Development of Teacher-Reported Preschool Children's Self-Regulation Skills Assessment Scale

H. Gözde Ertürk Kara*   Tülin Güler Yıldız**   Burcu Atar***

Abstract

The aim of this study was to develop a scale to assess the self-regulation (SR) skills of preschool children. The developed scale enables the assessment of preschool children's self-regulation (SR) skills based on their teachers' observations. Exploratory and confirmatory factor analyses were conducted on Turkish preschool children with two samples (n=300 and n=289, respectively). The TR-PCSAS, with 42 items in total, has its three-factor structure supported by the factor analysis results. In addition to good reliability and construct validity results, the measure also had a strong positive correlation with a similar scale. A multiple regression analysis was conducted to predict children's SR skills based on gender, duration of attended early childhood education, and the teachers' professional experience. These variables significantly predicted children's SR skills. Findings demonstrate that the TR-PCSAS has appropriate psychometric characteristics and can be used for assessing the SR skills of preschool children in Turkiye.

Keywords: Preschool, self-regulation, scale development, teacher-reported preschool children's self-regulation skills assessment scale, TR-PCSAS.

* *Corresponding Author:* Assoc. Prof. Dr., Kocaeli University, Faculty of Education, Department of Early Childhood Education, Kocaeli, Turkey. E-mail: gozde.erturk@kocaeli.edu.tr, https://orcid.org/ 0000-0001-7895 -8938

** Prof. Dr., Hacettepe University, Faculty of Education, Department of Early Childhood Education, Ankara, Turkey. E-mail: tguler@hacettepe.edu.tr, https://orcid.org/ 0000-0002-9518-0336

*** Prof. Dr., Hacettepe University, Faculty of Education, Department of Educational Measurement and Evaluation, Ankara, Turkey. E-mail: burcua@hacettepe.edu.tr, https://orcid.org/ 0000-0003-3527-686X

Okul Öncesi Dönemdeki Çocukların Öz Düzenleme Becerilerini Değerlendirme Ölçeği- Öğretmen Formu Geliştirme Çalışması

H. Gözde Ertürk Kara[*]   **Tülin Güler Yıldız**[**]   **Burcu Atar**[***]

Öz

Bu çalışmanın amacı, okul öncesi dönemdeki çocukların öz düzenleme becerilerini değerlendirmek üzere bir ölçme aracı geliştirmektir. Geliştirilen ölçek, okul öncesi dönemdeki çocukların öz düzenleme becerilerinin öğretmen gözlemlerine dayanarak değerlendirilmesini sağlamaktadır. Açımlayıcı ve doğrulayıcı faktör analizleri okul öncesi dönemdeki çocuklardan oluşan iki farklı örneklem (sırasıyla n=300 ve n=289) üzerinde gerçekleştirilmiştir. Faktör analizi sonuçları, toplam 42 maddeden oluşan OÇÖBD-Ö'nün üç faktörlü yapısının yapı geçerliğini desteklemektedir. İyi güvenirlik ve faktör geçerliği sonuçlarına ek olarak, benzer bir ölçekle de pozitif ve yüksek korelasyona sahiptir. Çocukların öz düzenleme becerilerini cinsiyet, devam ettiği okul öncesi eğitimi süresi ve öğretmenlerin mesleki deneyimlerine göre yordamak için çoklu regresyon yapılmıştır. Bu değişkenler çocukların öz düzenleme becerilerini anlamlı şekilde yordamıştır. Bulgular, OÇÖBD-Ö'nün uygun psikometrik özelliklere sahip olduğunu ve Türkiye'deki okul öncesi çocukların öz düzenleme becerilerinin değerlendirilmesinde kullanılabileceğini göstermiştir.

Anahtar Sözcükler: Okul öncesi, öz düzenleme becerileri, ölçek geliştirme, Okul Öncesi Dönemdeki Çocukların Öz Düzenleme Becerilerini Değerlendirme Ölçeği- Öğretmen Formu, OÇÖBD-Ö.

[*] *Sorumlu Yazar:* Doç. Dr., Kocaeli Üniversitesi, Eğitim Fakültesi, Okul Öncesi Eğitimi Anabilim Dalı, Kocaeli, Türkiye. E-posta: gozde.erturk@kocaeli.edu.tr, https://orcid.org/ 0000-0001-7895-8938

[**] Prof. Dr., Hacettepe Üniversitesi, Eğitim Fakültesi, Okul Öncesi Eğitimi Anabilim Dalı, Ankara, Türkiye. E-posta: tguler@hacettepe.edu.tr, https://orcid.org/ 0000-0002-9518-0336

[***] Prof. Dr., Hacettepe Üniversitesi, Eğitim Fakültesi, Eğitimde Ölçme ve Değerlendirme Anabilim Dalı, Ankara, Türkiye. E-posta: burcua@hacettepe.edu.tr, https://orcid.org/ 0000-0003-3527-686X

Introduction

From a theoretical perspective, self-regulation is a proactive process whereby individuals consistently organize and manage their thoughts, emotions, and behaviors (Zimmerman, 2000). Self-regulation skills develop through certain stages from the beginning of life. In the first years of life, the development of self-regulation takes place in a stage defined by stage characterized by external regulation. At this stage, infants trust the people who take care of them, and adults support their self-regulation by using various methods to calm them down when they cry and feel restless. In the co-regulation stage, as the child grows and develops, they participate in the self-regulation process with the person who cares for them. The child starts to internalise calmness through reading books together, deep breathing, hugging, and other calming activities. Through meaningful experiences in these two stages, the child's secure attachment to the adult is strengthened. In the self-regulation stage, adults act as guides for children and encourage them to use various strategies for self-regulation. Self-regulation skills develop dramatically, especially in the early childhood years. Around the age of six, children can realize what calms them down and try methods (e.g., deep breathing) that help them cope with negative emotions (Bronson, 2000).

