



Executive function skills as predictors of social skills in socially disadvantaged children

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Abstract

The aim of this study is to examine the effect of executive function skills on social skills in 4-5-year-old children. The study group consists of 151 children aged 4-5 years and their teachers. The data of the research were collected through the "Childhood Executive Functioning Inventory" and "Social-Emotional Assets and Resiliency Scale". The assumptions of the multiple regression analysis were tested and applied to the obtained data. There is a positive relationship between executive functions and social skills. Social competence and emotion recognition are only predicted by working memory. On the other hand, empathy, self-regulation and total social skills are predicted by working memory and inhibitory control together. Two executive function skills can explain approximately 41% of social skills. Tracking the executive function skills of the children in the preschool period can give an idea of their current and future social-emotional developments.

Keywords

Executive function
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Introduction

Social skills including emotion recognition and regulation, empathy, establishing positive relationships, maintaining relationships and responsible decision-making allow children to gain skills in social, academic and behavioral areas (Bierman et al., 2017). Social skills gained in early childhood enable the individual to exhibit skills such as establishing and maintaining healthy relationships, problem-solving, displaying positive social behaviors and responsible decision-making in the upcoming years (Weisberg, 2019). As these skills are developed, the sense of social belonging increases and the individuals have higher ethical values and demonstrate positive behaviors (Zins & Elias, 2007). This helps the conflicts and negative behaviors decrease by affecting society's mental health.

Social skills develop in line with cognitive skills (Bierman & Motemadi, 2015). Especially, the development of executive function skills plays a significant role in the social skills of children. Children with higher executive function skill levels adapt themselves to new conditions easily, cope with problems better, feel safe in new environments and interact with people around them more easily (Diamond, 2013). Children who plan their behaviors according to their goals, interact with their

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environment more easily, develop coping strategies and solve conflicts can exhibit behavior regulation, empathy and responsible behavior skills by reading the emotions of others (Benavides-Nieto et al., 2017). The research conducted in neuroscience indicates that similar areas of the brain are activated during the processes related to social skills and executive functions, and that the developments in certain areas of the brain affect executive functions and social skills (Cheng et al., 2010; Hinnant et al., 2013; Just et al., 2012). The mutual effect of development in the prefrontal region and environmental stimuli plays an important role in changes in executive functions and social skills (Eslinger et al., 2004). Damage or developmental problems in this region cause impairments in executive functions and social skills. Especially social and environmental deprivation in childhood negatively affects the development of prefrontal cortex and executive functions (Blair & Raver, 2012; Curtis & Cicchetti, 2007). Children living in socially disadvantaged areas can experience developmental problems due to the lack of environmental stimuli and exposure to negative events. Social and financial problems, negligence, poor nutrition and the lack of parent-child interaction affect the development of children in different areas (Black et al., 2017). As a whole, the lack of a stimulating environment during early childhood affects brain development and causes risks in executive function skills and social-emotional development (Barrasso-Catanzaro & Eslinger, 2016). In the study by Wolf and McCoy (2019), it is explicitly demonstrated that social skills and executive functions are important for early academic skills and success.

Social skills are essential for establishing successful relationships in social life (Hansen et al., 1995). Socially competent individuals can communicate effectively in various social settings and employ appropriate coping strategies. The development of social competence and social skills depends on the maturation of the skills of establishing effective communication, maintaining communication, and controlling emotions and behaviors (Fabes et al., 2006; Rubin et al., 2006). Benavides-Nieto et al. (2017) revealed that executive functions are related to the quality of social skills and peer relationships. The research concluded that children with high executive function scores also scored high in social interaction, social cooperation, following instructions, and developing friendship behaviors. According to the research findings of Veraksa et al. (2020), it was revealed that children with a high level of interaction in the classroom scored higher in cognitive flexibility tasks. Amani et al. (2019) examined the effects of an executive function skill strengthening program based on group games developed for preschool children on children's social skills. The research findings revealed that inhibitory control skills supported through group games produced improvements in children's social skills. Inhibitory control helps create appropriate responses reactions by regulating thoughts, behaviors, attention and emotions (Diamond, 2013). The ability to control and regulate emotions, thoughts and behaviors depends on children's ability to perceive social cues. In a study, preschool children's ability to understand emotions was found to be a predictor of their negative behaviors (Choe et al., 2013). The ability to understand emotions and correctly interpret social references also helps children regulate their behaviors and emotions. Skills such as inhibitory control and working memory are in a strong relationship with self-regulation skills (Slot et al., 2017). These executive function skills which help to choose appropriate responses and eliminate inappropriate options help the children to regulate their emotions and behaviors. A study shows that children with low working memory score conflict with their teachers, and the relationship between the teacher and children is negatively affected as a result. The findings of a study which revealed that this also influenced peer relationships showed that the conflict between the teacher and child decreased based on working memory which develops within the process (de Wilde et al., 2016).

The researchers investigating the effect of executive function skills on social skills conducted experimental studies to analyze the relationship between these two variables. These experimental studies show that the change occurring in the executive function skills affects cooperation, social interaction skills as well as adaptive skills (Romero-López et al., 2020) and that the children whose executive function skills develop exhibit behaviors such as helping peers in case of need, encouraging each other and helping other peers to find playmates (Diamond et al., 2019). The results obtained indicate that executive function skills have an effect on the social competencies of the children, and they mutually affect each other. Depending on the developments in their executive function skills, children demonstrate skills such as understanding and interpreting emotions, regulating behaviors, realizing the perspectives of others and acting accordingly. Conducted research shows that the developments in executive function skills have an effect on self-regulation (Slot et al., 2017), emotion recognition (Leung et al., 2016; Mohtasham et al., 2019), empathy (Cascia & Barr, 2017; Zeng et al., 2021) and social competence skills (Diamond et al., 2019; Dias & Seabra, 2017; Romero-López et al., 2020) of the children.

