrovich CE. Executive functions and school readiness intervention: impact, moderation, and mediation in the Head Start REDI program. Dev Psychopathol. 2008;20(3):821–43. https://doi.org/10.1017/S0954579408000394.

14. Blair C. School readiness: integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. Am Psychol. 2002;57(2):111–27. https://doi.org/10.1037/0003-066x.57.2.111.

15. Blair C, Diamond A. Biological processes in prevention and intervention: the promotion of self-regulation as a means of preventing school failure. Dev Psychopathol. 2008;20(3):899–911. https://doi.org/10.1017/S0954579408000436.

16. Blair C, Raver CC. School readiness and self-regulation: a developmental psychobiological approach. Annu Rev Psychol. 2015;66:711–31. https://doi.org/10.1146/annurev-psych-010814-015221.

17. Rimm-Kaufman SE, Pianta RC, Cox MJ. Teachers' judgments of problems in the transition to kindergarten. Early Child Res Q. 2000;15(2):147–66. https://doi.org/10.1016/S0885-2006(00)00049-1.

18. Hosokawa R, Katsura T. A longitudinal study of socioeconomic status, family processes, and child adjustment from preschool until early elementary school: the role of social competence. Child Adolesc Psychiatry Ment Health. 2017;11(1):62. https://doi.org/10.1186/s13034-017-0206-z.

19. Hosokawa R, Katsura T. Socioeconomic status, emotional/behavioral difficulties, and social competence among preschool children in Japan. J Child Fam Stud. 2018;27(12):4001–14. https://doi.org/10.1007/s10826-018-1231-0.

20. Grimm KJ, Steele JS, Mashburn AJ, Burchinal M, Pianta RC. Early behavioral associations of achievement trajectories. Dev Psychol. 2010;46(5):976–83. https://doi.org/10.1037/a0018878.

21. Nesbitt KT, Baker-Ward L, Willoughby MT. Executive function mediates socio-economic and racial differences in early academic achievement. Early Child Res Q. 2013;28(4):774–83. https://doi.org/10.1016/j.ecresq.2013.07.005.

22. McClelland MM, Acock AC, Piccinin A, Rhea SA, Stallings MC. Relations between preschool attention span-persistence and age 25 educational outcomes. Early Child Res Q. 2013;28(2):314–24. https://doi.org/10.1016/j.ecresq.2012.07.008.

23. Kautz T, Heckman JJ, Diris R, Ter Weel B, Borghans L. Fostering and measuring skills: improving cognitive and non-cognitive skills to promote lifetime success. In: OECD Education Working Papers. 2014. https://doi.org/10.2139/ssrn.2543890.

24. Collaborative for Academic, Social, and Emotional Learning (CASEL). 2023. https://casel.org. Accessed 21 Mar 2025.

25. Elbertson NA, Brackett MA, Weissberg RP. School-based social and emotional learning (SEL) programming: current perspectives. In: Hargreaves A, Lieberman A, Fullan M, Hopkins D, editors. Second international handbook of educational change. Dordrecht, Netherlands: Springer International Handbooks of Education; 2014. pp. 1017–32.

26. Wigelsworth M, Humphrey N, Kalambouka A, Lendrum A. A review of key findings from the national evaluation of the Social and Emotional Aspects of Learning (SEAL) programme. Educ Psychol (Lond). 2016;36(7):1207–22.

27. Domitrovich CE, Durlak JA, Staley KC, Weissberg RP. Social-emotional competence: an essential factor for promoting positive adjustment and reducing risk in school children. Child Dev. 2017;88(2):408–16. https://doi.org/10.1111/cdev.12739.

28. Blewitt C, Fuller-Tyszkiewicz M, Nolan A, Bergmeier H, Vicary D, Huang T, et al. Social and emotional learning associated with universal curriculum-based interventions in early childhood education and care centers: a systematic review and meta-analysis. JAMA Netw Open. 2018;1(8): e185727. https://doi.org/10.1001/jamanetworkopen.2018.5727.

29. Corcoran RP, Cheung ACK, Kim E, Xie C. Effective universal school-based social and emotional learning programs for improving academic achievement: a systematic review and meta-analysis of 50 years of research. Educ Res Rev. 2018;25:56–72. https://doi.org/10.1016/j.edurev.2017.12.001.

30. Mondi CF, Giovanelli A, Reynolds AJ. Fostering socio-emotional learning through early childhood intervention. Int J Child Care Educ Policy. 2021;15(1):1–43. https://doi.org/10.1186/s40723-021-00084-8.

31. Weissberg RP, Cascarino J. Academic learning+ social-emotional learning= national priority. Phi Delta Kappan. 2013;95(2):8–13. https://doi.org/10.1177/003172171309500203.

32. Upshur CC, Heyman M, Wenz-Gross M. Efficacy trial of the second step early learning (SSEL) curriculum: preliminary outcomes. J Appl Dev Psychol. 2017;50:15–25. https://doi.org/10.1016/j.appdev.2017.03.004.

