Development of the START Program for Academic Readiness and Its Impact on Behavioral Self-regulation in Japanese Kindergarteners

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Abstract

The "first-grade problem" of the lack of concentration, listening, and following of instruction has been widely identified among Japanese kindergarten students. To promote their executive functioning and self-regulation to prevent this issue, we developed the Social Thinking and Academic Readiness Training (START) program. The experimental group in which the program was implemented contained 79 children (average age = 73.22 months), and the standard practices group contained 70 children (average age = 72.91 months). Before and after the intervention, the children underwent tasks to test their behavioral self-regulation and executive function (working memory). For behavioral self-regulation, a significant interaction occurred between condition (experimental and standard practices) and time (pre- and post-test), suggesting that these 6 START lessons promoted self-regulation. However, no effects were found on either auditory or visual memory. Teacher reports in surveys were consistent with the executive functioning outcomes, reporting improvement in children's concentration, listening, and self-regulation skills.

Keywords Self-regulation · Executive function · Intervention · Kindergartener

Introduction

In Japan, compulsory education begins with elementary school. Japanese first-grade students are usually expected to sit quietly for 45 min at a time and listen to teachers or classmates. During breaks, children have more freedom in how they choose to behave; however, after 10 min, they are required to resume classroom activities, even if they want to play more. When children interact with their classmates, they need to be able to concentrate on what others are saying, to control their own emotions, and interact with others appropriately. Thus, to adapt to elementary school life, children require self-regulation skills. Although most young children successfully navigate the transition from pre-school

to a more structured and academically focused primary school environment, this can be difficult for children without the self-regulation skills necessary for a more structured setting (Tominey & McClelland, 2011).

Many Japanese educators have identified what is commonly called the *first grade problem*. Many first-grade students do not listen while their teachers talk, do not follow instructions, and will stand and walk around either inside or outside the classroom. The Tokyo Metropolitan Board of Education (2009) reported that 23.9% of all public elementary schools in Tokyo struggled with the first grade problem for several months, with 54.5% reporting that it continued until the end of the school year. This paper describes an attempt to prevent the first-grade problem by developing a short kindergarten program of teacher-delivered classroom lessons focused on promoting self-regulatory behavior related to academic functioning (e.g., focusing attention, impulse control).

Importance of Self-regulation at School

Self-regulation is a comprehensive construct that describes the capacity to regulate one's emotions, cognitions, and behaviors (Calkins, 2007). McClelland et al. (2007) posited

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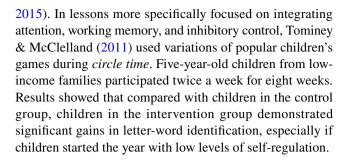   Baltimore County, Baltimore, MD, USA

that behavioral self-regulation involves applying executive functions to behavior. Executive functions include attentional or cognitive flexibility, working memory, and inhibitory control (Happaney et al., 2004).

Previous studies suggest that self-regulation is important for both academic and social success (Jimerson et al., 2006). Self-regulation skills are essential for planning and implementing goal-oriented activities (Hofmann et al., 2012) and achieving successful adaptive development at every life stage (Blair & Razza, 2007). Many studies have demonstrated that self-regulation significantly predicts academic achievement and social outcomes throughout elementary school (Rimm-Kaufman et al., 2009), even after controlling for child IQ (von Suchodoletz et al., 2009). Furthermore, children with behavioral difficulties related to self-regulation seem to benefit less than their peers in a classroom learning environment (Howse et al., 2003; McClelland et al., 2000). Further, research suggests that self-regulation is an important mechanism that helps explain why some *at-risk* children perform worse in school than others. For example, studies have found that children in families with low incomes (McClelland et al., 2000; Wanless et al., 2011) and children in foster care (Pears et al., 2007, 2012) have relatively lower levels of self-regulation when compared with other children.

Interventions to Improve Self-regulation and Executive Function

Classroom-based curricula and activities have been shown to improve children's self-regulation and executive function (Diamond & Lee, 2011), such as the Promoting Alternative Thinking Strategies (PATHS) curriculum (Bierman et al., 2008; Domitrovich et al., 2007) and the Chicago School Readiness Project (CSRP; Raver et al., 2011). These interventions represent additions to pre-existing classroom curricula. For example, the preschool PATHS curriculum focuses on promoting social and emotional skills and has been shown to effectively improve children's self-regulation and social-emotional competence (Bierman et al., 2008; Domitrovich et al., 2007). The CSRP is a comprehensive intervention focused on training teachers to consult with mental health professionals on specific classroom strategies (e.g., effective classroom management) and has been found to successfully promote self-regulation skills and academic achievement in children from low-income families (Raver et al., 2011). The Kids in Transition to School (KITS) program, which focuses on improving children's school readiness, has effectively improved self-regulation and reduced problem behavior in children in foster care (Pears et al., 2007, 2012).