In this study, it is aimed to investigate the effect of executive function skills on social-emotions development in children aged 4-5 years. The findings of the research which was conducted in a socioeconomically disadvantaged area provide information on social skills, social competence and interpersonal communication skills which are of critical importance in social life. It is thought that deficiencies in social skills, poor social adaptive skills and lack of social competence will affect the children in social life, academy and other fields. The ability to adapt oneself according to different circumstances, to regulate emotions and behaviors and the social competence skill in a world that is dynamic and constantly changing are of critical importance for functionality. Therefore, the findings to be obtained from this research will contribute to the expansion of literature knowledge of the children on factors affecting their academic, social life and interpersonal communication skills. Therefore, the findings of this research will contribute to the expansion of the literature on the factors affecting the academic, social life and interpersonal communication skills of children living in socio-economically disadvantaged areas.

As the aim of this study, which was conducted through predictive correlational design, the effect of executive function skills on social-emotions development in children aged 4-5 years was analyzed. In line with this aim, answers to the following questions will be sought:

- Do inhibitory control and working memory skills of children predict their recognition of emotions?
 - Do inhibitory control and working memory skills of children predict their empathy skills?
 - Do inhibitory control and working memory skills of children predict their regulation skills?
 - Do inhibitory control and working memory skills of children predict their social competencies?
- answers to these questions are sought.

Method

Participants

The participants of this research consist of 151 children ($n_{girl}=77$, 51.0% - $n_{boy}=74$, 49.0%) at the ages of 4-5 (Means=54.6 months) in the educational institutions of socially disadvantaged neighborhoods at the center of the capital city, Ankara. In the selection of the disadvantaged region, the rate of slums, the number of needy people to be assisted and the high rate of migration were taken into consideration.

Data Collection Tools

The data of the research were collected through the "Childhood Executive Functioning Inventory" and "Social-Emotional Assets and Resiliency Scale".

Childhood Executive Functioning Inventory

Turkish validity and reliability study of the measurement tool developed by Thorell and Nyberg (2008) was conducted by Çiftçi et al. (2020). The scale which was applied to 754 children 48-72-month-old has a two-factor, 24-item structure. When the fit indices were examined, it was stated that the RMSEA value was .06, the SRMR value was .04 and the CFI value was .93. Regarding the reliability values of the factors, Cronbach's Alpha coefficients were found to be .95 for Working Memory sub-scale and .91 for Inhibitory Control sub-scale. When Table 1 was analyzed in this study, as a result of a confirmatory factor analysis conducted to test the suitability of the study for the sample group, it was observed that item load values were between .30 and .92, X^2/sd value was 2.44, CFI value was .88, TLI value was .86, RMSEA value was .08 and SRMR value was .06. This shows that the current structure is suitable for the sample of the research. Reliability values were found to be .96 for Working Memory sub-scale and .88 for Inhibitory Control sub-scale.

Social-Emotional Assets and Resiliency Scale

Turkish validity and reliability study of the scale developed by Ravitch (2013) was conducted by Gülay Ogelman et al. (2021). The measurement tool which was applied to 403 children at the age of 5 has four sub-dimensions and 22 items. When the fit indices were examined, it was stated that the CFI value was .92, the SRMR value was .05 and the RMSEA value was .08. Cronbach's Alpha values were calculated as .92 for the Emotion Recognition sub-dimension, .92 for the Empathy sub-dimension, .85 for the Self-Regulation sub-dimension and .86 for the Social Competence sub-dimension. The total reliability coefficient was found to be .96. When Table 2 was analyzed in this study, as a result of a confirmatory factor analysis conducted to test the suitability of the study for the sample group, it was observed that item load values were between .36 and .81, X^2/sd value was 2.19, CFI value was .91, TLI value was .90, RMSEA value was .08 and SRMR value was .06. This shows that the current structure is suitable for the sample of the research. Cronbach's Alpha value was calculated as .92, .91, .86 and .88, respectively. The total reliability coefficient was found to be .96 in this study.

Data Collection Process

Required approvals regarding the use of scale and applications were obtained before data collection. Ethical approval was obtained from the Ethics Committee of Ankara University on 10/02/2022 with the decision number 56786525-050.04.04/410978. Since the instruments are not suitable for self-assessment by children, they should be completed by an adult who knows the child. The data were collected from 40 teachers at 15 preschool education institutions of 16 schools in the determined areas. When the teachers were determined, it was considered that they knew the children for at least 6 months and had information on their developments. The teachers chose the 4 children completely randomly without knowing the purpose. Each teacher was randomly asked to make an evaluation about no more than 4 children, as 2 girls and 2 boys. The participants of the research consisted of 151 children after deducting the number of children whose data was incomplete from 160 children who provided feedback.

Data Analysis

Before the data was ready for analysis, all values were standardized and converted into z-scores. Assumptions of multiple regression analysis were tested for the obtained data. Firstly, extreme values and assumption of normality were tested. After this process, whether there was a linear relationship between the dependent and independent variables was investigated with a scatter diagram. No multicollinearity problem was observed between the independent variables in the examination regarding the multicollinearity problem.

Table 1. Assumptions of Multiple Regression Analysis

Dimensions	Skewness	Kurtosis	Cook's	Durbin-Watson	Tolerance	VIF
Working Memory	-.553	.147	-	-	.393	2.542
Inhibitory Control	-.220	-.107	-	-	.393	2.542
Emotion Recognition	-.549	-.762	.00-.06	1.320	-	-
Empathy	-.221	-.460	.00-.11	1.231	-	-
Self-Regulation	-.276	-.364	.00-.07	1.253	-	-
Social Competence	-.333	-.739	.00-.07	1.385	-	-
Total SES	-.460	-.389	.00-.11	1.153	-	-

According to Table 1, when the coefficients of skewness and kurtosis for the assumption of normality are analyzed, it is observed that it is between ± 1 for all scores. This is one of the indicators that the data demonstrate a normal distribution (Tabachnick & Fidell, 2013). It can be said that there are no multiple extreme values since it was observed that Cook's values checked in the examination of extreme values ranged from 0 to .11 and were less than 1. In the examination regarding autocorrelation, Durbin-Watson values are expected to be between 1-3 and closer to 2. It is observed in the data examination that there is no autocorrelation (Field, 2018). Correlation, tolerance and VIF values were analyzed to test the assumption of multicollinearity. It was determined that there was no multicollinearity problem since correlation values were not above .90, the tolerance value was not less than .10 and the VIF value was not above 10 (Pallant, 2016).