Self-regulation (SR) skills in the preschool period are very formative, enhancing preschoolers' ability to develop early academic skills, which lead to later success. An achievement gap may be observed between children who struggle with SR in the preschool period and their peers. Closing this gap is difficult or impossible (Garner & Waajid, 2012; Blair & Razza, 2007; Blair, 2003; Izard et al., 2001). In this regard, Robson et al. (2020) investigated the formative role of SR skills for later periods of life in their meta-analysis. They found that SR development in the preschool period (∼4 years of age) is positively associated with children's social competence, attitude towards school, and academic achievement at the beginning of the primary school years (∼8 years of age). It is negatively associated with internalization problems, peer victimization, and externalization problems. In addition, it was found that, at the beginning of primary school years, SR positively correlates with academic achievement (math and early literacy) in later school years (∼13 years of age), whereas that it negatively correlates with externalization problems (aggressive and criminal behavior), depressive symptoms, obesity, smoking, and substance use. Children's self-regulation (SR) skills in early school years are negatively related to aggressive and criminal behavior, depressive symptoms, anxiety, obesity, smoking, alcohol and substance use, and physical illness symptoms in adulthood (∼38 years of age).

SR skills can be taught and reinforced. The child's environment should offer various supportive experiences to improve their SR. The facilitating process starts in infancy, characterized by warmth, responsiveness, sensitivity, and secure attachment relationships with the adults around the child, and continues with sensitive guidance that respects the child's increasing need for autonomy and independence. When children start preschool, teachers are expected to establish a trusting relationship, to be a model for them in SR skills, and to incorporate self-regulatory activities in the content of the program (routines, activities, peer relations, etc.) (McClelland & Tominey, 2016). Therefore, one must evaluate children's SR skills through valid and reliable measurement tools to provide effective guidance and support in the early childhood years.

A variety of methods are used for the evaluation of children's SR skills. In addition to the assessments based on adult observation or report (Rimm-Kaufmann et al., 2005; Achenbach & Rescorla, 2000), direct assessment tools can be implemented via different tasks that are performed by the child individually (Ponitz et al., 2009; Smith-Donald et al., 2007). Although direct assessment tools form an important part of assessment and evaluation, they can still be time-consuming and expensive. These tools are generally used by researchers and clinical psychologists who have attended practical training. In the national literature, scales originally developed in Western culture and adapted to Turkish culture have been widely used in the assessment and evaluation of SR skills (Ertürk Kara et al., 2017; Sezgin & Demiriz, 2015; Fındık Tanrıbuyurdu & Güler Yıldız, 2014). For instance, Ertürk Kara et al. (2017) and Fındık Tanrıbuyurdu & Güler Yıldız (2014) have used the Preschool Self-Regulation Assessment (PSRA) to assess children's SR skills within the Turkish context. They have reported that culture-specific behaviors are observed in children's task performances, particularly in the tasks Toy Wait and Snack Delay, which are related to the positive emotion subscale of PSRA. According to these results, Turkish children tend to be dependent on practitioners' directions during these tasks, compared to their

Western counterparts. For this reason, children's behaviors within these tasks do not show variance, all children wait for practitioners' directions patiently. Researchers have argued that children's behavior is due to culture rather than the high level of perseverance. Also, researchers have stated that the children do not go beyond the directions given by the adult they see as authoritative in the teacher-centered, traditional education approach. This interpretation of the researchers has been supported by their findings regarding the quality of teacher-child interactions. To this end, Merenda (2006) has underlined the importance of ensuring that the culture in which the scales are originally developed and the culture in which they are adapted be similar. Considering that the scales on SR skills are generally developed by researchers from the Western culture, and it is known that Turkish and Western cultures are quite different, there is a need for new assessment tools to more effectively assess children's SR in Turkish culture.

The current study aims to develop an easily implementable, valid, and reliable measurement tool to assess the SR skills of preschool children for reasons such as cultural specificity, time-saving for researchers and educators, and cost efficiency. The implementation process of the scale does not require any equipment or materials. Since the assessment process is based on observation, the scale is filled out by the child's teacher rather than by an outside researcher. The scale serves to assess preschool children's self-regulation skills by considering the process, rather than implementing a one-shot assessment, which is based on the principle that data about the child should be collected over time. The scale is also appropriate for evaluation in terms of temporal and spatial aspects.

Method

During the scale development process, the processing steps suggested by DeVellis & Thorpe (2021) were followed. In the first stage of the study, the item pool was formed to assess children's SR skills. In the next stage, Exploratory Factor Analysis (EFA) was performed to examine the structure of the scale items. Since the Tau-equivalent model provides acceptable goodness of fit, Cronbach's alpha values were calculated to analyze the scale's internal consistency. The factor structure identified by EFA was investigated on a different sample and then a confirmatory factor analysis (CFA) was performed. Finally, analyses were performed to assess the criterion validity of the scale and its relationship with various variables through correlational assessments.

Scale Development

The research team, consisting of an early childhood education specialist, two colleagues who had experience researching SR, and a specialist in the field of measurement and evaluation, carried out the item generation process of the scale. Items were written by two early childhood education specialists in the research team. Previous research on the assessment of SR skills was reviewed (MacKenzie, 2015; Cameron Ponitz et al., 2008; Smith-Donald et al., 2007; Bronson et al., 1990).