The aforementioned programs require great time and expense, partly because they either focus on a range of social and emotional skills and/or academic skills (Schmitt et al., 2015). In lessons more specifically focused on integrating attention, working memory, and inhibitory control, Tominey & McClelland (2011) used variations of popular children's games during *circle time*. Five-year-old children from low-income families participated twice a week for eight weeks. Results showed that compared with children in the control group, children in the intervention group demonstrated significant gains in letter-word identification, especially if children started the year with low levels of self-regulation.

The Present Study

To our knowledge, there are no published studies that examine interventions meant to improve Japanese students' self-regulation skills. Although interventions have been used by individual teachers in Japanese schools, no research has been conducted to support their use. Thus, in this study, we adapted a program originally developed in the United States for use in Japanese schools. The Goal Orientation, Attribution Learning, & Self-control (GOALS) program fosters executive function and social information processing, emphasizing concentration and self-control in preschool children (Betkowski & Schultz, 2009). The first author translated these GOALS lessons into Japanese. The resulting curriculum is the Social Thinking & Academic Readiness Training (START) program, consisting of 6 academic readiness lessons related to self-regulation and execution function and 12 social thinking lessons related to interpersonal relationships (Imai-Matsumura, 2011).

The present study represents an initial attempt to validate the START program by implementing the 6 academic readiness lessons from the START program and examining: (1) if in a randomized trial of classrooms they impact Japanese kindergarten children's self-regulation and executive functioning, and (2) how Japanese kindergarten teachers who implemented these lessons perceived the implementation of and outcomes of these lessons. We expected these lessons to promote children's executive functioning and self-regulation in the classroom and for teachers to find the lessons easy to implement. We first describe these six lessons from the START program.

Intervention: START Program

The START lessons reflect a subset of the lessons from the GOALS program, a 35-lesson classroom-based curriculum developed in the United States to promote social, emotional, and academic skills (Betkowski & Schultz, 2009). We used six lessons focused on attention, working memory, and self-regulation in the START program. Attention involves not only orienting oneself towards others but also ignoring distractions and developing the ability to switch one's focus from one object or task to another (Rothbart & Posner, 2005;

Rueda et al., 2005). Meanwhile, working memory is critical for following through with instructions (Adams et al., 1999). As described below, the six lessons we chose from the START program allow children to practice each of these skills. Table 1 presents the theme and content of each lesson in the START program. Prior to translating the lessons, the PI read through the lessons and deemed the content and activities from these six lessons to be culturally appropriate for the Japanese kindergarten context.

The first lesson focuses on rules for listening and speaking in class. This teaches children to raise their hands when they want to speak, not speak when someone else is speaking, and not speak unless called upon. Children learn to wait until it is their turn and to concentrate and listen to the person speaking and receive reinforcement for doing so. The aim is to help children develop inhibitory control related to listening and speaking, such that they can stop