In addition, statistical analysis was made to reveal the power of the research. When the effect size ($f^2=.41$), sample size ($n=151$) and the number of predictors ($n=2$) were analyzed, the power of the study was found to be .99.

Results

Findings related to the results of the research are examined in this section.

Table 2. Correlation Matrix of the Variables

Dimensions	1.	2.	3.	4.	5.	6.	7.
1. Working Memory	1.00	.779**	.541**	.540**	.572**	.543**	.617**
2. Inhibitory Control		1.00	.455**	.522**	.616**	.484**	.585**
3. Emotion Recognition			1.00	.777**	.668**	.690**	.893**
4. Empathy				1.00	.702**	.772**	.916**
5. Self-Regulation					1.00	.717**	.869**
6. Social Competence						1.00	.876**
7. Total SES							1.00

** $p<.01$, * $p<.05$

In Table 2, because the scale scores supported the assumption of normality, the relationship between social skills and executive functions was analyzed through Pearson's correlation coefficient. There is a positive relationship between working memory and emotion recognition ($r=.54$, $p<.01$), empathy ($r=.54$, $p<.01$), self-regulation ($r=.57$, $p<.01$), social competence ($r=.54$, $p<.01$) and total social skills ($r=.62$, $p<.01$). Similarly, there is a positive relationship between inhibitory control and emotion recognition ($r=.46$, $p<.01$), empathy ($r=.52$, $p<.01$), self-regulation ($r=.62$, $p<.01$), social competence ($r=.48$, $p<.01$) and total social skills ($r=.59$, $p<.01$).

Table 3. Regression Analysis for the Prediction of Emotion Recognition by Working Memory

Model	B	sh	β	t	p
Stable	.021	.067	-	0.311	.756
Working Memory	.524	.067	.541	7.842	.000
R=.541	R ² =.292				
F(1, 149)=41.231	$p<.001$	Emotion Recognition= (.541) x Working Memory			

When Table 3 was analyzed, it was found that Inhibitory Control was not a significant predictor of Emotion Recognition ($p>.05$). Therefore, it was excluded from the analysis and regression analysis was re-conducted. According to the results, it was observed that working memory is a significant predictor of emotion recognition scores ($F(1, 149)=41.231$, $R^2=.292$, $p<.001$). This indicates that 29% of the total variance regarding the emotion recognition score can be explained by working memory.

Table 4. Regression Analysis for the Prediction of Empathy by Working Memory and Inhibitory Control

Model	B	sh	β	t	p
Stable	.004	.068	-	0.055	.956
Working Memory	.340	.109	.339	3.135	.002
Inhibitory Control	.258	.109	.257	2.375	.019
R=.563	R ² =.317				
F(2, 148)=34.404	p<.001	Empathy= (.339) x Working Memory + (.257) x Inhibitory Control			

According to Table 4, it is observed that working memory and inhibitory control together are significant predictors of empathy ($F(2, 148)=34.404$, $R^2=.317$, $p<.001$). Working memory and inhibitory control together explain 32% of the total variance of empathy scores. The order of importance of the variables predicting empathy significantly is as follows: working memory ($\beta=.34$), inhibitory control ($\beta=.26$).

Table 5. Regression Analysis for the Prediction of Self-Regulation by Working Memory and Inhibitory Control

Model	B	sh	β	t	p
Stable	.014	.063	-	0.224	.823
Working Memory	.232	.100	.235	2.316	.022
Inhibitory Control	.428	.100	.433	4.269	.000
R=.633	R ² =.401				
F(2, 148)=49.565	p<.001	Self-Regulation= (.235) x Working Memory + (.433) x Inhibitory Control			

When Table 5 was analyzed, it was found that working memory and inhibitory control were significant predictors for self-regulation scores ($F(2, 148)=49.565$, $R^2=.401$, $p<.001$). Together they explain 40% of the total variance of self-regulation. The order of importance for predicting self-regulation is as follows: inhibitory control ($\beta=.43$) and working memory ($\beta=.23$).

Table 6. Regression Analysis for the Prediction of Social Competence by Working Memory and Inhibitory Control

Model	B	sh	β	t	p
Stable	.025	.065	-	0.390	.698
Working Memory	.517	.066	.543	7.893	.000
R=.543	R ² =.295				
F(1, 149)=62.299	p<.001	Social Competence= (.543) x Working Memory			

When Table 6 was analyzed, it was found that inhibitory control was not a significant predictor of social competence ($p>.05$). Therefore, it was excluded from the analysis and regression analysis was re-conducted. According to the results, it was observed that working memory is a significant predictor of social competence scores ($F(1, 149)=62.299$, $R^2=.295$, $p<.001$). This indicates that 30% of the total variance regarding the social competence score can be explained by working memory.

Table 7. Regression Analysis for the Prediction of Social Skills by Working Memory and Inhibitory Control

Model	B	sh	β	t	p
Stable	.018	.062	-	0.284	.777
Working Memory	.403	.099	.412	4.084	.000
Inhibitory Control	.258	.099	.264	2.618	.010
R=.639	R ² =.408				
F(2, 148)=51.075	p<.001	Total SES= (.412) x Working Memory + (.264) x Inhibitory Control			

According to Table 7, working memory and inhibitory control together are significant predictors for the total score of social skills ($F(2, 148)=51.075$, $R^2=.408$, $p<.001$). Working memory and inhibitory control explain 41% of the total variance of social skills scores. The order of importance for predicting social skills significantly is as follows: working memory ($\beta=.41$), inhibitory control ($\beta=.26$).