SR is described as an umbrella term in the literature. It involves the development of children's ability to regulate their emotions, thoughts, and behaviors, enabling them to act in a positive, goal-directed, and purposeful manner. In the early years of life, the foundations of emotional and cognitive SR are integrally linked, and both are necessary for behavioral SR (Posner & Rothbart, 2000). Considering this information, the first item pool, including 71 items, was formed, and the researchers approached self-regulation skills under three dimensions: cognitive, behavioral, and emotional regulation. Researchers focused on executive functions and attention components of cognitive regulation; naming, recognizing, understanding, expressing, and controlling emotions as processes of emotional regulation; and the components of impulse control and delaying gratification of behavior regulation.

A focus group interview was conducted to evaluate whether the scale items were accurate, whether they included the skills to be measured, and whether there were similar or inappropriate items. The focus group interview was conducted with two teachers who have more than ten years of professional experience and a master's degree in the field of early childhood education. The revisions were made according to the focus group discussion. For instance, to make the two items clearer, explanatory examples were written in parentheses after the items. One item in the item pool was divided into two items: "He/She works/plays independently without adult support." Lastly, the opinions of three

specialists in the field of early childhood education and one specialist in the field of measurement and evaluation were sought, and these four specialists reached a high level (.92) consensus on the items (Miles & Huberman, 1994).

Participants

The research was carried out in two phases, and different participant groups were studied for each phase. EFA and reliability analyses were performed in the first phase. The demographic characteristics of the participants in the first phase are given in Table 1.

Table 1. *Demographic characteristics of the participants who participated in the first phase*

		f	**%**
Gender	Girl	173	57,1
	Boy	127	42,3
Number of Siblings	Only child	81	27,0
	One sibling	124	41,3
	Two siblings	57	19,0
	Three or more siblings	38	12,7
Order of Birth	Youngest child	106	35,3
	Middle child	36	12,0
	Eldest child	77	25,7
Duration of Preschool Education	Less than one year	120	40,0
	One to two years	135	45,0
	Two to three years	37	12,3
	Three years	6	2,0
Mother's Education Level	Illiterate	21	7,0
	Primary	38	12,7
	High school	63	21,0
	Undergraduate	93	31,0
Father's Education Level	Illiterate	8	2,7
	Primary	34	11,3
	High school	70	23,3
	Undergraduate	93	31,0
Mother's Working Status	Working	114	38,0
	Not working	186	62,0
Types of ECE Institutions	Kindergarten in primary school	121	40,3
	Independent preschool	92	30,7
	Private school	35	11,7
	Kindergarten in secondary school	32	10,7
	Kindergarten within vocational and technical high schools	14	4,7
	Institutional kindergarten	6	2,0

A total of 300 children, 173 girls and 127 boys participated in this phase. The ages of the participant children ranged from 34 months to 79 months (M = 63.37, SD = 8.39). 27% of child participants were only children, 41.3% of them had one sibling, 19% had two siblings, and 12.7% had three or more siblings. 35.3% of the participating children were the youngest children in their families; 25.7% of them were the eldest children; and 12% were the middle children. Forty percent of the child participants attended formal early childhood education for less than one year, 45% for one to two years, 12.3% for two to three years, and 2.3% for three years. Seven percent of the mothers and 2.7% of the fathers were illiterate. 31% of the children's mothers and fathers had an undergraduate degree, 21% of the children's mothers and 23.3% of fathers were high school graduates, and 12.7% of the children's mothers and 11.3% of fathers were primary school graduates. Sixty-two percent of the children's mothers did not work. 40.3% of the children attended kindergarten in primary schools; 30.7% attended independent preschools; 11.7% attended private schools; 10.7% attended kindergarten in secondary schools; 4.7%

attended kindergarten within vocational and technical high schools; and 2% attended institutional kindergarten. During the second stage of the study, CFA and criterion validity analyses were carried out, along with the examination of correlations between children's SR skills, their gender, and the professional experiences of their teachers.

The demographic characteristics of the participants in the second phase are given in Table 2.

Table 2. *Demographic characteristics of the participants who participated in the second phase*

		f	**%**
Gender	Girl	154	53,3
	Boy	135	46,7
Number of Siblings	Only child	124	42,9
	One sibling	122	42,2
	Two siblings	35	12,1
	Three or more siblings	8	2,8
Order of Birth	Youngest child	106	44,6
	Middle child	36	36,7
	Eldest child	77	4,5
Duration of Preschool Education	Less than one year	129	44,6
	One to two years	106	36,7
	Two to three years	41	14,2
	Three years	13	4,5
Mother's Education Level	Illiterate	1	0,3
	Primary	19	6,6
	High school	45	15,6
	Undergraduate	161	55,7
Father's Education Level	Illiterate	1	0,3
	Primary	12	4,2
	High school	55	19,0
	Undergraduate	168	58,1
Mother's Working Status	Working	181	62,6
	Not working	108	37,4
Types of ECE Institutions	Kindergarten in primary school	77	26,6
	Independent preschool	25	8,7
	Private school	174	60,2
	Kindergarten in secondary school	20	7,0
	Kindergarten within vocational and technical high schools	6	2,1
	Institutional kindergarten	5	1,7

A total of 289 children, 154 girls (53.3%) and 135 boys (46.7%), participated in this phase. The ages of the children ranged from 36 months to 84 months (M = 59.31, SD = 10.38). 42.9% of participant children were only children, 42.2% of them had one sibling, 12.1% had two siblings, and 2.8% had three or more siblings. 44.6% of the children attended formal early childhood education for less than 1 year, 36.7% of them for 1–2 years, 14.2% for 2–3 years, and 4.5% for more than 3 years. Only one of the children's parents was illiterate. 55.7% of the mothers and 58.1% of the fathers had an undergraduate degree, 15.6% of the mothers and 19% of the fathers were high school graduates, and 6.6% of the mothers and 4.2% of the fathers were primary school graduates. Thirty-seven-point four percent of the mothers did not work. 26.6% of the children attended kindergarten classrooms in primary schools, 8.7% of them attended independent preschool, 60.2% attended kindergarten in private schools, 7% attended kindergarten in secondary school, 2.1% attended kindergarten in vocational and technical high schools, and 1.7% attended institutional kindergarten.