Table 1 Lesson themes and content for the START program

Academic readiness (self-regulation and executive function) lessons		
1	Rules for speaking in class	Children should not automatically shout out answers to the teacher's questions but raise their hands and wait to be called on
2	Paying attention	Children learn how to pay attention by watching, listening, and remaining quiet and learn why it is important to do so
3	Sustaining attention and ignoring distractions	Maintaining eye contact with the teacher and ignoring distractions is reinforced
4	Shifting attention and following directions	Children practice stopping what they are doing and making eye contact with the teacher
5	Emotional regulation of excitement	When children feel overly excited and need to calm down, they say to themselves, "Stop."
6	Emotional regulation of frustration and anger	When children feel overly frustrated or angry and need to calm down, they say to themselves, "Stop."
Social thinking lessons		
1	Understanding emotions logically (1) Same and different emotions	Just as objects and facial expressions are the same or different, children can understand the differences in their own and others' emotions and think logically about emotions
2	Understanding emotions logically (2) Why and because	Children consider the causes and consequences of their emotions as well as their actions and have perspectives on how to solve their emotional problems
3	Positive social goals (1) Objects	Children consider friendly goals in object-related troubles
4	Positive social goals (2) Group entry	Children consider friendly goals in interpersonal troubles
5	Friendly problem solving (1) Objects	Children learn friendly problem solving in object-related troubles
6	Friendly problem solving (2) Group entry and compromises	Children learn friendly problem solving in interpersonal troubles
7	Understanding ambiguous uncomfortable emotions (1) Self	Children understand some kinds of negative emotions. When they have negative emotions, they can think calmly about their own emotions, what they are against and whether their emotions are appropriate
8	Understanding ambiguous uncomfortable emotions (2) Peers	Children learn how to cope when they don't understand someone's emotions, such as asking them assertively
9	Positive interpreting (1) Physical provocations	Children can understand physical trouble as occurring by accident and not due to the intentional actions of the other person
10	Positive interpreting (2) Group entry situations	Children can understand that interpersonal problems are not because the other person was mean to them, but for a reason
11	Responding to physical provocations	Children learn solutions to physical problems
12	Responding to peer exclusion	Children learn the solution to peer exclusion

an initial response to demonstrate less automatic and more adaptive classroom behavior.

The second lesson focuses on paying attention. Children learn how to pay attention by watching, listening, and remaining quiet, and receive explanations of why it is important to do so. In this lesson, the teacher introduces a *Pay Attention* poster and displays it in the classroom to remind children how to pay attention. The children then play a working memory game in which, when the music stops, they must remember to direct their attention towards the teacher and immediately imitate her or his facial expression. Children are reinforced for expected attention shifting behaviors.

The third lesson focuses on teaching children how to maintain attention during classroom instruction. Teachers introduce the idea of ignoring distractions, and children practice maintaining eye contact with the teacher while being distracted by another adult or puppet. The fourth lesson focuses on shifting attention, following directions, and working memory. Children are instructed to paint or draw at tables. At various times during this activity, the teacher will say, *Look at me*. Children are to stop what they are doing and make eye contact with the teacher and receive reinforcement for doing so.

The fifth and sixth lessons focus on regulating excitement and negative emotions, respectively. When children feel overly excited, frustrated, or angry and need to calm down, they are taught to use the *freeze technique*, which involves stopping what they are doing, taking a quiet deep breath, and allowing their bodies to relax. Children learn and practice this technique so that when needed, they can inhibit negative behaviors, emotions, and thoughts by themselves. Children practice the technique repeatedly during various classroom activities. Teachers reinforce this skill by periodically asking children to stop their current activity and make eye contact with the teacher. Through this, the freeze technique becomes part of children's daily routines, with teachers instructing both entire classrooms and individual children on how and when to use this technique.

Materials and Methods

Participants and Setting

All 11 public kindergartens in a rural Japanese school district participated in this study. This area is an average suburban city in Hyogo prefecture, located in the center of mainland Japan. In Japan, the laws stipulate that parents with school-aged children who are recognized as having difficulty attending school for economic reasons can receive public assistance. In 2016, the proportion of parents receiving public assistance in this school district was 10–15%, compared

to the national average in Japan of 15.2% (Ministry of Education, 2019).

These 11 public kindergartens were housed in three different types of educational settings. There are two main lines of pre-school education in Japan. One is kindergarten, which is under the jurisdiction of the Ministry of Education, Culture, Sports, Science and Technology, and is regulated by the School Education Law. The purpose of kindergartens is to "care for young children, provide them with an appropriate environment, and promote their physical and mental development" (Article 77 of the School Education Law). The standard daily childcare time is four hours, and there are at least 39 weeks per year.

The other is nursery school under the jurisdiction of the Ministry of Health, Labor and Welfare, and is regulated by the Child Welfare Law. The purpose of nursery schools is to "take care of infants and toddlers who are lacking in childcare on a daily basis under the entrustment of their guardians" (Article 4 and Article 39 of the Child Welfare Law). In principle, the daily childcare hours are eight hours, and there are approximately 300 days per year.

In addition, "certified childcare centers," which are a combination of kindergartens and daycare centers, were established in 2006. This new system, under the jurisdiction of the Cabinet Office, provides consistent pre-school education and care for children from the age of 0 until they enter elementary school.