Discussion, Conclusion, Suggestions

Executive functions which present the skill to plan, control and update the interactions and behaviors in social environments are important for the healthy development of children. These environments provide children with the opportunity to experience different social situations and establish new relationships. In addition, children encounter social problem situations and have the opportunity to experience the processes of producing solutions to these situations. Controlling their behaviors in social environments, creating appropriate response reactions, and developing problem solving skills by establishing effective communication enable children to gain social competence. Executive function skills come into play in children's ability to communicate effectively, review their behaviors in social situations and produce new options and alternatives, manage their behaviors, and use effective problem-solving strategies. Executive functions, which are involved in the processes of making plans, controlling behaviors and impulses, and changing behaviors when necessary, are important for the healthy development of children. The development of children living in socio - economically disadvantaged areas can be negatively affected by factors such as poverty, neglect, and lack of a stimulating environment. Poor executive function and social emotional skills of children who face limited learning opportunities due to environmental factors can be observed (Black et al., 2017; Korzeniowski, 2022). Poor executive function skills impair behavior regulation abilities, which in turn lead to problem behaviors and hinder the development of social competence (Holmes et al., 2016). Studies have revealed that similar regions in the brain are activated in behaviors that involve social skills and in processes where executive functions must be used (Cheng et al., 2010; Hinnant et al., 2013; Just et al., 2012). Development in the prefrontal region of the brain affects executive functions and social skills. Developmental problems due to damage to this region or lack of environmental stimulation lead to deterioration in executive functions and social skills (Blair & Raver, 2012; Curtis & Cicchetti, 2007). The study conducted by Wolf and McCoy (2019) also reveals the effect of the development of executive functions and social skills on children's early learning processes. Based on the relationship between social skills and executive functions, this study aimed to examine whether executive function skills are predictors of social-emotional development in socially disadvantaged children.

The findings obtained from the study show that working memory is a predictor of children's emotion recognition skills. However, when working memory and inhibitory control were included in the model together, it was determined that there was no significant effect. The results of the study conducted by Morra et al. (2011) also support these findings. In the study conducted with children between the ages of 5-11, it was revealed that working memory predicted emotion understanding skills. Perceiving and recognizing emotions is an important skill that allows predicting what the other person feels, their purpose and subsequent behaviors during the interaction process with others (Thingujam et al., 2012). Working memory ensures that the information received after stimulus inputs is integrated with previous experiences, the inputs are processed sequentially, they are interpreted and this information is manipulated for a purpose (Spencer, 2020). Therefore, a strong working memory will

help children read and interpret social references as a result of experiences correctly and make correct analyses by combining them with their past experiences. Swanson and Beebe-Frankenberger (2004) also show that children with weak working memory have difficulty integrating new learning experiences with their past experiences. In both social life and in the cognitive processes in which learning experiences take place, the results obtained from past experiences help to structure new information. Social references such as emotions, facial expressions and tone of voice are also structured according to past experiences and reactions are formed accordingly. Therefore, having a strong working memory is important for recognizing emotions, associating them with past experiences and creating responses. The emotional socialization behaviors of adults such as mothers, fathers or teachers in the child's close environment and the learning opportunities they offer to children enable children to understand emotions and become aware of others' thoughts (Castro et al., 2015).

Growing up in environments that deprive children of a stimulating environment and cause a lack of social experience leads to deficiencies in the ability to recognize emotions and interpret social cues. Parents who interact less with their children and are unaware of their developmental needs interact less with children and cause children to be socially isolated (Rokita et al., 2018). The study conducted by Li et al. (2023) reveals the effect of learning opportunities in the home environment on social competence. The stimuli provided by parents depending on their beliefs and attitudes towards the development of children's social skills affect children's social skills. The risk of children living in socially disadvantaged areas being deprived of a stimulating environment, and parents' beliefs and attitudes towards children's developmental needs can affect developmental processes. According to Soucie et al. (2023), mothers who were more aware of their children's emotions used more emotional expressions than mothers who were less aware. This reveals the importance of parental awareness and the learning opportunities that parents offer to the child.

The findings obtained regarding the second research question show that working memory and inhibitory control skills predict empathy when included in the model. These two skills together explain empathic skills in children. The results of the meta-analysis study conducted by Yan et al. (2020) based on studies on children's empathy skills and executive functions revealed that cognitive empathy skills are related to inhibitory control, working memory and cognitive flexibility skills, and emotional empathy skills are related to inhibitory control. The results of another research reveal that inhibitory control skill is the predictor of cognitive empathy (Zeng et al., 2021). In the research by Gao et al. (2016), it is shown that there is a relationship between working memory and cognitive and emotional empathy skills. The results obtained in the research support the findings of this research which shows that working memory and inhibitory control skills are predictors of empathy. In the process of social interaction, it seems reasonable that empathy which includes emotional sharing and regulation processes and enables making deductions about the cognitive and emotional states of people (Decety & Holvoet, 2021) can be affected by inhibitory control and working memory skills which ensures that the behaviors are displayed in a consistent and regulated way. An individual who makes inferences by considering the emotional states, facial expressions and tones of voice of people will perceive these social references and go into a process of regulation based on previous experiences. It is thought that working memory and inhibitory control skills will become more prominent in these processes. Executive function skills are influenced by life experiences and learning opportunities. Adverse experiences during childhood can impact children's developmental processes. Research indicates that experiences in childhood affect social-cognitive skills, such as the ability to understand others' perspectives and develop empathy (Crawford et al., 2020; Lim et al., 2024).

