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Developing minds: a sociodemographic perspective on executive functions development in preschool children

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ABSTRACT

The current study focused on sociodemographic factors (i.e., parents' education, objective household income, subjective household income, school type) in relation to Executive Functions (EF). Given the associations of preschooler EF on developmental outcomes from childhood through adulthood, Socio economic Status (SES: both parents' education and objective household income) relations to EF warrant investigation. The sample included 215 Turkish mothers (26–47 years old) and their 3- to 5-year-old preschoolers (47.4% boys; 52.6% girls). Mothers completed a demographics form, and children were tested on the three cool components of EF (cognitive flexibility, conflict inhibition, working memory). Results indicated that SES predicted preschoolers' cognitive flexibility and conflict inhibition. In contrast, subjective income and school type were not related to any of the EF components. The main conclusion is that broadening measures of SES will help isolate relations that are relevant for preschool EF development.

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Introduction

'Brains are built, not born' (Van Ginkel, 2023, p. 6). This phrase refers to development which is not just a biological/maturational process but an on-going creation via environmental engagement such that better sociodemographic environments can help children develop improved self-regulation skills, cognitive abilities, and academic achievements (Brooks-Gunn & Duncan, 1997; Heckman, 2013).

For the current study, sociodemographic environment was defined in terms of parents' education, objective income, subjective income, and school type. Educational attainment and income are the commonly used variables for the assessment of Socioeconomic Status (SES) (Bornstein & Bradley, 2003). Social Capital construct expands SES beyond material possessions by including social connections and norms (Coleman, 1988). According to Coleman's framework, SES can be understood by investigating financial capital, which is the *objective income* of the person; human capital, which is the *education level* of the individual or family; and social capital, which refers to how individuals use their resources to benefit from them.

Environmental factors that can be attributed to social capital, such as parental investment and home environment, linked with preschoolers' cognitive development (Yeung et al., 2002). Accordingly, the current study incorporated *subjective income*, defined as individuals' self-evaluation of their objective income level, which may not always reflect the same variable as objective income (Glei et al., 2018). Since subjective income captures an aspect of social capital, it would be important to understand how subjective income is associated with sociodemographic dynamics and Executive Functions (EF) (Kezer & Cemalcilar, 2020; Ming et al., 2021; Ursache et al., 2015).

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In Türkiye today, about a third of the population (35.3%) is categorized as low SES (Turkish Statistical Institute, 2025; see [Supplementary material](#)), and it is important to study SES in a wide variety of SES samples to better understand the potential developmental consequences. Previous studies found that lower SES was negatively related to children's cognitive development and EF (Hackman et al., 2010; Noble et al., 2007). Longitudinal studies have also found that preschoolers and primary school children from low-SES families perform worse than children from high-SES groups, across multiple domains of EF (Hackman et al., 2015; Raz & Shaul, 2025).

EF is a collection of higher-order cognitive processes that enables goal-directed thoughts, emotions, and behaviors (Diamond, 2013; Miyake et al., 2000). With development, these processes include the increasing differentiations between working memory, conflict inhibition, and cognitive flexibility (Carlson et al., 2013). Working memory can be described as the capability to maintain and mentally operate on information that is no longer available (Diamond, 2013; Shah & Miyake, 1999). Conflict inhibition is the ability to suppress an automatic or habitual response tendency when a situation requires a subdominant yet more contextually appropriate action (Diamond, 2013). Cognitive flexibility, by contrast, is conceptualized as adjusting one's thoughts or behavior in accordance with changing rules, goals, or environmental demands, such as reconsidering which features of a stimulus should count as relevant (Diamond, 2013; Zelazo, 2006). Collectively and individually, these skills are essential for early social and academic outcomes, especially in preschool and primary school (Best & Miller, 2010; Blair, 2016). EF was found to be related to various environmental factors such as SES, cognitive stimulation, family stress, and parenting (Kara & Selcuk, 2023; Lawson et al., 2018; Rakesh et al., 2024). Amongst these variables, SES seems to be more inconsistent in terms of having small-to-medium relations with EF (for an extensive review, see Lawson et al., 2018), and other factors might mediate this relationship. For example, parenting and school quality become more essential when EF is studied in terms of its component processes (Altenburger & Schoppe-Sullivan, 2021; Jacobsen et al., 2017). Hence, in the current study, SES was expected to be positively related to preschoolers' cognitive flexibility and conflict inhibition while the relation for the working memory dimension was left open (Arán-Filippetti & Richaud de Minzi, 2012; Last et al., 2018; Ming et al., 2021; Raz & Shaul, 2025).

