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## Behavioral self-regulation skills and the teacher-child relationship in early childhood

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### Abstract

The present study examined the relationship between children's behavioral self-regulation (BSR) skills and the teacher-child relationship (TCR). Furthermore, this study investigated the contribution of TCR, child age, family monthly income, and child gender on children's BSR assessed by the Revised Head-Toes-Knees-Shoulders. Participants consisted of 292 children aged 42 to 77 months. The data were analyzed using Pearson product-moment correlation and multiple linear regression analysis. The results showed a moderately positive relationship between BSR skills and TCR's closeness subscale and a moderately negative relationship between BSR skills and TCR's conflict subscale. Except for child gender, the TCR's subscales, child's age, and family monthly income significantly predicted the total score of BSR skills. TCR closeness was the strongest predictor of BSR skills, followed by TCR conflict, child age, and family monthly income. The results suggest that teacher-child relationships are essential for children's BSR skills.

**Keywords:** Behavioral self-regulation, Early childhood, Teacher-child relationship, Closeness, Conflict.

### Introduction

Children who start kindergarten face increasing demands for behaviors appropriate to the educational environment. Children are expected to listen, remember, follow directions, share, wait their turn, and behave according to classroom rules (Phillips et al., 2017). These skills, which require self-regulation (SR), develop rapidly when children attend kindergarten (Montroy et al., 2016). Studies indicate that children are born with the potential to develop SR skills (Center on the Developing Child at Harvard University [CDC], 2014; Savina, 2021). Therefore, high-quality early childhood education influences children's SR skills, and teacher-child interaction is a critical component of quality early childhood education. The sensitive and responsive interaction between the teacher and the child motivates children to learn, deepens their learning, and improves their SR skills (Phillips et al., 2017). From this point of view, this study aims to examine the relationship between children's behavioral self-regulation (BSR) skills and the teacher-child relationship (TCR).

### Behavioral Self-Regulation in Early Childhood

SR is a complex structure with cognitive, emotional, and behavioral dimensions (Kim & Kochanska, 2012; McClelland et al., 2015; McClelland & Cameron, 2012). The cognitive dimension of SR, also called executive functions, consists of three components that enable individuals to exhibit their SR skills behaviorally: working memory (WM), inhibitory control (IC), and cognitive flexibility (CF) (McClelland et al., 2007; Morrison et al., 2010). WM is related to children's keeping the instructions in mind, remembering them, and following them (Gathercole & Pickering, 2000). IC enables children to inhibit their strong internal tendencies or impulsive reactions and produce more appropriate responses (Diamond, 2013). Finally, CF enables children to shift and maintain their attention between different tasks consciously, even if there is a distraction in the environment (Blair & Diamond, 2008; Blair & Ursache, 2011; Rothbart & Posner, 2005). Studies indicate that SR has an integrated structure and that the components of WM, IC, and CF work in an integrated manner (McClelland et al., 2007; Tominey & McClelland, 2013; Wiebe et al., 2008; Willoughby et al., 2012). BSR is defined as the manifestation of these components in the child's real-life behaviors (McClelland et al., 2014; Ponitz et al.,

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2009). Consistent with this view, the current study considers the integrated nature and behavioral dimension of SR.

Early childhood is a critical period for the development of BSR skills. In addition to the child's genetic characteristics, environmental experiences considerably affect the development of BSR (Berger, 2007; Posner et al., 2014). The socio-economic status of the family, parenting behaviors, and the TCR in the classroom environment influence children's BSR skills (Kochanska et al., 2000; Li et al., 2017; Liew et al., 2010; Rodriguez et al., 2005; Williams & Berthelsen, 2017). From infancy, meaningful social interactions shape children's SR skills (Bronson, 2000; CDC, 2014). When children start school, their social environment expands. Thus, in addition to the family, external resources such as teachers and peers are included in this environment (Kopp, 1982; Pauen, 2016). In addition to internal resources such as genetics and temperament, external resources such as teachers, peers, and the school environment guide children's behaviors in the school environment (Hamre & Pianta, 2001; Usher & Schunk, 2017; Wang et al., 2016). Studies show that TCR and SR skills are related (Acar et al., 2019; Acar et al., 2018; Liew et al., 2010; Phillips et al., 2022). As a result of their study with disadvantaged children, Acar et al. (2021) revealed that a close TCR is positively related to children's SR skills, and a conflicted TCR is negatively related to children's SR skills.