Although there is a difference in the governing body between the Ministry of Education, Culture, Sports, Science and Technology, the Ministry of Health, Labor and Welfare, and the Cabinet Office, the municipality actually oversees all three. In this study, public kindergartens, nursery schools, and certified childcare centers included in a single board of education are referred to as "kindergartens." Because they are overseen by a single board of education, teacher training and major events in these three organizations are conducted in the same way. The classrooms involved this study contained children in one of these three types of educational settings in their last year before their first year of elementary school.

We described the study's details to parents and received parental consent for 171 children to participate. All participating children were Japanese and at least five years old. Twenty-two children had missing data in either the pre-test or post-test, resulting in a total of 149 children with complete data. The most common reasons for attrition were children changing schools or being out sick during the pre- or post-test. This attrition rate is similar to, if not smaller than, rates reported in other studies (Domitrovich et al., 2007).

To randomize classrooms, we selected every other classroom from the list of 11 participating classrooms, generating 6 experimental and 5 standard practices. The experimental

group contained 79 children (31 boys and 48 girls) with an average age of 73.22 months ($SD = 3.06$), and the standard practices group contained 70 children (33 boys and 37 girls) with an average age of 72.91 months ($SD = 3.44$).

In each of the kindergartens in the experimental group, the classroom teacher implemented the START program. We had teacher demographic information for experimental but not standard practices classrooms. The START teachers averaged 46.7 years of age ($SD = 3.0$; *range* 43–52) and 22.0 years of teaching experience ($SD = 4.4$; *range* 14–26).

Intervention

In the experimental group, classroom teachers implemented the six START lessons. All teachers were female. Teacher training involved two steps: First, teachers attended a two-hour training led by the first author that focused on executive function and self-regulation. Second, teachers watched a START program tutorial DVD (Imai-Matsumura, 2011) containing visual examples of teachers implementing lessons from the START program.

Generally, teachers implemented one lesson a week over the course of six weeks. Each lesson lasted approximately 15–20 min. Following each lesson, throughout classroom days, the teachers used START techniques and encouraged the children to use START behaviors in the classroom.

Measures

Direct Measures of Self-regulation and Executive Function

Children were directly assessed both before and after implementation of START lessons. At both points, they completed three tasks focused on behavioral self-regulation, executive function, and, particularly, working memory: (1) the head-toes-knees-shoulders (HTKS) task (McClelland et al., 2007; Ponitz et al., 2008), (2) digit span backwards task, and (3) a hand movement task.

Behavioral Self-regulation To measure the START program's effect on self-regulation, we used the HTKS task, which involves integrating attention, switching, and working memory in 3–8-year-old children (McClelland et al., 2010; Ponitz et al., 2009). This game-style self-regulation measurement method is suitable for preschool children because they are not fully capable of reading and comprehending text. Moreover, previous studies have found a significant relationship between children's HTKS task scores and inhibitory control and attention, as evaluated by both parents and teachers (McClelland et al., 2007; Ponitz et al., 2009). The HTKS task is short and relatively simple, requiring children to pay attention, remember up to four rules, and demonstrate inhibitory control. Children are first asked to

touch their head or toes (knees or shoulders in the alternate version), and then the assessor asks them to do the opposite of what they were told (Tominey & McClelland, 2011). The possible score for each item is 0, 1, or 2: 0 denotes an incorrect response, 1 is a self-correct (e.g., the child moves towards an incorrect body part, but then stops and performs the correct action), and 2 is a correct response without movement towards an incorrect body part. There are 30 task items, and total scores range from 0 to 60 points, with higher scores indicating higher levels of behavioral self-regulation. This task has shown good reliability and constitutive validity in children aged 3–8 years (McClelland et al., 2014). In the current sample, the HTKS demonstrated strong internal reliability (Cronbach's $\alpha = 0.84$ at pre-test and 0.82 at post-test).

Auditory Working Memory To assess auditory working memory, we used the digit span backwards task from the Wechsler Intelligence Scale for Children—4th Edition (Japanese WISC-IV Publication Committee, 2010; Wechsler, 2003). In this task, the assessor states a series of numbers, and the child repeats them back in reverse order. It begins with two pairs of two-digit series presented one at a time. If the child answers one correctly, he or she continues to two three-digit series, and so on, up to two eight-digit series. Total scores range from 0 to 16, based on how many levels a child completes successfully. This task demonstrates good reliability and is limited to individuals between the ages of 5–16 years (Japanese WISC-IV Publication Committee, 2010; Wechsler, 2003).