SES is also related to the type of school a family chooses (Ardila et al., 2005; Jheng et al., 2022; Rehman et al., 2010;) and school type might be associated with a wide range of developmental outcomes regarding EF. While the impact of private school on EF was compared for 9,267 kindergarteners, significantly better performance for working memory was found (Little, 2021). On the other hand, 5- to 14-year-old Colombian and Mexican children from private schools outperformed their public-school counterparts for cognitive flexibility and problem solving although this difference diminished with age (Ardila et al., 2005). This suggests that, early in development, EF is more sensitive to contextual factors. Private schools might facilitate EF by providing individualized attention and structured learning environments (Jacobsen et al., 2017; Ramsden et al., 1989). Hence, in the current study, it was hypothesized that preschoolers who were from private schools would perform better than state school students in all areas of EF.

Taken together with the family-level indicators, incorporating school type adds an institution-level dimension to the environments considered for sociodemographic variables (Piovesan et al., 2011). Moreover, the contributions of the present study extend beyond documenting an association by refining how the sociodemographic environment is conceptualized and measured. Rather than collapsing the environment into a single index, parental education, objective income, subjective income, and school type were utilized. This is consistent with Coleman's (1988) conceptualization of socioeconomic standing as encompassing distinct forms of capital, subjective income deserves closer attention. The existing literature has more often examined subjective SES and subjective social status both of which refer to the evaluation of income, education and occupational prestige (Ming et al., 2021; 2026; Ursache et al., 2015). Further, educational attainment in Türkiye has risen steadily in recent years, with a growing share of the population completing higher levels of education (OECD, 2025). However, since there are rapid economic changes (Turkish Statistical Institute, 2023, 2025), this might result in changes in how parents evaluate their own income levels. Therefore, this study focused on subjective income in order to address a more accurate framework of families' SES standing. Finally, because evidence on SES and EF derives predominantly from Western, high-income settings (Hackman et al., 2015; Hackman &

Farah, 2009; Singh & Rajendra, 2024), and work in Türkiye has tended to rely on narrow socioeconomic bands (i.e. just collecting data from certain SES levels or specifically from either urban or rural areas) (Gönül & Sahin-Acar, 2026; Okur-Ataş & Berument, 2023), the studies need a broader socioeconomic range.

Within this framework, the present study was designed to test whether higher SES would predict higher performance on measures of cognitive flexibility and conflict inhibition, while the working memory dimension was examined on an exploratory basis. It was further hypothesized that children who attended private schools would outperform their state-school peers across all three components of EF. In pursuit of these aims, the current research sought to explore the environmental dynamics underlying EF development during the preschool years.

Methods

Participants

The sample included 220 mother-child dyads¹; however, 5 participants did not report SES information and were excluded, leaving the final sample at 215 mother-child dyads. Of those children, 72 were aged 36–47 months; 75 were aged 48–59 months and 68 were aged 60–70 months (Range: 36–70 months; $M=53.16$, $SD=9.33$). Among those preschoolers, 102 (47.4%) were boys and 113 (52.6%) were girls. All participants were recruited from public and private schools in various socioeconomic regions of the capital of the country, Ankara. One hundred and forty-one children (65.6%) were from public schools and 74 (34.4%) were from private schools. Mothers' age ranged from 26 to 47 ($M=35.62$, $SD=4.07$). For SES and subjective income, see [Supplementary Table S1](#).

Procedure

The study began after approvals were obtained from the Turkish Ministry of National Education and the Bilkent University Ethics Committee. Participants were recruited by contacting kindergartens and preschools in different socioeconomic regions of Ankara. While contacting the kindergartens and preschools, only schools which wanted to attend to the study were asked to distribute consents for the parents. Twenty-eight schools were agreed to be a part of the study.

Data collection

After receiving consents, mothers were given the demographics form (either in hard copy or electronic format, depending on their preference). Children were tested at their preschools after receiving their verbal assent. Three measures were used in the following fixed order to assess EF: The Dimensional Change Card Sort task, the Day-Night task, and the Balloon task. A debriefing was provided to the participants at the end of the study. Data was collected between August 2023 and December 2024.

Materials

School type measurement

Schools in Türkiye are categorized as either private or public. In this study, the school type variable was coded accordingly. This information was verified from official school websites.

Parent measures

Demographics form A demographics form was used to assess three sociodemographic variables to capture SES: the education level of both parents and the household income level (objective income). The 7 education level categories were from illiterate to PhD. The 7 objective income categories were from lower than 15.000 to higher than 90.000 Turkish Liras. The personal evaluation of income level was used to assess the subjective income of the participants. The 4 subjective income categories were from low to very good.

Child measures

Dimensional change card sort task (DCCS) The DCCS task assesses cognitive flexibility by requiring children to sort cards based on rules (Zelazo, 2006). First, children sort cards by color, then by shape, lastly by border. The procedure of coding followed Zelazo (2006) and children could receive 0–3 points for this task.