The bio-ecological model (Bronfenbrenner & Morris, 2006) that explains environmental factors in a child's development may offer a perspective to understand the links between SR skills and TCR. According to this, a child's development is affected by experiences in a series of intertwined systems that interact. These systems expand from the microsystem (proximal context), which includes the child's experiences with his/her closest environment, such as his or her family, classroom, and teacher, to the macrosystem (distal context), the most expansive environment covering cultural values, laws, and policies. The microsystem includes the interactions with the immediate environment (family, teachers, and peers) that most strongly influence the child's development (Degol & Bachman, 2015).

### **Qualities of Teacher-Child Relationships and Children's Behavioral Self-Regulation**

In the bio-ecological model, positive dynamics between the teacher and the child are an essential proximal context that facilitates learning and development. Teachers provide children with a safe and supportive learning environment and support children's participation in effective pedagogical practices, which affect children's learning processes (Elster, 2014). One of the most critical components of a supportive environment is a consistent and safe relationship between the teacher and the child (Pianta, 1999; Pianta et al., 1997).

In this current study, the TCR is conceptualized within the framework of two widely studied basic dimensions: closeness and conflict (Koomen et al., 2012; Pianta, 2001; Rudasill et al., 2010; Settanni et al., 2015). According to Birch and Ladd (1997), closeness, the positive dimension of the TCR, includes emotional warmth and open communication between the teacher and the child. The fact that the child is in a close relationship with his or her teacher increases his or her positive feelings and attitudes toward school, his or her participation in school, and his or her prosocial behavior (Birch & Ladd, 1997; Birch & Ladd, 1998; Hamre & Pianta, 2001). Conflict, the negative dimension of the TCR, means the lack of harmony and conflict between the teacher and the child. A conflicting TCR is a source of stress for children. Children can develop angry and anxious feelings due to the stress they experience. It may cause the child to develop negative feelings and attitudes toward school, become alienated from school, have problems adapting to school, and have behavioral problems. These sources of stress can also negatively affect a child's academic success (Birch & Ladd, 1997; Hamre & Pianta, 2001).

Previous studies have shown that the quality of teacher-child interaction plays an essential role in children's school readiness, school adjustment, social competence, and academic achievement (Birch & Ladd, 1997; Burchinal et al., 2008; Güleç & İvrendi, 2017; Hamre & Pianta, 2001; OECD, 2018; Vandebroucke et al., 2018). A study stated that warm, sensitive, and supportive teacher-child interaction encourages children to use better SR skills (Hatfield et al., 2021). Birch and Ladd (1997) found a negative relationship between a conflicted TCR and liking school, SR, and collaborative participation and a positive relationship between a close TCR and liking school, SR, and academic achievement. Acar et al. (2021) revealed a relationship between low regulatory temperament and high SR when teacher-child conflict decreased. This finding indicates that related temperamental problems can be decreased by fostering close teacher-child relationships and encouraging SR in children.

BSR scores of children who experienced positive interaction with their teachers in the educational environment were found to be higher, regardless of family risk factors (mother and father education level, family

employment status, family income, number of people living in the home environment) (Cadima, Enrico, et al., 2016). Therefore, regardless of factors that strongly influence BSR, a child's close relationships with his or her teacher may have a decisive role in BSR skills.