Visuospatial Working Memory To assess visuospatial working memory, we used the hand movement task from the Kaufman Assessment Battery for Children—2nd Edition (KABC-II) (Japanese KABC-II Publication Committee, 2013; Kaufman & Kaufman, 2004). In this task, an assessor shows a child three hand movements: tapping a desk with the fist, palm, and side of the hand. The assessor performs these movements in a specific order, which the child is then asked to copy. Total scores range from 0 to 23. This task demonstrates good reliability and is limited to individuals between 2.5 and 18 years (Japanese KABC-II Publication Committee, 2013; Kaufman & Kaufman, 2004).

Compliance

We additionally measured child compliance on a subset of the sample. We selected one kindergarten classroom from each condition to record their morning clean-up activities both pre- and post-intervention. We were only able to conduct these observations in two kindergarten classrooms because of limited time and availability to conduct recordings. We asked all the kindergarten teachers if they would

allow videotaping within a certain period of time. The first kindergarten classroom that responded from each condition—that, the START condition and the standard practices condition—participated. This included 7 START children (2 boys and 5 girls) and 21 standard practices children (11 boys and 10 girls). To record the behaviors of all children in the classroom, we used three video cameras. We investigated the children's compliance with the teacher's instructions while cleaning up the classroom following free play. The classroom teacher in each kindergarten gave the same instructions, in the same room, and at the same time of day in both the pre- and post-intervention. Each teacher told the children to clean up once. We used a behavior coding system by DKH Inc. in Tokyo to measure the time between the end of the teacher's directed utterance to clean up and the end of each child's clean-up behavior. Starting from the end of the teacher's remark, the time until the end point of each child's clean-up behavior was determined.

Teacher Perceptions of the START Program

To examine teacher perceptions of the START program, we created a survey for this study. The six teachers who implemented the START program responded to the survey. It included four questions rated on four-point scales (0: not at all, 1: moderately, 2: very, 3: extremely): "How effective do you think the START program was?"; "How have the behaviors of children changed because of the START program?"; "How much do you think children have been able to focus because of the START program?"; and "How well are children preparing for school with the START program?" It also asked teachers to describe situations in which the children used skills taught in the START program, changes teachers saw in the children's behavior, episodes in which teachers felt the children were able to pay attention, and episodes in which teachers felt the children demonstrated increased school readiness. All teachers answered all four questions on the paper. Approximately one week after the children's direct measurement, 20–30 min individual interviews were conducted with each of the six teachers to review their answers on the paper.

Procedure

For Japanese kindergarten students, the academic year starts in April and has three semesters. From the fourth week of July to the end of August is summer vacation, and two weeks from the end of December to the beginning of January is winter vacation. Teachers implemented one START lesson per week in the second semester (November–December). This represents the second half of the second semester. We chose this time frame to provide the lessons as close to the end of the year as possible, closer to the transition to kindergarten, but also to allow time for the standard practices children to receive the lessons in the third semester. We conducted pre-test evaluations at the end of October and post-test evaluations in the middle of December. During this time, the standard practices group followed the standard Japanese curriculum. Trained graduate students blind to the intervention condition collected the data by testing children individually at the schools. Measurements took approximately 10–20 min. After we completed the post-test evaluations, the six teachers who implemented the START program completed the START survey and semi-structured interviews. In the third semester (January–March), the standard practices teachers implemented the START program.

Results

Data Analyses

Data were analyzed using IBM SPSS Statistics and Amos for Windows, version 25. We first conducted t-tests to compare groups at baseline to determine the effectiveness of randomization. Table 2 presents the means for all variables at baseline. There was one difference at baseline; children in the one START classroom selected for the compliance task took significantly longer to begin cleaning up toys following

Table 2 Baseline data for experimental and standard practices classrooms

	START				Standard				Group comparisons	
	n	M	SD	Range	n	M	SD	Range	t	p
Child age (months)	79	73.22	3.01	67–79	70	72.91	3.44	67–79	0.565	0.573
Child gender[a]	79	0.39	0.49	0–1	70	0.47	0.50	0–1	−0.969	0.334
Behavioral self-regulation	79	33.08	15.67	0–56	70	37.14	14.07	0–58	−1.658	0.099
Auditory working memory	79	3.85	1.92	0–8	70	3.96	2.02	0–8	−0.338	0.736
Visuospatial working memory	79	10.48	3.63	0–19	70	10.33	3.13	2–18	0.273	0.785
Compliance	6	149.15	18.81	113.0–164.6	20	29.63	14.37	5.8–56.3	14.357	<0.001

[a]Child gender: 0 = female, 1 = male

the teacher's instruction as compared to the children in the one standard practices classroom, $t(24) = 14.357$, $p < 0.001$.