Research Instruments and Procedures

Demographic Information Form

This form includes the participant children's age, gender, number of siblings, duration of formal early childhood education experience, educational background of their parents, employment status of the mothers, type of school children attends.

The Preliminary Teacher Reported – Preschool Children's Self-Regulation Skills Assessment scale (TR-PCSAS)

Considering the focus group interviews, related literature, and professional opinions, the scale was structured in three subscales: behavior regulation, emotion regulation, and cognitive regulation. The cognitive regulation subscale consists of 35 items (for example, Item 2: He/She has difficulty making decisions when there are many options). Item 3: He/She needs a reminder to start an activity). The behavior regulation subscale consists of 18 items, for instance, Item 19: He/She uses materials without harm, Item 28: He/She does not want to get in line, for example, for riding a swing or washing hands. Lastly, the emotion regulation subscale consists of 18 items (for example Item 58: He/she uses the names of emotions correctly (for instance, happy, sad, confused, etc.), Item 56: He/she talks about the causes and consequences of his/her feelings). There were 71 items in the first item pool. The items in the scale were designed on a five-point Likert scale with options 1, never, 2, rarely, 3, sometimes, 4, often, and 5, always.

Self-Regulation Skills Teacher Form (SRSTF) for 4-6 Years-Old Children

This form was used for criterion validity, as it showed comparable scale characteristics. It was developed by Ivrendi & Erol (2018). The items in the scale were arranged in a five-point Likert scale with options (1-never, 2-rarely, 3-sometimes, 4-usually, and 5-always). It consists of three subscales: inhibitory control, working memory, and attention. The scale can be evaluated based on the total score and subscales. After the validity and reliability analyses of the assessment tool were conducted, 22 items remained. The maximum score that can be obtained from the scale is 110, and the minimum score is 22. The 11th item in the scale (He/She harms the environment when he/she gets angry.) is reverse scored. Cronbach's alpha coefficient is calculated to be 0.94.

Ethics committee approval was obtained to carry out the study. In the first phase of the study, the Preliminary Teacher Reported – Preschool Children's Self-Regulation Skills Assessment Scale (TR-PCSAS), in its initial version with 71 items, and the Demographic Information Form were combined in Google Forms. Within the second phase, TR-PCSAS (42 items after EFA), the Self-Regulation Skills Scale (SRSTF) for 4–6-year-old children's Teacher Form, and the Demographic Information Form were sequentially combined in a single Google Form. Within the two phases of the study, the early childhood education teachers were easily accessible, willing to participate in the research, and contribute to the research process through the forms. The teachers filled out the forms provided in the link for each child in their classrooms one by one, based on observations specific to each child.

Data Analysis

The data obtained from the TR-PCSAS, the SRSTF for 4- to 6-year-old children, and the demographic information form were analyzed with the SPSS program. Exploratory and confirmatory factor analyses, which assessed the construct validity of TR-PCSAS, were carried out as part of the related studies. The MPlus 8 software was used for confirmatory factor analysis. As part of the criterion validity analysis of TR-PCSAS, the relationship between TR-PCSAS scores and the SRSTF for 4-6-year-old children was analyzed by calculating the Pearson correlation coefficient. As part of the reliability analysis of TR-PCSAS, Cronbach's alpha was examined. Finally, the predictive power of children's gender, the duration of formal early childhood education experience, and their teachers' professional experience with SR skills were analyzed by multiple linear regression.

Ethical Procedures

The Human Sciences Ethics Committee of the corresponding author's university approved the research protocol on March 24, 2023. The data were obtained from teachers' observations of children.

For this reason, the participating teachers and the families of the children were informed about the content of the study. The research was based on voluntary participation.

Results

Results for Exploratory Factor Analysis (EFA)

EFA was performed on 71 items included in the analysis. It was decided to apply the principal axis factoring method. One of the types of vertical rotation was performed using the Promax method. The Kaiser-Meyer-Olkin (KMO) value was calculated as .950, which indicates that the data are factorable. According to the results of the Bartlett test, which tests whether the correlation matrix is a unit matrix (null hypothesis), the p-value was calculated to be greater than .001. Consequently, the null hypothesis was rejected at the alpha level of .05. Therefore, the correlation matrix differed significantly from the unit matrix. According to the parallel analysis, three factors have been extracted. Hence, EFA was performed following the three-factor structure. Three factors explained 57.63% of the total variance. The items were removed in the final analysis, taking into consideration factor loadings and common variance values, as follows: 4, 8, 9, 10, 13, 17, 18, 21, 22, 24, 27, 29, 37, 40, 41, 42, 43, 45, 47, 49, 50, 54, 59, 60, 61, 62, 63, 66. The high percentage of the total variance was considered valid because it showed that this scale could measure its intended construct. It is also seen in the scree plot given in Figure I that the final scale is three-dimensional.
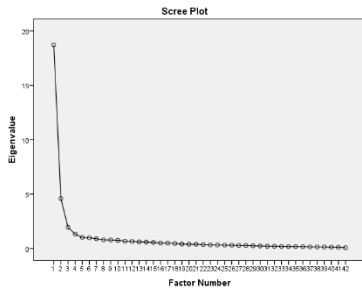
Figure 1. *Scree Pilot*

Table 3 demonstrates the factor rotation results and provides

Table 3. *EFA Results for the TR-PCSAS: Three-Factor Solution with Varimax Rotation for The EFA Sample (N = 300).*