### **Socio-Demographic Variables and Children's Behavioral Self-Regulation**

Various child and family factors, such as child age, family income, and child gender, are associated with SR skills (Gestsdottir et al., 2014; İvrendi & Erol, 2018; Lawson et al., 2018; Matthews et al., 2009; Salminen et al., 2021). For example, studies indicate that the development of SR skills is related to age, and older children can self-regulate better than younger children (Ertürk-Kara & Gönen, 2015; Whitebread & Basilio, 2011). Some studies found that girls' SR skills are higher than boys' (Matthews et al., 2009; McClelland et al., 2007; İvrendi & Erol, 2018). However, other studies did not find gender differences (Ertürk-Kara & Gonen, 2015; Son et al., 2013; Yamamoto & Imai-Matsumura, 2017). Inconsistent findings regarding the relationship between gender and SR skills require re-examining the relationship between gender and SR skills. Additionally, recent studies show that family income significantly affects BSR skills (Cadima, Enrico, et al., 2016; Duncan et al., 2017; Evans & Rosenbaum, 2008; Tominey & McClelland, 2013). Cadima, Enrico et al. (2016) found that children from socio-economically disadvantaged backgrounds have lower levels of BSR than their peers. This study examines the relationships between the abovementioned variables (child age, family income, and gender) and BSR skills. The primary aim is to provide further evidence about the relationships between these variables and BSR skills. Another aim is to determine whether these variables and the TCR predict BSR skills.

### **Current Study**

Numerous studies examining the TCR indicate that the perceived positive TCR is associated with children's social and academic outcomes (Buyse et al., 2008; Hughes & Kwok, 2006; Schmerse, 2020). The perceived negative TCR is a risk factor for the child's school adjustment, academic success, and behavior (Acar et al., 2021; Acar et al., 2022; Buyse et al., 2008). However, limited studies examined the relationship between the perceived TCR and BSR skills measured by the integrated structure of SR skills (Cadima, Verschueren et al., 2016; Hatfield et al., 2021). The present study examined children's BSR skills using the HTKS-R assessment tool, a psychometrically powerful and performance-based tool suitable for the integrated structure of BSR and teacher-child relationships based on teacher views. Possible relationships between socio-demographic variables (age, family monthly income, and gender), BSR skills, and TCR subscales were investigated. In this study, the answers to the following research questions were sought:

- RQ1: What is the relationship between children's socio-demographic variables, BSR skills, and TCR subscales?  
RQ2: Do independent variables (the TCR subscales, child age, gender, and family monthly income) predict children's BSR skills?

### **Method**

This study used a relational survey method to examine the predictive power of children's socio-demographic variables and TCR subscales on their BSR skills (Chirstensen et al., 2015).

### **Participants**

Participants for the part of examining the psychometric properties of HTKS-R consisted of 388 children aged 42 to 77 months, attending preschool and kindergarten in a southwestern province of Turkey in the fall semester of the 2021-2022 academic year. In this study, the convenience sampling method was used. Patton (2015) mentions that the easily accessible sampling method can minimize time, effort, and cost loss. In addition, an easily accessible sample provides speed and practicality to the research (Yıldırım & Şimşek, 2013). Of the participants, 196 (50.5%) were girls, and 192 (49.5%) were boys. The average age of children was 60 months. The youngest child participating in the study was 42 months old, and the oldest was 77 months old. Of the children, 306 (78.9%) attend preschool education for one year, 50 (12.9%) for two years, and 32 (8.1%) for three years. The average monthly income of families is 6653<sub>TL</sub>. This income level is above the minimum living wage determined in Türkiye for 2021 (Minimum Wage Determination Commission Decision, 2020). Just as 196 (43.6%) of the mothers were college graduates, 136 (35.1%) of the fathers were college graduates. Missing values about the family monthly income and outliers were removed from the data to examine the relationship

between children's socio-demographic variables and TCR subscales on children's BSR skills. As a result of this procedure, data from 292 participants out of 388 were used in the regression analysis.

## Data Collection Tools

### *Child Information Form*

This form comprises items related to the child and family features, such as gender, age, and family income.