The findings regarding the third question of the research show that working memory and inhibitory control explain self-regulation skills in children. Working memory and inhibitory control predict self-regulation skills when included together in the model. Slot et al. (2017) examined the relationship between the emotional and cognitive self-regulation skills of children and executive functions. In the study, it was concluded that there is a strong relationship between inhibitory control and working memory which are executive function skills and self-regulation skills of children. In another study, it was determined that there is a significant relationship between inhibitory control skills and emotional regulation skills of preschool children (Carlson & Wang, 2007). Inhibitory control skill which helps the creation of appropriate response reactions by enabling the control of thoughts, behaviors, attention and emotions (Diamond, 2013) will help the children to regulate their emotions and behaviors. The findings of a study on children with attention deficit hyperactivity disorder show that inhibitory control plays an important role in the regulation of externalization behaviors of children (Cristofani et al., 2020). Another research reveals that children with low working memory scores have a higher rate of conflict with their teachers and they have more problems with their peers accordingly. It has been revealed that there is a decrease in conflicts between the teacher and children whose working memory skills are developed through the intervention practices made during the research process and that the teacher-child relationships are improved (de Wilde et al., 2016). The results of the research in the literature indicate that working memory and inhibitory control skills help children with the regulation of behaviors and emotions. The promotion and enhancement of these skills will help the children to display behaviors by putting them into the process of evaluation, interpretation and re-regulation. Families with low socioeconomic status face numerous stressors that affect their lives, such as financial concerns, access to quality nutrition, and adequate housing. Children raised in these environments, where access to resources is limited, are more exposed to risk factors such as parental stress, restricted access to resources, and a lack of stimulating environments (Duncan et al., 2015). Compared to children in socially advantaged positions, those growing up in disadvantaged regions experience life circumstances that influence their social and cognitive development. Neurodevelopmentally intertwined executive functions, and social skills are also shaped by children's life experiences (Cuartas et al., 2022). Children raised in socioeconomically challenging conditions are more likely to face social and emotional difficulties later in life compared to their peers (van Poortvliet, 2021). The research findings by Hosokawa and Katsura (2017) also revealed that low family income is a predictor of an increase in emotional and behavioral problems. It is thought that the stress factors experienced affect the coping processes of families and children and the processes of using effective problem-solving skills. The lack of environments that support effective problem-solving skills and the modeling of parents' problem-solving styles suggest that children's problem-solving and self-regulation skills will be affected.

The findings for the fourth research question show that working memory is a significant predictor of social competence scores. According to Tang et al. (2021), it was concluded that verbal ability in children, that is, the ability of children to express their feelings and thoughts effectively, predicts social competence together with working memory. In short, it was observed that children with good verbal abilities and working memories also have better social skills. Children with stronger executive function skills also have better abilities to adapt to changing situations, overcome problems, feel safe in new environments, and communicate more easily with their environment. Experimental research results focusing on developing executive function skills show that children have increased cooperation, social interaction skills, and adaptation behaviors due to the development seen in their executive function skills (Romero-López et al., 2020) and that they exhibit behaviors such as helping their peers in case of need, encouraging each other, and mediating other peers to find playmates (Diamond et al., 2019). The results of a study also show that working memory affects children's ability to display social competence behavior in peer conflict situations. It has been found that working memory shows a higher correlation than these two skills in the task of coping with conflict situations, in which other components of executive functions, such as cognitive flexibility and inhibitory control skills, are also involved (Caporaso et al., 2019). Children who are good at working memory and other

executive function skills can become more socially competent individuals by exhibiting skills such as thinking, reviewing and regulating their behavior in conflict situations or situations that require competence. Therefore, it is estimated that executive function skills may have an impact on social-emotional development.

Another finding from this study is that executive function skills are predictors of social skills. When working memory and inhibitory control are included in the model together, it is concluded that they explain the total social skill scores of children. According to the research of Amani et al. (2019), there are improvements in the social skills of children whose inhibitory control skills are supported. Benavides-Nieto et al. (2017) revealed that children with high executive function scores had high scores in social interaction, social cooperation, following instructions, developing friendship behaviors, and accepting others.

In early childhood, the importance of social competence and social-emotional well-being is emphasized (Oberle et al., 2016). It is stated that children who are socially competent are more likely to be successful in education, find a job in the future, and establish safe and stable social relationships (Jones et al., 2015). Deficiencies in social skills affect the children's adaptation to school. Disruptive behaviors lead to aggression and adaptation problems (Domitrovich et al., 2007). Additionally, the sense of belonging is higher in children who have good social-emotional well-being and feel self-sufficient. The sense of belonging that is developed with social competence and well-being helps children to have high academic self-efficacy and success (Goodenow, 1993). Children who are socially strong and successful are more likely to be strong in other areas. The positive effect of feeling socially competent and good in other stages of development shows that these skills should be supported (Taylor et al., 2013).

Similar to the other studies in the literature, this research indicates the effect of executive function skills on social skills. The predictors of social skills were analyzed in this research which specifically focuses on two specific executive function skills such as working memory and inhibitory control. In addition to the studies in the literature, analysis was made by modeling both skills together and the prediction level of these two skills for social skills jointly and separately was determined. The obtained findings indicate that inhibitory control and working memory skills of the children living in socio-economically disadvantaged areas predict their empathy and self-regulation skills. It demonstrates that particularly the education programs of children living in disadvantaged areas should be diversified, especially through objectives for executive function skills. It is thought that children whose skills such as planning, avoiding sudden behaviors, ability to switch between emotions, and behavior-shaping according to life experiences are more socially competent and behave responsibly by minding the emotions and thoughts of others. The acquisition of these skills which will facilitate the resolution of conflicts and problems in social life will help individuals within society to establish healthy relationships, produce alternatives, care about others and respect their rights.

The research reveals the effect of executive function skills of children within the study group on social skills and includes various limitations. The limitations of the research include conducting the research in a specific area and collecting the data through teachers who know the children well. It is thought to be effective to conduct the research with the data obtained directly from children with a broader sample and include different executive function skills in the research can be effective. Tracking the executive function skills of the children in the preschool period can give an idea of their current and future social-emotional developments. Besides, the promotion of executive functions at the points that they are deemed inadequate can prevent the weaknesses which may occur during their social-emotional development.