ID	F1:CR P	F2:BR P	F3:ER P	h2
7	.882			.682
53	.833			.649
35	.830			.545
33	.814			.746
34	.797			.586
39	.791			.715
5	.788			.583
2	.779			.576
3	.778			.697
52	.755			.772
11	.721			.573
32	.720			.576
1	.694			.49
48	.686			.628
51	.678			.623
38	.673			.604
12	.654			.644
6	.626			.336
36	.579			.282
44	.552			.294
65	.525			.351

70	.911	.665
69	.906	.694
23	.850	.739
67	.821	.479
64	.818	.594
15	.775	.653
26	.746	.687
20	.643	.62
16	.636	.624
30	.623	.469
14	.617	.504
28	.614	.639
31	.608	.572
46	.606	.427
19	.601	.563
71	.566	.28
68	.502	.209
25	.911	.438
56		.905	.868
55		.810	.817
57		.733	.713

The final version of the scale consists of three dimensions: cognitive regulation (21 items), behavior regulation (18 items), and emotion regulation (3 items).

**Results for Confirmatory Factor Analysis (CFA)**

CFA was performed using the weighted least squares mean and variance adjusted (WLSMV) method, with data collected from a different sample (n=289) to test the fit of the three-factor model established by EFA. Indices related to model-data fit are shown in Table 4 following the criteria determined by Kline (2016).

Table 4. *Global Fit Statistics for the TR-PCSAS for the CFA Sample (N = 289).*

Fit indices	Acceptable value range	Estimated value indexes
x^2/df	$0 \leq x^2/df \leq 3$	1.93
RMSEA	$00 \leq RMSEA \leq .08$	0.057
CFI	$.90 < CFI \leq 1.00$	.968
SRMR	$.00 \leq SRMR \leq .08$	.066

Note. CFA = Confirmatory factor analysis, TR-PCSAS = Teacher-reported preschool children's self-regulation skills assessment scale; x^2//df= chi-square test; RMSEA = root mean square error of approximation; CFI = comparative fit index; SRMR= standardized root mean square residual.

The fit indices estimated on CFA are generally within acceptable limits. In this context, the three-factor model fits the data. Estimated standardized factor loadings for the model are shown in the path diagram below.
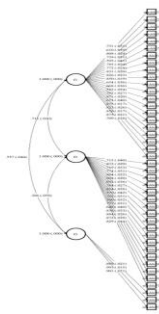
Figure 2. *Path Diagram for the TR-PCSAS*

Standardized factor loadings of items associated with the first, second, and third factors ranged from .552 to .875 , .570 to .902, and .869 to .991, respectively.

Results for Criterion Validity

The SRSTF for 4–6-year-old children was used as a comparable scale in the current study. The Cronbach's alpha reliability of the scale's sub-dimensions was estimated to be .90 for the inhibitory control sub-dimension, .92 for the attention sub-dimension, and .91 for the working memory sub-dimension. The reliability of the total scores for the entire scale was calculated as .94. In this case, reliability is high for both the scores obtained from the sub-dimensions of the scale and those obtained from the complete scale.

Table 5. *Correlation Coefficient Values between SRSTF for 4-6 Years-Old Children and TR-PCSAS scores (N=289).*

	CR	BR	ER	TR-PCSAS total	IC	A	WM	SRSTF for 4-6 Years-Old Children total
Cognitive Regulation (CR)	1,000							
Behavior Regulation (BR)	,648	1,000						
Emotion Regulation (ER)	,479	,253	1,000					
TR-PCSAS Total	,923	,880	,506	1,000				
Inhibitory Control (IC)	,667	,360	,789	,636	1,000			
Attention (A)	,794	,721	,348	,832	,553	1,000		
Working Memory (WM)	,784	,496	,419	,724	,567	,723	1,000	
SRSTF for 4-6 Years-Old Children Total	,863	,626	,610	,854	,836	,899	,838	1,000

The correlation coefficients between SRSTF for the 4- to 6-year-old children subscales ranged from 0.348 to 0.794. The strongest relationship was found between the cognitive regulation subscale and the attention subscale (r = .794). The weakest correlation was found between the emotion regulation subscale and the attention subscale (r = .348). The TR-PCSAS provides evidence that it is valid and measures a trait similar to the SRSTF, for 4- to 6-year-old children.

Results for Predictive Validity

Multiple regression analysis was conducted to predict children's self-regulation (SR) skills based on their gender, duration of formal early childhood education experience, and professional experience of their teachers. These variables predicted the children's SR skills significantly ($F_{[3, 285]}=8.365$, $p < .001$, $R^2=.081$).

The sex of children was a significant predictor of SR skills when other variables were controlled (t = -3.837; p = 0.001). The SR skills of boys (coded as 1) were on average 12.096 units higher than the SR skills of girls (coded as 0). When other variables were controlled, the duration of formal early childhood education experience was not a significant predictor of self-regulation (SR) skills (t = .0747; p = .941). The professional experience of teachers was a significant predictor of children's SR skills levels when other variables were controlled (t = 3.124; p= .002). As the professional experience of the teacher increases by one unit, it is expected that the SR skills of the children will increase by approximately 4.810 units.

Results for the Reliability of TR-PCSAS

The internal consistency reliability of the scale was analyzed by estimating Cronbach's alpha coefficient. Therefore, Cronbach's alpha reliability coefficient values were calculated for the different sub-dimensions of the scale, with values of 0.96 for cognitive regulation, 0.95 for behavior regulation, and 0.93 for emotion regulation. These high Cronbach's alpha values indicate that the scores obtained from these dimensions are highly reliable.