### *Self-Regulation Skills Scale (Teacher-Form)*

Based on teachers' views, this scale assesses the SR skills of preschool children aged four to six (İvrendi & Erol, 2018). This scale consists of 22 items and three subscales: WM (e.g., remembers instructions given to perform a task or activity), IC (e.g., solves problems by talking to friends), and attention (e.g., obeys rules without reminding). The internal consistency coefficient (Cronbach's alpha) of the total score was .94. The Cronbach's alpha values for its subscales ranged from .91 to .87. Item-total correlation values ranged from .41 to .77. Also, the scale's fit indexes of the structure obtained from the CFA were at a sufficient level ( $\chi^2/df=1.28$ , RMSEA=.05, SRMR=.07) (İvrendi & Erol, 2018). For the current study, Cronbach's alpha values were .96 for the total score, .91 for IC, .94 for attention, and .95 for WM.

### *Student-Teacher Relationship Scale-Short Form (STRS-S)*

Developed by Pianta (2001) and adapted into Turkish by Ası and Karabay (2017), the STRS-S was used to determine the teacher's perception of the relationship with a child. STRS-S consists of 15 items and two subscales: closeness (e.g., it is easy to understand and share what this child feels) and conflict (e.g., this child maintains anger or resistance after being disciplined). Its Cronbach's alpha values were .82 for the total score, .84 for the conflict subscale, and .76 for the closeness subscale. Test-retest reliability coefficients were .83 for the total score, .87 for the conflict subscale, and .83 for the closeness subscale. The CFA values of the STRS-S were that the  $\chi^2$  value was 274.99 and  $df=83$ , and the value obtained by dividing the  $\chi^2$  value by the degrees of freedom remained at the level of  $NC=274.99/83=3.3$ , and this ratio was accepted as a good fit level. Other goodness-of-fit statistics were found to be CFI value .97, GFI value .96, NFI value .96, and RMSEA .053 (Ası & Karabay, 2017). For the current study, Cronbach's alpha values of the STRS-S were .87 for the total score, .83 for the closeness subscale, and .88 for the conflict subscale.

## Revised Head-Toes-Knees-Shoulders (HTKS-R)

The HTKS-R was adapted into Turkish to assess children's BSR skills in this present study. The HTKS-R was revised by McClelland et al. (2018) based on the previous Head-Toes-Knees-Shoulders (HTKS) BSR skills assessment tool (McClelland et al., 2014). As a direct measure of the BSR skills of children aged four to eight based on performance, the scale consists of 22 exercises and 37 testing items and includes the features of CF, WM, and IC components (Gonzales et al., 2021; McClelland et al., 2018). The scale is an updated version of the three-part HTKS (McClelland et al., 2014), including a new extension at the beginning. The newly added extension has Chapter 0 (Contrasts), four exercise items (e.g., what do you say when you say head?), and seven test items in which children are asked to say the opposite (e.g., if I say head, you?). The rest of the HTKS-R follows the same protocol as the original HTKS, which consists of three parts. The first part contains two different instructions, seven exercises, and ten test items. The child is asked to do the opposite of the given instruction (it is expected to touch your feet when it is said to touch your head and to touch your head when it is said to touch your feet). In the second part, there are four different instructions, and the child is expected to do the opposite of the given instruction (it is expected to touch your feet when it is said to touch your head, to touch your head when it is said to touch your feet. It is expected to touch your shoulders when it is said to touch your knees, and to touch your knees when it is said to touch your shoulders). In the third part, the rules change: when it is said to touch your head, he/she should touch his/her knees; when it is said to touch your knees, he/she should touch his/her head; when it is said to touch your shoulders, he/she should touch his/her feet; when it is said to touch your feet, he/she should touch his/her shoulders (Gonzales et al., 2021).

The HTKS-R consists of training, practice, and application sections. In the application section, after the instructions are given to the child, the evaluator observes the child's responses and records them accordingly in

the assessment tool. If the child makes the correct move, he or she gets two points; if he or she makes a wrong move and then corrects himself or herself, he or she gets one point; and if he or she makes a wrong move, he or she gets zero points. The total scores range from 0 to 74 for only testing items and from 0 to 118 for both exercises and testing items. It is administered to children individually. In this present study, the application time of the HTKS-R took an average of 9 minutes for each child.