References

- Amani, M., Koruzhdeh, E., & Taiyari, S. (2019). The effect of strengthening executive functions through group games on the social skills of preschool children. *Games for Health Journal*, 8(3), 213-219. <https://doi.org/10.1089/g4h.2018.0052>
- Barrasso-Catanzaro, C., & Eslinger, P. J. (2016). Neurobiological bases of executive function and social-emotional development: Typical and atypical brain changes. *Family Relations*, 65(1), 108-119. <https://doi.org/10.1111/fare.12175>
- Benavides-Nieto, A., Romero-López, M., Quesada-Conde, A. B., & Corredor, G. A. (2017). Basic executive functions in early childhood education and their relationship with social competence. *Procedia-Social and Behavioral Sciences*, 237, 471-478. <https://doi.org/10.1016/j.sbspro.2017.02.092>
- Bierman, K., Greenberg, M., & Abenavoli, R. M. (2017). *Promoting social and emotional learning in preschool* [Webinar]. State College, PA: The Pennsylvania State University. <https://earlychildhoodwebinars.com/webinar/promoting-social-and-emotional-learning-in-preschool-programs-and-practices-that-work>
- Bierman, K. L., & Motamedi, M. (2015). SEL programs for preschool children. In J. A. Durlak, C. E. Domitrovich, R. P. Weissberg, & T. P. Gullota (Eds.), *Handbook of social and emotional learning: Research and practice* (pp. 135-150). Guilford Press.
- Black, M. M., Walker, S. P., Fernald, L. C., Andersen, C. T., DiGirolamo, A. M., Lu, C., & Devercelli, A. E. (2017). Early childhood development coming of age: Science through the life course. *The Lancet*, 389(10064), 77-90. [https://doi.org/10.1016/S0140-6736\(16\)31389-7](https://doi.org/10.1016/S0140-6736(16)31389-7)
- Blair, C., & Raver, C. C. (2012). Child development in the context of adversity: Experiential canalization of brain and behavior. *American Psychologist*, 67(4), 309-318. <https://doi.org/10.1037/a0027493>
- Caporaso, J. S., Boseovski, J. J., & Marcovitch, S. (2019). The individual contributions of three executive function components to preschool social competence. *Infant and Child Development*, 28(4), e2132. <https://doi.org/10.1002/icd.2132>
- Carlson, S. M., & Wang, T. S. (2007). Inhibitory control and emotion regulation in preschool children. *Cognitive Development*, 22(4), 489-510. <https://doi.org/10.1016/j.cogdev.2007.08.002>
- Cascia, J., & Barr, J. J. (2017). Associations among vocabulary, executive function skills and empathy in individuals with autism spectrum disorder. *Journal of Applied Research in Intellectual Disabilities*, 30(4), 627-637. <https://doi.org/10.1111/jar.12257>
- Castro, V. L., Halberstadt, A. G., Lozada, F. T., & Craig, A. B. (2015). Parents' emotion-related beliefs, behaviors, and skills predict children's recognition of emotion. *Infant and Child Development*, 24(1), 1-22. <https://doi.org/10.1002/icd.1868>
- Cheng, Y., Chou, K. H., Chen, I. Y., Fan, Y. T., Decety, J., & Lin, C. P. (2010). Atypical development of white matter microstructure in adolescents with autism spectrum disorders. *NeuroImage*, 50(3), 873-882. <https://doi.org/10.1016/j.neuroimage.2010.01.011>
- Choe, D. E., Lane, J. D., Grabell, A. S., & Olson, S. L. (2013). Developmental precursors of young school-age children's hostile attribution bias. *Developmental Psychology*, 49(12), 2245-2256. <https://doi.org/10.1037/a0032293>
- Crawford, K. M., Choi, K., Davis, K. A., Zhu, Y., Soare, T. W., Smith, A. D., Germine, L., & Dunn, E. C. (2020). Exposure to early childhood maltreatment and its effect over time on social cognition. *Development and Psychopathology*, 34(1), 409-419. <https://doi.org/10.1017/S095457942000139X>
- Cuartas, J., Hanno, E., Lesaux, N. K., & Jones, S. M. (2022). Executive function, self-regulation skills, behaviors, and socioeconomic status in early childhood. *PLOS One*, 17(11), e0277013. <https://doi.org/10.1371/journal.pone.0277013>