Discussion, Conclusion and Recommendations

The aim was to contribute to the relevant literature by developing a valid, reliable measurement tool to assess the SR skills of preschool children. Based on a comprehensive literature review on SR skills, the opinions of preschool teachers, and the evaluations of field experts, a measurement tool consisting of three dimensions— cognitive regulation, behavior regulation, and emotion regulation— with a total of 42 items, was developed. The results of the two-phased study showed that the TR-PCSAS provided valid and reliable scores for children's SR skills. The positive correlations between TR-PCSAS scores and the SRSTF for 4-6-year-old children, which have similar scale characteristics, provided evidence for criterion validity. Internal consistency of the scale was ensured by high Cronbach's alpha coefficients. Like the scales developed for the assessment of SR skills in the relevant literature, the TR-PCSAS has been shown to reflect the multidimensional structure of SR skills (Korucu et al., 2022; Asiye & Erol, 2018; Morrison & Grammer, 2016; Zhou et al., 2012; Smith-Donald et al., 2007). TR-PCSAS is different from the scales in the national literature: the Self-Regulation Skills Teacher Form for 4–6-Year-Old Children (Asiye & Erol, 2018), the Child Behavior Rating Scale (Ertürk Kara, 2017; Bronson et al., 1990), and the Children's Independent Learning Development Checklist 3–5 Years (Saraç et al., 2019). It focuses on SR as an umbrella term encompassing emotional, cognitive, and behavioral self-regulatory skills, and evaluates how these SR skills are structured around the relationship between these three dimensions.

The national literature also shows that Turkish versions of Head-Toe-Knees-Shoulders (Ponitz et al., 2008) and Preschool Self-Regulation Assessment (Sezgin & Demiriz, 2015; Fındık & Güler Yıldız, 2014) have been frequently used in the assessment of children's SR-skills. These measurement tools share common features: a practitioner needs training to implement the tools, they are adapted from Western culture, and are implemented individually for each child. Hence, TR-PCSAS is timely, economical, culturally appropriate, and convenient. It can be used to support the measurement process and will allow a comprehensive and multifaceted evaluation of SR.

According to the results of the current study, TR-PCSAS significantly predicted the SR skills of the children, considering variables such as gender, the duration children spent in formal early childhood education, and their teachers' professional experience. It is known that SR skills develop dramatically in the early childhood years, in parallel with the development of the frontal lobe of the brain (Fjell et al., 2012). During these years, the duration of children's attendance in a well-planned and systematic formal early childhood education, and their teachers' professional experience in the field have a direct effect on their self-regulation (SR) skills. When the children's gender and the duration of formal early childhood education experience were controlled, the significant relationship between children's SR skills and teachers' professional experience may stem from teachers improving their knowledge of SR skills over the years (Iriogbe-Efionayi, 2020; Webster, 2015; Rice, 2013). It has been observed that longer attendance in early childhood education did not have a significant effect on children's SR skills when the professional experience of the teachers was controlled. This finding suggests that the duration of formal early childhood education experience, when combined with the professional experience of the teachers, has a significant effect on the children's self-regulation (SR) skills. When the variables of the duration of children's formal early childhood education and the presence of professional teachers were controlled, boys were observed to have higher SR skills than girls. Although it has been revealed in the international literature that girls are better than boys in academic skills, including SR skills (Magat, 2013), the gap between boys and girls has been closing in recent years according to the National Assessment of Educational Progress (Perie et al., 2005). When the national literature was reviewed, it was evident that there were various findings on the differences in SR skills based on children's gender. While some studies have not found a difference in children's SR skills based on their gender (Eren, 2022; Yılmaz, 2020; Ural et al., 2020; Ertürk Kara & Gönen, 2015; Fındık Tanrıbuyurdu & Güler

Yıldız, 2014), the results of several studies have indicated that girls are better than boys (Öztabak & Özyürek, 2018; Aksoy & Tozduman Yaralı, 2017; Dağgül, 2016). This variation among the findings may be due to various factors, such as the uncontrolled socio-economic backgrounds of children and the educational status of their parents. However, the finding that boys are better than girls in SR skills in the current study may stem from assessing children's SR skills not only in the cognitive dimension involving attention/impulse control but also in emotional and behavioral regulation.

In the current study, the examination of children's SR skills only in terms of gender, teacher's professional experience, and children's experience in formal early childhood education, limits the study. Further research can be carried out to investigate other factors and mediating variables associated with the SR skills of children. To strengthen the predictive power of TR-PCSAS, further studies can be conducted to examine the relationship between TR-PCSAS and the related variables, such as SR skills, quality of the teacher-child relationship, and the quality of the classroom environment. Since TR-PCSAS is a teacher-reported scale, the collected data were based on the personal statements and observations of participant teachers. Therefore, it would be better to incorporate alternative approaches in the measurement and evaluation processes of children's SR skills. In addition to TR-PCSAS, it is advisable to use multiple data sources to obtain information on self-regulation skills directly from children or indirectly from families. Another limitation of the study was that it was not possible to explore the social or cultural differences among the children because all participants were Turkish. In recent years, children from different cultures have begun to attend early childhood education institutions in Turkey. In this regard, the current findings are limited in generalizability to these groups. Therefore, replicating the research in other samples (e.g., Afghan, Syrian children) may promote better evaluation of the factor structure and psychometric quality of the scale. These studies will provide further evidence for the validity and reliability of TR-PCSAS.

Educational specialists place importance on supporting self-regulation (SR) skills in the early childhood years. Efforts to evaluate children's SR skills and design practices within the scope of these evaluations have begun recently. At this point, it is suggested that developing a valid and reliable measurement tool, such as TR-PCSAS, would be beneficial for educators and researchers. Also, developing such an assessment tool will both contribute to early childhood education literature and lead to further research in this field. The measurement tool consists of concrete behaviors that teachers can easily observe in the classroom environment. Moreover, because the items of TR-PCSAS focus on emotion, behavior, and cognition, it offers an important perspective on SR skills as a set of prerequisite abilities that should be supported by educators and researchers to achieve learning outcomes such as school readiness, academic success, and social competence. It is believed that the data collected by researchers and educators using TR-PCSAS will allow for the design and implementation of early intervention programs, supporting the development of children's SR skills during the early childhood years.