To adapt the HTKS-R scale to Turkish, the necessary permission was obtained. The scale was first translated into Turkish by the researchers. Later, three experts in early childhood examined the translation, and its final version was given in line with their feedback.

The original version of HTKS-R was investigated as single-factor and multi-factor. As a result of the analyses, the researchers emphasized that the one-factor solution represents the optimal solution (Gonzales et al., 2021). This study evaluated the HTKS-R BSR skills assessment tool as a single factor. The values in the later stages of the study reflect the single-factor structure. Accordingly, the adaptation process of the scale into Turkish was structured in two stages: validity and reliability. Validity procedures were performed using criterion validity and predictive validity (Pearson product-moment correlation analysis, regression analysis), structure validity (exploratory factor analysis (EFA), and confirmatory factor analysis (CFA)) to reveal the valid structure of the scale.

Item analysis (Pearson product-moment correlation analysis), analyses for the whole test (standard deviation, variance, mean difficulty level, standard error of the assessment tool), internal consistency coefficients (Cronbach alpha), Split Half, and Guttman Lambda techniques were used to determine the reliability of the scale. The findings regarding the validity and reliability analysis of the HTKS-R, for which the adaptation study was performed, are presented below.

#### Results Related to Validity Analysis

For the validity analyses of the scale, EFA, CFA, criterion validity-concurrent, predictive validity-, and intra-class correlation coefficients were computed. In the EFA, factor loads of the HTKS-R varied between .51 and .86. The factor loads for part one ranged from .67 to .81. For part two, factor loads were between .62 and .82, for part three between .51 and .86, and the section of the opposition between .56 and .86. In the original version of the scale, the factor loadings ranged from .63 to .92 (Gonzales et al., 2021). It was determined that HTKS-R explained 46% of the total variance. In addition, CFA showed that model fit indices were determined to be at an acceptable level ( $\chi^2 = 1839.17$ , RMSEA = .063; SRMR = .153; CFI = .952; TLI = .968). These results are also like the English version of the scale ( $\chi^2 = 1789.56$ , RMSEA = .057; SRMR = .113; CFI = .991; TLI = .990) (Gonzales et al., 2021). For the criterion validity of the HTKS-R, its relations with the SR Skills Scale (Teacher Form) and its sub-dimensions were examined. Accordingly, a moderate positive correlation was found between HTKS-R and SR Skills Scale of .56, between subscales of WM ( $r = .58$ ,  $p < .01$ ), attention ( $r = .49$ ,  $p < .01$ ), and IC ( $r = .43$ ;  $p < .01$ ). In addition, the SR Skills Scale significantly predicted the HTKS-R ( $R = .32$ ,  $R^2 = .56$ ;  $F = 177.12$ ,  $p < .01$ ). SR Skills Scale explains the HTKS-R total scores at a level of 56%. The results related to the Pearson product-moment correlation analysis between the parts of HTKS-R are presented in Table 1.

Table 1. Pearson Product-Moment Correlation Between Parts of HTKS-R

	P0	P1	P2	P3	HTKS-R
Part 0	1				
Part 1	.536*	1			
Part 2	.319*	.453*	1		
Part 2	.317*	.453*	.897*	1	
HTKS-R	.499*	.847*	.780*	.780*	1

\* $p < .01$

Table 1 indicates that each part of HTKS-R was significantly positively related to all other parts. The sum of the scale shows a moderately positive correlation with part 0 ( $r = .50$ ). In addition, part 1 ( $r = .85$ ), part 2 ( $r = .78$ ), and part 3 ( $r = .78$ ) show a high level of positive correlation with the sum of the scale. This result is also consistent with the original version of the scale.