- Curtis, W. J., & Cicchetti, D. (2007). Emotion and resilience: A multilevel investigation of hemispheric electroencephalogram asymmetry and emotion regulation in maltreated and nonmaltreated children. *Development and Psychopathology*, 19(3), 811-840. <https://doi.org/10.1017/S0954579407000405>
- Cristofani, C., Sesso, G., Cristofani, P., Fantozzi, P., Inguaggiato, E., Muratori, P., & Milone, A. (2020). The role of executive functions in the development of empathy and its association with externalizing behaviors in children with neurodevelopmental disorders and other psychiatric comorbidities. *Brain Sciences*, 10(8), 489. <https://doi.org/10.3390/brainsci10080489>
- Çiftçi, H. A., Uyanık, G., & Acar, İ. H. (2020). Çocukluk Dönemi Yürütücü İşlevler Envanteri Türkçe Formunun 48-72 aylık çocuklar için geçerlik ve güvenirlik çalışması. *Journal of Early Childhood Studies*, 4(3), 762-787. <https://doi.org/10.24130/ecccd-jecs.1967202043260>
- de Wilde, A., Koot, H. M., & van Lier, P. A. (2016). Developmental links between children's working memory and their social relations with teachers and peers in the early school years. *Journal of Abnormal Child Psychology*, 44(1), 19-30. <https://doi.org/10.1007/s10802-015-0053-4>
- Decety, J., & Holvoet, C. (2021). The emergence of empathy: A developmental neuroscience perspective. *Developmental Review*, 62, 100999. <https://doi.org/10.1016/j.dr.2021.100999>
- Diamond, A. (2013). Executive functions. *Annual Reviews of Psychology*, 64, 135-168. <https://doi.org/10.1146/annurev-psych-113011-143750>
- Diamond, A., Lee, C., Senften, P., Lam, A., & Abbott, D. (2019). Randomized control trial of Tools of the Mind: Marked benefits to kindergarten children and their teachers. *PLOS One*, 14(9), e0222447. <https://doi.org/10.1371/journal.pone.0222447>
- Dias, N. M., & Seabra, A. G. (2017). Intervention for executive functions development in early elementary school children: Effects on learning and behaviour, and follow-up maintenance. *Educational Psychology*, 37(4), 468-486. <https://doi.org/10.1080/01443410.2016.1214686>
- Domitrovich, C. E., Cortes, R. C., & Greenberg, M. T. (2007). Improving young children's social and emotional competence: A randomized trial of the preschool "PATHS" curriculum. *The Journal of Primary Prevention*, 28(2), 67-91. <https://doi.org/10.1007/s10935-007-0081-0>
- Duncan, G., Magnuson, K. A., & Votruba-Drzal, E. (2015). Children and socioeconomic status. In M. H. Bornstein, T. Leventhal, & R. M. Lerner (Eds.), *Handbook of child psychology and developmental science* (pp. 534-573). Wiley & Sons. <https://doi.org/10.1002/9781118963418.childpsy414>
- Eslinger, P. J., Flaherty-Craig, C. V., & Benton, A. L. (2004). Developmental outcomes after early prefrontal cortex damage. *Brain and Cognition*, 55(1), 84-103. [https://doi.org/10.1016/S0278-2626\(03\)00281-1](https://doi.org/10.1016/S0278-2626(03)00281-1)
- Fabes, R. A., Gaertner, B. M., & Popp, T. K. (2006). Getting along with others: Social competence in early childhood. In K. McCartney & D. Phillips (Eds.), *Blackwell handbook of early childhood development* (pp. 297-316). Blackwell. <https://doi.org/10.1002/9780470757703.ch15>
- Field, A. (2018). *Discovering statistics using IBM SPSS statistics*. SAGE Publications.
- Gao, Z., Ye, T., Shen, M., & Perry, A. (2016). Working memory capacity of biological movements predicts empathy traits. *Psychonomic Bulletin & Review*, 23(2), 468-475. <https://doi.org/10.3758/s13423-015-0896-2>
- Goodenow, C. (1993). The psychological sense of school membership among adolescents: Scale development and educational correlates. *Psychology in the Schools*, 30(1), 79-90. [https://doi.org/10.1002/1520-6807\(199301\)30:1<79::AID-PITS2310300113>3.0.CO;2-X](https://doi.org/10.1002/1520-6807(199301)30:1<79::AID-PITS2310300113>3.0.CO;2-X)
- Gülay Ogelman, H., Saraç, S., Önder, A., Abanoz, T., & Akay, D. (2021). Okul Öncesi Sosyal-Duygusal Beceriler ve Psikolojik Dayanıklılık Ölçeği'nin Türkçe geçerlik güvenirlik çalışması. *International Journal of New Trends in Arts, Sports & Science Education*, 10(4), 231-242.

- Hansen, D. J., Giacoletti, A. M., & Nangle, D. W. (1995). Social interactions and adjustment. In V. B. Van Hasselt & M. Hersen (Eds.), *Handbook of adolescent psychopathology: A guide to diagnosis and treatment* (pp. 102-129). Lexington Books.
- Hinnant, J. B., Nelson, J. A., O'Brien, M., Keane, S. P., & Calkins, S. D. (2013). The interactive roles of parenting, emotion regulation and executive functioning in moral reasoning during middle childhood. *Cognition & Emotion*, 27(8), 1460-1468. <https://doi.org/10.1080/02699931.2013.789792>
- Holmes, C. J., Kim-Spoon, J., & Deater-Deckard, K. (2016). Linking executive function and peer problems from early childhood through middle adolescence. *Journal of Abnormal Child Psychology*, 44(1), 31-42. <https://doi.org/10.1007/s10802-015-0044-5>
- Hosokawa, R., & Katsura, T. (2017). A longitudinal study of socioeconomic status, family processes, and child adjustment from preschool until early elementary school: The role of social competence. *Child Adolesc Psychiatry Ment Health*, 11, 62. <https://doi.org/10.1186/s13034-017-0206-z>
- Jones, D. E., Greenberg, M., & Cowley, M. (2015). Early social-emotional functioning and public health: The relationship between kindergarten social competence and future wellness. *American Journal of Public Health*, 105(11), 2283-2290. <https://doi.org/10.2105/AJPH.2015.302630>
- Just, M. A., Keller, T. A., Malave, V. L., Kana, R. K., & Varma, S. (2012). Autism as a neural systems disorder: A theory of frontal-posterior underconnectivity. *Neuroscience & Biobehavioral Reviews*, 36(4), 1292-1313. <https://doi.org/10.1016/j.neubiorev.2012.02.007>
- Korzeniowski, C. (2022). An ecological-contextual model of the development of executive functions: Identifying target areas for its promotion in children in socially disadvantaged contexts. In S. Deb & B. A. Gerrard (Eds.), *Handbook of health and well-being: Challenges, strategies and future trends* (pp. 455-476). Springer Nature Singapore. https://doi.org/10.1007/978-981-16-8263-6_20
- Leung, R. C., Vogan, V. M., Powell, T. L., Anagnostou, E., & Taylor, M. J. (2016). The role of executive functions in social impairment in autism spectrum disorder. *Child Neuropsychology*, 22(3), 336-344. <https://doi.org/10.1080/09297049.2015.1005066>
- Lim, L., Talozzi, L., & Howells, H. (2024). Atypical brain structural connectivity and social cognition in childhood maltreatment and peer victimisation. *BMC Psychiatry*, 24(1), 287. <https://doi.org/10.1186/s12888-024-05759-3>
- Li, S., Tang, Y., & Zheng, Y. (2023). How the home learning environment contributes to children's social-emotional competence: A moderated mediation model. *Frontiers in Psychology*, 14, 1-19. <https://doi.org/10.3389/fpsyg.2023.1065978>
- Mohtasham, M. K., Patterson, A. B., Vennergrund, K. C., Chen, E., & Pasnak, R. (2019). Emotional competence, behavioural patterning, and executive functions. *Early Child Development and Care*, 189(10), 1647-1656. <https://doi.org/10.1080/03004430.2017.1403434>
- Morra, S., Parrella, I., & Camba, R. (2011). The role of working memory in the development of emotion comprehension. *British Journal of Developmental Psychology*, 29(4), 744-764. <https://doi.org/10.1348/2044-835X.002006>
- Oberle, E., Domitrovich, C. E., Meyers, D. C., & Weissberg, R. P. (2016). Establishing systemic social and emotional learning approaches in schools: A framework for schoolwide implementation. *Cambridge Journal of Education*, 46, 277-297. <https://doi.org/10.1080/0305764X.2015.1125450>
- Pallant, J. (2016). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS*. McGraw-Hill Education.
- Ravitch, N. (2013). *Development and preliminary validation of the Social-Emotional Assets and Resiliency Scale for preschool* (Thesis No. ED563224) [Doctoral dissertation, University of Oregon]. <https://eric.ed.gov/?id=ED563224>
- Rokita, K. I., Dauvermann, M. R., & Donohoe, G. (2018). Early life experiences and social cognition in major psychiatric disorders: A systematic review. *European Psychiatry*, 53, 123-133. <https://doi.org/10.1016/j.eurpsy.2018.06.006>