References

Achenbach, T. M., and Rescorla, L. A. (2000). *Manual for the ASEBA preschool forms & profiles.* Burlington, VT: University of Vermont.

Aksoy, A. B., and Tozduman Yaralı, K. (2017). *Çocukların öz düzenleme becerileri ile oyun becerilerinin cinsiyete göre incelenmesi. [An analysis of children's self-regulation and play skills according to gender]. Trakya Üniversitesi Eğitim Fakültesi Dergisi*, 7(2): 442-455. https://doi.org/10.24315/trkefd.304124

Blair, C. (2003). Behavioral inhibition and behavioral activation in young children: Relations with self-regulation and adaptation to preschool in children attending Head Start. *Developmental Psychobiology 42*(3): 301-311. https://doi.org/10.1002/dev.10103

Blair, C., and Razza, R. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development 78*(2): 647-663. https://doi.org/10.1111/j.1467-8624.2007.01019.x

Bronson, M. B., Goodson, B. D., Layzer, J. I., and Love, J. M. (1990). Child Behaviour Rating Scale. Cambridge MA: Abt Associates.

Bronson, M. B. (2000). *Self-regulation in early childhood: nature and nurture.* 1 st. edition. New York, NY: The Guilford Press

Cadima, J., Enrico, M., Ferreira, T., Verschueren, K., Leal, T., and Mena Matos, P. (2016). Self-regulation in early childhood: the interplay between family risk, temperament, and teacher-child interactions. *European Journal of Developmental Psychology 13*(3), 341-360. https://doi.org/10.1080/17405629.2016.1161506

Cameron Ponitz, C., McClelland, M. M., Connor, C. M., Jewkes, A., M., Farris, C. L., and Morrison, F. J. (2008). Touch your toes! developing a direct measure of behavioural regulation in early childhood. *Early Childhood Research Quarterly 23* (2): 141–158. https://doi.org/10.1016/j.ecresq.2007.01.004

Dağgül, H. C. (2016). *Okul öncesi dönem çocuklarının öz düzenleme becerileri ile ebeveynlerin çocuk yetiştirme stilleri arasındaki ilişkinin incelenmesi. [Investigation of the relationship between preschool children's self-regulation skills and parents' child-raising styles*]. (Unpublished master's Thesis). Eastern Mediterranean University, North Cyprus.

DeVellis, R. F., and Thorpe, C. T. (2021). *Scale development: theory and applications.* Fifth edition, Newbury Park, CA: Sage.

Duval, S., Bouchard, C., Pagé, P., and Hamel, C. (2016). Quality of classroom interactions in kindergarten and executive functions among five-year-old children. *Cogent Education 3*(1): 1207909. https://doi.org/10.1080/2331186X.2016.1207909

Eren, S. (2022). *The effect on parents interested in their preschool children's self-regulation skills*. Unpublished Doctoral Dissertation. Bursa Uludag University, Bursa, Turkey.

Ertürk Kara, H. G., and Gönen, M. (2015). Examination of children's self-regulation skills in terms of different variables. *Journal of Theory and Practice in Education 11*(4): 1224–1239. Retrieved from https://dergipark.org.tr/tr/pub/eku/issue/5467/74230

Ertürk Kara, H. G. (2017). The role of children's behavioural skills in predicting early academic skills. *The Journal of International Social Research,* 10(49): 432-441. Retrieved from https://www.sosyalarastirmalar.com/articles/the-role-of-childrens-behavioral-skills-in-predicting-early-academic-skills.pdf

Fjell, A. M., Walhovd, K. B., Brown, T. T., Kuperman, J. M., Chung, Y., Hagler, D. J. Jr., Venkatraman V., Roddey, J. C., Erhart , M., McCabe, C., Akshoomoff, N., Amaral, D. G., Bloss, C. S., Libiger, O., Darst, B. F., Schork, N. J., Casey, B. J., Chang, L., Ernst, T. M., Gruen, J. R., Kaufmann, W.E., Kenet, T., Frazier, J., Murray, S. S., Sowell, E. R., van Zijl, P., Mostofsky, S., Jernigan, T. L., and Dale A. M. (2012). Pediatric imaging, neurocognition, and genetics study. multimodal imaging of the self-regulating developing brain. *Proceedings of the National Academy of Sciences,109*(48):19620-19625. https://doi.org/10.1073/pnas.1208243109

Fındık Tanrıbuyurdu, E., and Güler Yıldız, T. (2014). Preschool Self-Regulation Assessment (PSRA): adaptation study for Turkey. *Education and Science 39* (176): 317-328. https://doi.org/10.15390/EB.2014.3647

Garner, P. W., and Waajid, B. (2012). Emotion knowledge and self-regulation as predictors of preschoolers' cognitive ability, classroom behaviour, and social competence. *Journal of Psychoeducational Assessment 30*(4): 330–343. https://doi.org/10.1177/0734282912449441

Iriogbe-Efionayi, S. (2020). Promoting self-regulation in early childhood education: teachers' knowledge of self-regulation. *Urban Education Research and Policy Annuals- Tennessee State University Special Edition, 7*(1): 5-21. Retrieved from https://journals.charlotte.edu/urbaned/article/view/900

Izard, C., Fine, S., Schultz, D., Mostow, A., Ackerman B., and Youngstrom, E. (2001). Emotion knowledge as a predictor of social behaviour and academic competence in children at risk. *Psychological Science 12*(1): 18-23. https://doi.org/10.1111/1467-9280.00304

Kline, R. B. (2016). *Principles and practice of structural equation modelling* (4th ed.). New York, NY: Guilford Press.