33. Wenz-Gross M, Yoo Y, Upshur CC, Gambino AJ. Pathways to kindergarten readiness: the roles of second step early learning curriculum and social emotional, executive functioning, preschool academic and task behavior skills. Front Psychol. 2018;9:1886. https://doi.org/10.3389/fpsyg.2018.01886.

34. Domitrovich CE, Cortes RC, Greenberg MT. Improving young children's social and emotional competence: a randomized trial of the preschool "PATHS" curriculum. J Prim Prev. 2007;28(2):67–91. https://doi.org/10.1007/s10935-007-0081-0.

35. Belfield C, Bowden AB, Klapp A, Levin H, Shand R, Zander S. The economic value of social and emotional learning. J Benefit Cost Anal. 2015;6(3):508–44. https://doi.org/10.1017/bca.2015.55.

36. Committee for Children. Second Step early learning: program guide. 2022. https://www.cfchildren.org/second-step/early-learning. Accessed 21 Mar 2025.

37. Schonert-Reichl KA, Hanson-Peterson J, Hymel S. Social and emotional learning and preservice teacher education. In: Durlak JA, Domitrovich CE, Weissberg RP, Gullotta TP, editors. Handbook of social and emotional learning: research and practice. New York: The Guilford Press; 2015. pp. 406–21.

38. Jones SM, Bailey R, Brush K, Kahn J. Preparing for effective SEL implementation. Harvard Graduate School of Education. 2017. https://www.wallacefoundation.org. Accessed 21 Mar 2025.

39. Stice E, Shaw H, Bohon C, Marti CN, Rohde P. A meta-analytic review of depression prevention programs for children and adolescents: factors that predict magnitude of intervention effects. J Consult Clin Psychol. 2009;77(3):486–503. https://doi.org/10.1037/a0015168.

40. Moy GE, Hazen A. A systematic review of the Second Step program. J Sch Psychol. 2018;71:18–41. https://doi.org/10.1016/j.jsp.2018.10.006.

41. Moy G, Polanin JR, McPherson C, Phan TV. International adoption of the "Second Step" program: moderating variables in treatment effects. Sch Psychol Int. 2018;39(4):333–59. https://doi.org/10.1177/0143034318789030.

42. Fisak BJ, Richard D, Mann A. The prevention of child and adolescent anxiety: a meta-analytic review. Prev Sci. 2011;12(3):255–68. https://doi.org/10.1007/s11121-011-0210-0.

43. Rasing SPA, Creemers DHM, Janssens JMAM, Scholte RHJ. Depression and anxiety prevention based on cognitive behavioral therapy for at-risk

Hosokawa *et al. BMC Pediatrics*   (2025) 25:276

Page 13 of 13

adolescents: a meta-analytic review. Front Psychol. 2017;8:1066. https://doi.org/10.3389/fpsyg.2017.01066.

44. Kaga Y. Early childhood education in Japan: a historical and comparative perspective. Int J Early Child Educ. 2008;40(2):71–87.

45. Heckman JJ. Skill formation and the economics of investing in disadvantaged children. Science. 2006;312(5782):1900–2. https://doi.org/10.1126/science.1128898.

46. Riggs NR, Greenberg MT, Kusché CA, Pentz MA. The mediational role of neurocognition in the behavioral outcomes of a social-emotional prevention program in elementary school students: effects of the PATHS curriculum. Prev Sci. 2006;7(1):91–102. https://doi.org/10.1007/s11121-005-0022-1.

47. Cook CR, Crews SD, Hale LR, et al. Promoting social and emotional learning in elementary school: evaluation of Strong Kids and Second Step. J Sch Psychol. 2007;45(1):13–39.

48. Durlak JA, Weissberg RP, Dymnicki AB, Taylor RD, Schellinger KB. The impact of enhancing students' social and emotional learning: a meta-analysis of school-based universal interventions. Child Dev. 2011;82(1):405–32. https://doi.org/10.1111/j.1467-8624.2010.01564.x.

49. Merrell KW, Gueldner BA, Ross SW, Isava DM. How effective are school bullying intervention programs? A meta-analysis of intervention research. Sch Psychol Q. 2008;23(1):26–42. https://doi.org/10.1037/1045-3830.23.1.26.

50. Achenbach TM, McConaughy SH, Howell CT. (2006). Child/adolescent behavioral and emotional problems: implications of cross-informant correlations for situational specificity. Psychol Bull. 2006;101(2):213–32.

51. De Los RA, Thomas SA, Goodman KL, Kundey SMA. Principles underlying the use of multiple informants' reports. Annu Rev Clin Psychol. 2013;9(1):123–49. https://doi.org/10.1146/annurev-clinpsy-050212-185617.