- Romero-López, M., Pichardo, M. C., Bembibre-Serrano, J., & García-Berbén, T. (2020). Promoting social competence in preschool with an executive functions program conducted by teachers. *Sustainability*, 12(11), 4408. <https://doi.org/10.3390/su12114408>
- Rubin, K. H., Bukowski, W., & Parker, J. G. (2006). Peer interactions, relationships, and groups. In N. Eisenberg, W. Damon, & R. M. Lerner (Eds.), *Handbook of child psychology: Social, emotional, and personality development* (6th ed., pp. 571-645). Wiley. <https://doi.org/10.1002/9780470147658.chpsy0310>
- Slot, P. L., Mulder, H., Verhagen, J., & Leseman, P. P. (2017). Preschoolers' cognitive and emotional self-regulation in pretend play: Relations with executive functions and quality of play. *Infant and Child Development*, 26(6), e2038. <https://doi.org/10.1002/icd.2038>
- Soucie, K., Scott, S. A., Partridge, T., Hakim-Larson, J., Babb, K. A., & Voelker, S. (2023) Meta-emotion and emotion socialization by mothers of preschoolers during storytelling tasks. *Journal of Child and Family Studies*, 33(5), 1618-1631. <https://doi.org/10.1007/s10826-023-02736-4>
- Spencer, J. P. (2020). The development of working memory. *Current Directions in Psychological Science*, 29(6), 545-553. <https://doi.org/10.1177/0963721420959835>
- Swanson, H. L., & Beebe-Frankenberger, M. (2004). The relationship between working memory and mathematical problem solving in children at risk and not at risk for serious math difficulties. *Journal of Educational Psychology*, 96(3), 471-491. <https://doi.org/10.1037/0022-0663.96.3.471>
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson
- Tang, Y., Harris, P. L., Zou, H., Wang, J., & Zhang, Z. (2021). The relationship between emotion understanding and social skills in preschoolers: The mediating role of verbal ability and the moderating role of working memory. *European Journal of Developmental Psychology*, 18(4), 593-609. <https://doi.org/10.1080/17405629.2020.1854217>
- Taylor, S. J., Barker, L. A., Heavey, L., & McHale, S. (2013). The typical developmental trajectory of social and executive functions in late adolescence and early adulthood. *Developmental Psychology*, 49(7), 1253-1265. <https://doi.org/10.1037/a0029871>
- Thingujam, N. S., Laukka, P., & Elfenbein, H. A. (2012). Distinct emotional abilities converge: Evidence from emotional understanding and emotion recognition through the voice. *Journal of Research in Personality*, 46(3), 350-354. <https://doi.org/10.1016/j.jrp.2012.02.005>
- Thorell, L. B., & Nyberg, L. (2008). The Childhood Executive Function Inventory (CHEXI): A new rating instrument for parents and teachers. *Developmental Neuropsychology*, 33(4), 536-552. <https://doi.org/10.1080/87565640802101516>
- van Poortvliet, M. (2021). Inequality in skills for learning: Do gaps in children's socio-emotional development widen over time according to family background?. *Oxford Review of Education*, 47(4), 455-474. <https://doi.org/10.1080/03054985.2020.1862778>
- Veraksa, A., Bukhalenkova, D., & Almazova, O. (2020). Executive functions and quality of classroom interactions in kindergarten among 5-6-year-old children. *Frontiers in Psychology*, 11, 3099. <https://doi.org/10.3389/fpsyg.2020.603776>
- Weisberg, R. P. (2019). Promoting the social and emotional learning of millions of school children. *Perspectives on Psychological Science*, 14(1), 65-69. <https://doi.org/10.1177/1745691618817756>
- Wolf, S., & McCoy, D. C. (2019). The role of executive function and social-emotional skills in the development of literacy and numeracy during preschool: A cross-lagged longitudinal study. *Developmental science*, 22(4), e12800. <https://doi.org/10.1111/desc.12800>
- Yan, Z., Hong, S., Liu, F., & Su, Y. (2020). A meta-analysis of the relationship between empathy and executive function. *PsyCh Journal*, 9(1), 34-43. <https://doi.org/10.1002/pchj.311>
- Zeng, X., Yang, L., Zhu, X., Zhou, K., Zhang, J., & Yan, Z. (2021). Preschoolers' executive function boots the development of empathy: One-year cross-lagged panel analysis. *Early Child Development and Care*, 192(13), 2175-2183. <https://doi.org/10.1080/03004430.2021.1990908>
- Zins, J. E., & Elias, M. J. (2007). Social and emotional learning: Promoting the development of all students. *Journal of Educational and Psychological consultation*, 17(2-3), 233-255. <https://doi.org/10.1080/10474410701413152>