Korucu, I., Ayturk, E., Finders, J. K., Schnur, G., Bailey, C. S., Tominey, S. L., and Schmitt, S. A. (2022). Self-regulation in preschool: examining its factor structure and associations with pre-academic skills and social-emotional competence. *Frontiers in Psychology 12*: 1-14. ttps://doi.org/10.3389/fpsyg.2021.717317

MacKenzie, H. (2015). *Self-regulation in everyday life: A how-to guide for parents*. Wired Fox Publications.

Magat, J. (2013). Looking at gender differences in preschoolers' self-regulation through multiple lenses. Degree of Bachelor of Arts, USA: University of Michigan

McClelland, M., and Tominey, S. (2016). *Stop, think, and act. integrating self-regulation in the early childhood classroom*, 1 st edition, New York: Routledge.

Merenda, P. (2006). An overview of adapting educational and psychological assessment installments: past and present. *Psychological Reports, 99* (2): 307-314. https://doi.org/10.2466/pr0.99.2.307-314

Miles, M. B., and Huberman, A.M. (1994). *Qualitative data analysis: An expanded sourcebook*. (2nd ed.). California: SAGE Publications.

Morrison, F. J., and Grammer, J. K. (2016). Conceptual clutter and measurement mayhem: proposals for cross-disciplinary integration in conceptualizing and measuring executive function. In *Executive function in preschool-age children: Integrating measurement, neurodevelopment, and translational research* edits by J. A. Griffin, P. McCardle, and L. S. Freund, 327-348, Washington, DC: American Psychological Association.

Öztabak, M., and Özyürek, A. (2018). An investigation on the relation between self-regulation skills of preschool students and parental attitudes. [Okul öncesi öğrencilerinin öz-düzenleme becerileri ile ebeveyn tutumları arasındaki ilişkinin incelenmesi]. *Journal of History Culture and Art Research 7*(5): 385-395. http://doi.org/10.7596/taksad.v7i5.1544

Perie, M., Moran, R., and Lutkus, A.D. (2005). Trends in math achievement of boys and girls source: NAEP 2004 Trends in Academic Progress: Three Decades of Student Achievement in Reading and Mathematics. Washington, D.C., Institute of Education Sciences, National Center for Education Statistics. Retrieved from https://files.eric.ed.gov/fulltext/ED485627.pdf

Posner, M., and Rothbart, M.K. (2000). Developing mechanisms of self-regulation. *Development & Psychopathology 12* (3): 427- 441. http://doi.org/10.1017/s0954579400003096

Rice, J. K. (2013). Learning from experience? Evidence on the impact and distribution of teacher experience and the implications for teacher policy. *Education Finance and Policy, 8* (3): 332-348. http://doi.org/10.1162/EDFP_a_00099

Rimm-Kaufman, S. E., Romberg, M. E., and Klein, S. E. (2005). Classroom observation protocol for the early learning study, Unpublished protocol, University of Virginia.

Robson, D. A., Allen, M. S., & Howard, S. J. (2020). Self-regulation in childhood as a predictor of future outcomes: A meta-analytic review. *Psychological bulletin*, *146*(4), 324–354. https://doi.org/10.1037/bul0000227

Salminen, J., Guedes, C., Lerkkanen, M. K., Pakarinen, E., and Cadima, J. (2021). Teacher–child interaction quality and children's self-regulation in toddler classrooms in Finland and Portugal. *Infant and Child Development, 30* (3): 1-23. https://doi.org/10.1002/icd.2222

Saraç, S., Karakelle, S. and Whitebread, D. (2019). Okul Öncesi Çocuklar için Bağımsız Öğrenme Davranışları Ölçeği 3-5 (BÖD 3-5): Türkçe formu için geçerlik ve güvenirlik çalışması. *Elementary Education Online, 18* (3): 1093-1106. https://doi.org/10.17051/ilkonline.2019.610148

Sezgin, E., and Demiriz, S. (2015). The validity and reliability of behaviour regulation measure head-toes-knees-shoulders (htks) tasks. *International Journal of Family, Child, and Education* 7: 52-71. https://doi.org/10.17359/ACED.201571407

Smith-Donald, R., Raver, C., Hayes, T., and Richardson, B. (2007). Preliminary construct and concurrent validity of The Preschool Self-Regulation Assessment (PSRA) For Field-Based Research. *Early Childhood Research Quarterly 22* (2): 173–187. https://doi.org/10.1016/j.ecresq.2007.01.002

Ural, G., Gültekin Akduman, G., and Şepitci Saribaş, M. (2020). Investigation of preschooler's self-regulatory skills according to some variables [Okul öncesi dönem çocuklarinin öz düzenleme becerilerinin bazi değişkenlere göre incelenmesi.*J. Ekev Akademi Dergisi, 24* (83): 323-342.

Webster, M. A. (2015). *Teachers' beliefs and practices related to student self-regulation in the classroom.* Unpublished Doctoral Dissertation, USA: James Madison University.

Yılmaz, Y. (2020). *5-6 yaş grubu çocuklarının sahip oldukları öz düzenleme becerileri ile anne baba tutumları arasındaki ilişkinin incelenmesi*. *[*Investigating the relationship between 5–6-year-old children's self-regulation skills with parenting attitudes*]*. (Unpublished master's thesis). Bursa Uludag University, Bursa, Turkey.

Zhou, Q., Chen, S. H., and Main, A. (2012). Commonalities and differences in the research on children's effortful control and executive function: A call for an integrated model of self-regulation. *Child Development Perspectives, 6* (2): 112–121. https://doi.org/10.1111/j.1750-8606.2011.00176.x

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 1–9). San Diego, CA: Academic Press