Intervention Effects on Self-regulation and Working Memory

We conducted a separate mixed ANOVA (group × time) for each dependent variable. For behavioral self-regulation, a significant interaction occurred between condition (experimental and standard practices) and time (pre- and post-test), $F(1,147) = 5.852$, $p = 0.017$, $\eta^2 = 0.02$ (Table 3). The effect size was small. We then investigated the simple main effect. Behavioral self-regulation significantly increased from pre-test to post-test in experimental classrooms ($p < 0.001$) but not in standard practices classrooms. No significant interactions between condition and time occurred for auditory working memory, $F(1,147) = 0.048$, $p = 0.827$, $\eta^2 < 0.001$, or for visuospatial working memory, $F(1,147) = 0.620$, $p = 0.432$, $\eta^2 < 0.001$. These scores showed the main effects of time, with increases from pre-test to post-test across groups: auditory working memory, $F(1,147) = 34.727$, $p < 0.001$, and visuospatial working memory, $F(1, 147) = 8.743$, $p = 0.004$.

Intervention Effects on Compliance

Table 4 presents the compliance results based on observations of children's clean-up behaviors. A mixed ANOVA (condition × time) showed a significant interaction between condition (experimental and standard practices) and time (pre- and post-test), $F(1, 24) = 56.73$, $p < 0.001$, $\eta^2 = 0.11$ (Table 4). The effect size was large. We used Wilcoxon signed-rank tests to examine whether significant changes occurred over time in both conditions. In the experimental group, the post-measurement ($M = 115.45$, $SD = 15.53$) was significantly shorter than the pre-measurement ($M = 149.15$, $SD = 18.81$; $z(5) = -2.201$, $p = 0.028$). In the standard practices group, the post-measurement ($M = 61.32$, $SD = 16.84$) was significantly longer than the pre-measurement ($M = 29.62$, $SD = 14.37$; $z(19) = -3.547$, $p < 0.001$).

Teacher Perceptions of the START Program

START Survey

Table 5 presents the quantitative results regarding the 6 teachers' perceptions of the START program. The means for teachers' ratings for all four questions about the effectiveness of these six START lessons were in the *very* to *extremely* effective ranges.

Table 3 Self-regulation and working memory by condition and time

		Pre		Post		ANOVA (group x time)		Effect size
	n	M	SD	M	SD	F	p	η^2
Behavioral self-regulation								
START	79	33.08	15.67	43.33	13.82	5.852	0.017	0.02
Standard	70	37.14	14.07	40.81	15.84			
Auditory working memory								
START	79	3.85	1.92	4.68	1.84	0.048	0.827	<0.001
Standard	70	3.96	2.02	4.86	1.80			
Visuospatial working memory								
START	79	10.48	3.63	11.42	3.12	0.620	0.432	<0.001
Standard	70	10.33	3.13	10.87	3.11			

Table 4 Children's compliance by condition and time

		Pre		Post		ANOVA (group x time)		Effect size
	n	M	SD	M	SD	F	p	η^2
Compliance								
START	6	149.15	18.81	115.45	15.54	56.73	<0.001	0.11
Standard	20	29.63	14.37	61.32	16.84			

Table 5 Survey on the START program with the teachers

Questions to the teachers	M	SD	Range
(1) How effective do you think the START program was?	2.33	0.816	1–3
(2) How has the behavior of children changed because of the START program?	2.33	0.816	1–3
(3) How much do you think children have been able to focus because of the START program?	2.50	0.548	2–3
(4) How well are children preparing for school with the START program?	2.17	0.753	1–3

(0: not at all, 1: moderately, 2: very, 3: extremely)

Table 6 Example responses from teachers

(1) Tell us the situations in which the children used the learning contents of the START program
In class activities, each child's gaze has become more seriously focused on the teacher. [2]
I feel a heightened awareness that children are trying to implement what they have learned. [5]
After the activities, the children were able to concentrate when they all gave their reflections in turn. [2]