Table 2. Intraclass Correlation Coefficient

Intraclass Correlation	95% Confidence Interval	F Test with True Value 0
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		Lower Bound	Upper Bound	Value	df1	df2	P
Single Measures	.434	.399	.473	24.047	387	11223	.000
Average Measures	.958	.952	.964	24.047	387	11223	.000

As seen in Table 2, when HTKS-R is analyzed according to ICC (Intraclass Correlation) criteria, the variances and total variances of the test halves are like each other. In this respect, the HTKS-R is a valid and reliable scale regarding the order of the questions and their structural features. In line with these results, the test has reliable construct validity according to single and average measurements ( $p < .01$ ). These results are consistent with the English version of the scale.

### Results Related to Reliability Analysis

The HTKS-R's Cronbach alpha value was .96 for this current study and .97 for the original scale version (Gonzales et al., 2021). The split-half reliability coefficient was .79. According to the Guttman Lambda (Li) method, the reliability coefficients varied between .91 and .94. Additionally, the test-retest reliability was calculated with data collected from 38 children three weeks apart. As a result, the test-retest reliability coefficient of the scale was .81. The item-total correlation values of the scale ranged between .34 and .76, and there was no item with a value below .30 according to the item-total correlation results.

Considering the validity and reliability results of the HTKS-R, the scale can be used to measure behavioral self-regulation skills of 4- to 8-year-old children in a valid and reliable way in Turkey. The findings related to the HTKS-R's adaptation into Turkish were consistent with the original structure of the scale as reported by Gonzales et al. (2021).

### Procedures

The researchers received the HTKS-R practitioner certificate after completing the training and evaluation process on the HTKS-R training website. The data collection process continued for five weeks in the fall semester of the 2021-2022 academic year. Four undergraduate students studying in the preschool teaching undergraduate program, trained by the researchers, participated in the HTKS-R data collection process together with the researchers. The agreement criterion between independent observers was used to determine the reliability of the HTKS-R scale. Before the data collection process started, six different observers administered the HTKS-R scale to a group of children who were not among the participants and scored according to the HTKS-R scale. The Kappa coefficient of the agreement was calculated to determine the agreement between independent observers ( $\kappa = .91$ ), which is considered good (Karasar, 2018). Then, the trainees individually administered the HTKS-R scale to the participating children. The children's teachers filled in the STR-S and the SR skills scale.

### Ethical Considerations

The Ethics Committee and Ministry of National Education application approval were obtained before starting the study. After obtaining the ethics committee's approval, both written and verbal consent was obtained from the director of the institution, the classroom teacher, and the families of the children. Child consent forms for children, informed consent forms for families, and teacher application permission forms were filled out before starting the study.

### Data Analysis

For data analysis, firstly, the normality assumption was examined through the kurtosis and skewness coefficients. The kurtosis values of the dependent and independent variables vary between .44 and -.92, and the skewness values vary between -.04 and -.93. Table 3 contains the kurtosis and skewness values.

**Table 3.** Kurtosis Skewness Values

	Skewness	Kurtosis
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HTKS-R	-.509	-.924
TCR-Conflict	-.584	.697
TCR-Closeness	-.778	.436
Self-Regulation (Teacher Form)	-.554	-.040
Inhibitory Control	-.301	-.596
Attention	-.885	.770
Working Memory	-.926	.297

Based on Table 3, it was seen that the normality assumption was met. The homogeneity assumption was examined with the Levene test. As a result of Levene's test of dependent and independent variables, there was no statistically significant difference between the variances of each measurement group ( $p > .05$ ), so the homogeneity assumption was met.

Based on these results, Pearson correlation analysis and multiple linear regression analysis techniques were used to reveal the relationship between the BSR and children's socio-demographic variables, and TCR subscales. Due to outliers examined with Mahalanobis and missing data about family income, 97 out of 388 participants were excluded from the data analysis. As a result, the multiple regression analysis was computed with 292 participants. Secondly, the multicollinearity among the independent variables was examined utilizing variance inflation factor (VIF) values. The VIF values for the independent variables were between 1.25 and 1. Field (2013) states that a VIF value below 10 indicates no multicollinearity problem between the independent variables.

## Results

This study investigated the predictive power of children's socio-demographic variables and TCR subscales on their BSR skills. The mean scores of the variables, standard deviations, and correlation analysis results of children's BSR, conflict, and closeness are presented in Table 4.