52. Anme T, Shinohara R, Sugisawa Y, Tanaka E, Watanabe T, Hoshino T. Validity and reliability of the Social Skill Scale (SSS) as an index of social competence for preschool children. J Health Sci. 2013;3:5–11. https://doi.org/10.5923/j.health.20130301.02.

53. Gresham FM, Elliot SN. Social Skills Rating System PsycTESTS Dataset. 1990. https://doi.org/10.1037/t10269-000.AccessedDDMonYear.

54. Takahashi Y, Okada K, Hoshino T, Anme T. Developmental trajectories of social skills during early childhood and links to parenting practices in a Japanese sample. PLoS ONE. 2015;10(8): e0135357. https://doi.org/10.1371/journal.pone.0135357.

55. Denham SA, Bassett HH, Wyatt T. The socialization of emotional competence. In: Grusec JE, Hastings PD, editors. Handbook of socialization: Theory and research. 2nd ed. The Guilford Press; 2015. pp. 590–613.

56. von Suchodoletz A, Trommsdorff G, Heikamp T. Linking maternal warmth and responsiveness to children's self-regulation. Soc Dev. 2011;20(3):486–503. https://doi.org/10.1111/j.1467-9507.2010.00588.x.

57. National Institute of Child Health and Human Development Early Child Care Research Network. Fathers' and mothers' parenting behavior and beliefs as predictors of children's social adjustment in the transition to school. J Fam Psychol. 2004;18(4):628–38. https://doi.org/10.1037/0893-3200.18.4.628.

58. Burt KB, Roisman GI. Competence and psychopathology: cascade effects in the NICHD study of early child care and youth development. Dev Psychopathol. 2010;22(3):557–67. https://doi.org/10.1017/S0954579410000271.

59. Goodman R. The Strengths and Difficulties Questionnaire: a research note. J Child Psychol Psychiatry. 1997;38(5):581–6. https://doi.org/10.1111/j.1469-7610.1997.tb01545.x.

60. Goodman R. Psychometric properties of the Strengths and Difficulties Questionnaire. J Am Acad Child Adolesc Psychiatry. 2001;40(11):1337–45. https://doi.org/10.1097/00004583-200111000-00015.

61. Matsuishi T, Nagano M, Araki Y, Tanaka Y, Iwasaki M, Yamashita Y, et al. Scale properties of the Japanese version of the Strengths and Difficulties Questionnaire (SDQ): a study of infant and school children in community samples. Brain Dev. 2008;30(6):410–5. https://doi.org/10.1016/j.braindev.2007.12.003.

62. Cohen J. Statistical power analysis for the behavioral sciences. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum Associates; 1988.

63. Sullivan GM, Feinn R. Using effect size—or why the P value is not enough. J Grad Med Educ. 2012;4(3):279–82. https://doi.org/10.4300/JGME-D-12-00156.1.

64. Lakens D. Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. Front Psychol. 2013;4:863. https://doi.org/10.3389/fpsyg.2013.00863.

65. Lipsey MW, Puzio K, Yun C, Hebert MA, Steinka-Fry K, Cole MW, et al. Translating the statistical representation of the effects of education interventions into more readily interpretable forms. National Center for Special Education Research. 2012. https://ies.ed.gov/ncser/pubs/20133000/pdf/20133000.pdf. Accessed 21 Mar 2025.

66. Sheridan SM, Knoche LL, Edwards CP, Bovaird JA, Kupzyk KA. Parent engagement and school readiness: effects of the Getting Ready intervention on preschool children's social-emotional competencies. Early Educ Dev. 2010;21(1):125–56. https://doi.org/10.1080/10409280902783517.

67. Bierman KL, Nix RL, Greenberg MT, Blair C, Domitrovich CE. Executive functions and school readiness intervention: impact, moderation, and mediation in the Head Start REDI program. Dev Psychopathol. 2010;20(3):821–43. https://doi.org/10.1017/S0954579408000394.

68. Mella N, Pansu P, Batruch A, Bressan M, Bressoux P, Brown G, et al. Socioemotional competencies and school performance in adolescence: what role for school adjustment? Front Psychol. 2021;12: 640661. https://doi.org/10.3389/fpsyg.2021.640661.

69. Low S, Cook CR, Smolkowski K, Buntain-Ricklefs J. Promoting social–emotional competence: an evaluation of the elementary version of Second Step. J Sch Psychol. 2015;53:463–77. https://doi.org/10.1016/j.jsp.2015.09.002.

70. McLeod BD, Weisz JR, Wood JJ. Examining the influence of rater beliefs on outcome ratings in controlled trials of youth psychotherapy. J Consult Clin Psychol. 2013;81(5):775–87.

71. Gresham FM, MacMillan DL, Beebe-Frankenberger ME, Bocian KM. Fidelity in intervention research: definitions, measures, and implications for outcomes. Educ Psychol Rev. 2017;29(4):547–74.

Publisher's Note