(2) Tell us the changes you have seen in the behavior of children
Everyone stops and listens when a child starts talking. [2]
Children have begun to focus on what others said. [5]
Some children whispered to their nearby friends who had not stopped their noisy behavior to stop. [3]

(3) Tell us the episodes in which you felt your children were able to pay attention
When the children played in an ensemble, they were able to focus on the teacher's direction. [1]
The number of children who turned their attention to the teacher as soon as she stood in front of them has increased. [3]
Children were able to prepare for concerts and other activities in a short amount of time. [1]

(4) Tell us the episodes in which you felt your children were more ready for school
Children have begun to listen to their friends as well as their teachers. [4]
Children can now sit on chairs, correct their posture, and listen without speaking. [1]
When children want to express their opinions during class, they silently raise their hands and begin to state their opinion after being called on by a teacher. [2]

Numbers in brackets indicate the number of teachers who reported this idea or sentiment

Table 6 presents sample teacher answers to each of the four questions asked in the survey. The numbers in brackets indicate the number of teachers who responded similarly. The most frequent types of comments included teachers reporting that children were trying hard to apply what they've learned and more often listened to and focused on what others, including teachers and peers, said to them.

Discussion

Development of a Program to Improve Self-regulation

In Japan, academic activities begin in the first grade of elementary school. In the first grade, some children cannot control certain aspects of their own behavior, such as walking around the classroom and not listening to their teachers and peers (Tokyo Metropolitan Board of Education, 2009). Therefore, we developed the START program, which is a classroom-based intervention designed

to be conducted by kindergarten classroom teachers in order to improve children's self-regulation skills. When selecting lessons from the GOALS program, we therefore paid particular attention to lessons focused on calming, waiting, and focusing, and created a short set of academic readiness (self-regulation & executive function) lessons (Table 1). The present study is among the first to report at least some positive benefits to training self-regulation in Japanese schools.

Effect on Self-regulation

The results of the present study indicated that the children who received the START program intervention showed significant improvement in self-regulation compared with children in the standard practices group. START teachers also reported this effect in survey responses. This is an encouraging finding, as some other classroom-based interventions have had difficulty impacting self-regulation skills (McClelland et al., 2019), particularly across the entire classroom (Tominey & McClelland, 2011). In the lessons, teachers

learned to use a *stop* command to help children stop behaviors. We asked teachers to encourage students to use the stop behavior anytime they needed, both inside and outside of the classroom. It is possible that acquiring this behavioral technique promoted self-regulation, as seen in the improved performance in the HTKS assessment.

While many studies in the US have targeted children with socio-economic risks, the START program targeted the general population. This was a school-based primary prevention intervention aimed at helping all children to be able to concentrate and listen to their teachers and other children and to be able to control and switch between situations. We believe that if these skills are developed in the children, the transition from kindergarten to elementary school will be smoother, and the first grade problem in Japan will significantly decrease.

Effects on Visuospatial and Auditory Working Memory

In both the visuospatial and auditory working memory tasks, we found no effect for the six START lessons. However, there was a main effect of time, indicating that in both conditions, children's working memory increased significantly. This may reflect age-related changes in working memory (Cowan, 2017). The standard practices curriculum, which both groups of children received, may also have helped promote working memory in some way. Additionally, our working memory assessments may not have been matched well with how the six START lessons used in this study address working memory. The digit span and hand movement assessments involve *cool* executive functioning (Zelazo & Carlson, 2012), whereas the START lessons practice working memory in conjunction with behavioral control, such as remembering to look at the teacher when the music turns off. Future evaluation of the START lessons should include more *hot* executive functioning assessments.

Effect on Compliance to Teachers' Instructions in the Classroom

In a subset of participating classrooms, we examined whether START lessons led to increased compliance to teacher instructions to clean up. Children who received the START lessons showed greater improvement in compliance times. The two classrooms selected for this subset analysis had baseline differences in compliance, however, with the small number of START children showing more delayed compliance. This leaves unanswered the question of whether or not these START children's baseline time to compliance scores might have been artificially inflated for some reason, such as a couple of the children being particularly slow to clean up on the one day of assessment. START teachers' reports about the impact of START lessons are consistent with a positive impact on compliance; they reported that as a consequence of START lessons, children paid more attention to them and completed activities more quickly. Furthermore, the START lessons do not teach compliance to instructions about cleaning up directly; instead, children practice listening to the teacher's voice and instructions in general. Additionally, in these lessons, children also practice changing ongoing behavior based on teacher verbalizations. This behavioral practice may very well have been generalized to instructions about cleaning up.