**Table 4.** HTKS-R, TCR's Subscales and Demographic Variables (N=292)

Variables	$\bar{X}$	SD	HTKS-R (Pearson Correlation)
HTKS-R	31.49	18.37	1
TCR-Conflict	12.27	5.66	-.43*
TCR-Closeness	33.01	4.95	.47*
Child's Age (Months)	60.93	8.13	.13*
Family Monthly Income	6653.27	3547.82	.10*

\* $p < .05$

As seen in Table 4, the mean scores of the children were 31.49 for the HTKS-R, 12.27 for the conflict, and 33.01 for the closeness. While HTKS-R and TCR's subscales had a statistically moderately negative relationship with conflict ( $r = -.43$ ,  $p < 0.01$ ), there was a moderately positive relationship with the closeness subscale ( $r = .47$ ,  $p < 0.01$ ). Additionally, a low positive correlation existed between children's BSR skills and age ( $r = .13$ ). The results of the multiple linear regression for predicting children's BSR skills by independent variables are given in Table 5.

**Table 5.** Predictive Variables of BSR Skills

Independent variables	B	S.E	$\beta$	t	p	Partial r
(Constant)	-25.186	12.114		-2.079	.038*	
TCR-Conflict	-.870	.192	-.273	-4.527	.000*	-.259
TCR-Closeness	1.330	.258	.311	5.146	.000*	.291
Child's Age (Months)	.304	.118	.131	2.583	.010*	.151
Family Monthly Income	.071	.096	.113	2.251	.025*	.132
Child Gender	.193	1.826	.005	.106	.916	.006

$R = .54$ ,  $R^2 = .29$ ;  $F = 23.34$ ;  $p < .01$

\* $p < .05$

Table 5 demonstrates that the independent variables significantly predicted the BSR ( $R = .54$ ,  $R^2 = .29$ ,  $F = 29.01$ ,  $p < .01$ ) and explained 29% of its variance. The strongest predictor of the BSR was closeness ( $\beta = .311$ ) followed by conflict ( $\beta = -.273$ ), child age ( $\beta = .131$ ), and family monthly income ( $\beta = .113$ ). Child gender did not contribute significantly to the model ( $t = -.106$ ;  $p > .05$ ).

## Discussion

The quality of teacher-child interactions plays an essential role in children's SR skills (Vandenbroucke et al., 2018). The results of this study indicated that TCR closeness, TCR conflict, child age, and family income were significant predictors of children's BSR skills.

### Teacher-Child Interactions and Behavioral Self-Regulation

The study's findings indicated a correlation between the children's BSR, TCR closeness, and TCR conflict. In other words, consistent with the findings of previous studies (Acar et al., 2021; Salminen et al., 2021), teacher-child closeness is positively correlated with children's BSR skills, and teacher-child conflict is inversely related to children's BSR. Also, TCR conflict and closeness scores significantly predicted children's BSR scores. They were the strongest predictors of BSR skills compared to other independent variables. As in the bio-ecological model (Bronfenbrenner & Morris, 2006), positive dynamics between the teacher and the child are crucial proximal contexts influencing BSR. This finding implies that as teachers' supportive relationships with children increase, the children's abilities to remember and follow instructions (Gathercole & Pickering, 2000), inhibit their strong impulsive reactions in favor of responding appropriately (Diamond, 2013), and shift and maintain their attention between different tasks enhance (Blair & Diamond, 2008). On the other hand, teacher-child relationships characterized by conflict (e.g., a teacher's feeling that he or she and a child struggle with each other) appear to decrease children's working memory, inhibitory control, and attention flexibility skills. Similarly, in a study with toddlers, emotional and behavioral support quality in teacher-child interactions yielded significant associations with effective IC in children. Learning support was associated with better attention and IC in children (Salminen et al., 2021). Coinciding with the findings of previous studies (Acar et al., 2022; Cadima, Verschueren et al., 2016; Li & Lau, 2019; Loomis, 2021; Portilla et al., 2014), the findings of this study highlight the influence of teacher-child relationships on children's BSR skills.