Although we did not assess academic abilities in this study, the positive findings for self-regulation and compliance suggest that the START lessons might have positive impacts on academic abilities. In this context, it is worth noting that children's abilities to self-regulate predict their academic abilities (McClelland et al., 2006; von Suchodoletz et al., 2013; Wanless et al., 2016). Nevertheless, future evaluations of the START program will be necessary to establish whether these lessons impact academic ability or achievement.

Teacher's Evaluation of the START Program

START teachers gave these six lessons high ratings. Teachers reported high effectiveness of the START program and children's behavioral changes, attentional focus, and school readiness. Additionally, the specific examples they reported about the effects of the lessons demonstrate that they believe children's concentration, listening, and self-regulation skills improved. In the interview with the teachers, they also described improvements in their teaching abilities. They reported paying attention to children more frequently and being more aware of their students' behavior. One reason for this could be that they and their children learned the *stop* technique used to stop behaviors, emotions, and thoughts, which makes it easier to notice children's behaviors. Additionally, one teacher reported having increased expectations for students. Because the teachers felt the children's abilities had improved in a short period of time, the teachers might have also felt empowered that their guidance could make a difference.

One aspect of the START program that a teacher reported experiencing difficulties with in the interview was the use of the puppet. In Japan, there is almost no classroom instruction that incorporates the use of puppets. Thus, it appears that the teacher was confused by a teaching method she had not previously implemented. We will consider not using puppets in the START program lessons in the future.

Limitations and Future Research Directions

The present study has several limitations. First, we had a limited amount of time to conduct assessments and therefore limited self-regulation assessments to three, relatively brief, assessments. This led us to only assess a limited number of self-regulatory constructs, and there are other, equally important constructs, such as inhibition or switching or *hot* executive functioning tasks that deserve attention. Future research should examine a wider range of executive functioning and self-regulatory skills to more fully examine the START program's effectiveness.

Second, the subset of children used to analyze compliance was small, as we could not record all the kindergarten classrooms for behavioral analysis. Future studies will need to use a larger sample and attempt to replicate this finding.

Third, the use of puppets in the program was challenging for Japanese kindergarten teachers. They seemed less familiar with role playing with puppets as GOALS teachers in the United States have been. This therefore may reflect a cultural difference that requires some program adaptation or enhanced training.

Finally, the effect sizes were relatively small. Although finding any significant differences in self-regulation is noteworthy at this early age, the limited number of lessons and corresponding relatively short period of time to practice self-regulation skills during the rest of the classroom day may have limited the strength of findings.

Implications and Conclusions

It is important to nurture children's executive function and self-control skills during kindergarten and the early elementary school years. Although many programs have been developed and validated in Europe and the United States, the empirical basis for such programs in Japan does not exist. It is therefore necessary to develop and evaluate programs within the Japanese context. This study provides initial evidence that the START program not only was evaluated positively by Japanese kindergarten teachers but also might have positive impacts on Japanese kindergarten children.

Although this study focused on Japanese children, the importance of self-regulation and adjustment problems for children during the transition from kindergarten to elementary school or nursery school to kindergarten is universal. The START program has improved self-regulation, which may be beneficial for children outside of Japan. The six lessons focusing on 'stop' behaviors are easy for children's teacher to implement, and the START program is based on the GOALS program in the US, which is written in English. Therefore, it may become a common prevention program for children's adjustment to school during the transition to school in other countries.

This study also was conducted with cooperation between the local educational administration and the first author and her university. As such, it provides an example of an effective partnership that might be mimicked in other regions of Japan. We plan to build on this success by promoting the START program in other Japanese regions as well.

In conclusion, the START program shows some promise to promote young Japanese children's self-regulation. Teachers reported improvement in children's attentional and behavioral functioning, and direct child assessment found some evidence for improvement in executive functioning and compliance. Future research will need to evaluate the impacts of the START program more fully, such as by using a more comprehensive battery of executive functioning and self-regulatory assessments and also by assessing children's academic abilities. Nevertheless, the present study's findings are encouraging enough that we might begin to develop an empirical foundation for preventive programming in Japanese schools.

Data availability The dataset analyzed in this study will be disclosed by the corresponding author on reasonable request.

Declarations

Conflict of interest The authors have no conflicts of interest to declare that are relevant to the contents of this article.

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