As seen in prior studies, children with improved SR skills establish quality relationships with their teachers, develop positive interactions, and enjoy school and activities (Cadima, Verschueren et al., 2016; Loomis, 2021; Portilla et al., 2014; Silva et al., 2011). Reciprocal relationships were also found between conflicting TCRs and ICs (Berry, 2012). Attention deficits and impulsive behaviors in children substantially affect the TCR quality. Children who exhibit inattention and impulsiveness when they start school experience more conflict with teachers at the end of kindergarten, which continues until the first grade (Portilla et al., 2014). Importantly, some studies emphasize that children with behavioral problems can improve their behavior and SR skills (Acar et al., 2021; Bulotsky-Shearer et al., 2020; Narea et al., 2022). These findings show a need for strategies, such as movement-based activities, play-based interventions, and mindfulness, to help children develop strong SR skills during preschool education (Savina, 2021).

### Socio-Demographic Variables and Behavioral Self-Regulation

The findings showed that children's BSR skills were positively, but at a low level, correlated with age and family monthly income. Also, independent variables (closeness, conflict, age, family income, and gender) significantly predicted BSR skills, except for child gender. This result coincides with other studies' findings (Ertürk-Kara & Gönen, 2015; Salminen et al., 2021; Whitebread & Basilio, 2011). For example, Salminen et al. (2021) demonstrated that older children perform better in selective attention and IC and have better behavior regulation skills than younger ones. Another finding of this study was that the family's income was a significant predictor of children's BSR skills, which is consistent with previous studies' findings (Cadima et al., 2016; Li et al., 2017). For instance, Li et al. (2017) found a correlation between family income and cognitive SR. They stated that cognitive SR was more strongly associated with family income than emotional SR. Also, gender did not significantly contribute to the BSR skills, which coincides with other research results (Son et al., 2013; Tominey & McClelland, 2013). On the other hand, this finding is inconsistent with other studies' findings indicating the existence of gender differences in children's SR skills (Ívrendi & Erol, 2018; Matthews et al., 2014; Salminen et al., 2021; Wanless et al., 2013; Yamamoto & Imai-Matsumura, 2017). For instance, one study found that boys have weaker IC and behavior regulation skills than girls (Salminen et al., 2021). Although more research is needed, such inconsistencies about gender may stem from the participants' features, such as the culture in which children grow up or teachers' instructional approaches.

## Limitations and Recommendations

This study has several limitations along with its informative results. First, this study was conducted with limited participants due to the ongoing pandemic. Other studies can be conducted with more participants to increase the generalizability of the results obtained from the study. Second, in this study, the SR skills scale and the TCR scale were filled in by teachers on behalf of children, and children's BSR skills were assessed using a task-based direct assessment tool. In addition to these assessment methods, observation-based data can be collected in future studies to obtain detailed information about TCR.

The results have some implications for researchers and teachers. The TCR's subscales predicted children's BSR skills in this current study. Therefore, other studies can be planned longitudinally to explore the relationship between the quality of the TCR and the development of children's BSR skills at time points from early childhood education to primary school entry. Additionally, this study examined only children's BSR skills and TCR subscales. Upcoming studies may investigate children's BSR skills with other teacher variables, such as teachers' approaches to classroom management and instructional beliefs. Teacher professional development programs may focus on intervention programs that strengthen the TCR and SR.

## Author (s) Contribution Rate

First Author: Conceptualizing, methodology, data collecting, analysis and interpretation of data, and writing-original draft.

Second Author: Methodology, data collecting, analysis and interpretation of data, and writing-original draft.

Third Author: Writing-review, supervision, and editing.

## Conflict of Interests

The authors have no conflicts of interest to declare relevant to this article's content.

## Ethical Approval

The Ethics Committee approval (14.07.2021-E.77254) from Pamukkale University and the Provincial Directorate of National Education approval was obtained before starting the study.

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