Day-night task This task measures conflict inhibition (Gerstadt et al., 1994). Children are asked to say ‘day’ when they see a picture of the moon and ‘night’ when they see a picture of the sun. The task consists of two training and sixteen test trials. Children could receive 0–16 points for this task.

Balloon task This task is inspired by backward digit-span and was developed by researchers at Bilkent University (Allen et al., 2021) to measure working memory. First, children are asked to name the color of 3 balloons. After confirming that children knew the colors, balloons were placed in an opaque tube in sequence and then children were asked to recall their order. If the child correctly names the entire order of the balloons, they receive 1 point in one trial. The second trial follows the same procedure with differently colored balloons. Children could receive 0–2 points for the whole task.

Result

Analysis plan

This paper aimed to investigate the relationship between sociodemographic variables and EF in pre-school. To explore these relations, the frequency of sample characteristics was investigated (see [Supplementary Table S1](#)). Next, bivariate correlations and age controlled partial correlations were conducted to see the relations between sociodemographic and child variables (see [Tables 1](#) and [2](#)). Third, a set of analyses regarding the hypotheses was conducted; hierarchical regressions were used to test the relations between SES and EF. In the regressions, school type was added to test the hypotheses and subjective income was added to the model for exploratory purposes.

Preliminary analysis

All SES variables (mother education, father education, and objective income) were found to be significantly related to one another (all p -values < 0.001) (see [Table 1](#)). Therefore, the scores from these variables were converted into z-scores to generate a composite SES score² (Davis-Kean et al., 2021). Importantly, there is a diversity in terms of the range of objective income levels. Subjective income as

Table 1. Bivariate correlation with sociodemographic variables and EF.

Variables	1	2	3	4	5	6	7
1. Mother education	—						
2. Father education	0.41***	—					
3. Objective income	0.42***	0.42***	—				
4. Subjective income	0.19**	0.14*	0.51***	—			
5. Cognitive flexibility	0.07	0.13 [†]	−0.06	0.00	—		
6. Conflict inhibition	0.10	0.05	0.03	−0.03	0.36***	—	
7. Working memory	0.02	0.02	−0.07	−0.05	0.23***	0.33***	—

***Correlation is significant at the 0.001 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

[†] $p < 0.10$.

Table 2. Bivariate and partial correlation analyses for EF.

Variables	1	2	3	4
1. Age (in mn)	—			
2. Cognitive flexibility	0.42***	—	0.22***	0.10
3. Conflict inhibition	0.42***	0.36***	—	0.21**
4. Working memory	0.35***	0.23***	0.33***	—

Note: The lower diagonal section of this table displays the bivariate correlations, and the upper diagonal section shows the age-partial correlations.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

an evaluation of objective income level was correlated with all SES variables (see Table 1) even though the variability in subjective income was limited (see Supplementary Table S1).

EF measures (cognitive flexibility, conflict inhibition, and working memory) showed strong correlations with each other (see Table 2). Since these measures showed convergent validity and the literature supports the three-factor EF model (Diamond, 2013; Zelazo et al., 2016), a combined EF score was calculated by converting them into z-scores and it was used in analyses related to composite EF.

Relations between sociodemographic variables and EF

While this study focused on several aspects of sociodemographic variables, the main hypothesis of the study was that SES would predict preschoolers' cognitive flexibility and conflict inhibition. Regarding SES, the exploratory part that we included was about working memory as there were no specific hypotheses regarding this component of EF. In addition, school type was another sociodemographic variable that was expected to predict better EF skills for preschoolers who attended private schools. Finally, subjective income was added to the regressions for exploratory purposes.

Family SES, subjective income, school type and EF

To investigate these hypotheses, the current study ran a set of hierarchical regression analyses. Age and gender were added to all regressions as potentially relevant independent variables (Silverman, 2021; Zhong et al., 2022). For all hierarchical regressions, in step 1, gender, age, and family SES were entered in the regression; in step 2, school type and subjective income were added. Finally, in step 3, the interactions of age and school type as well as family SES and subjective income were included (see Table 3). The analysis revealed that SES significantly predicted EF ($\beta=0.19$, $p<0.01$). Further analyses were conducted on each of the EF components as separate DVs (see Table 3).

Prediction of cognitive flexibility The first model was found to significantly predict cognitive flexibility ($p<0.001$). While including all predictors in the final regression model, SES remained significant ($\beta=0.16$, $p<0.05$). None of the sociodemographic variables or the interaction terms predicted the cognitive flexibility dimension.

Prediction of conflict inhibition The first model ($p<0.001$) and marginally the third model ($p=0.07$) were found to predict conflict inhibition. For all models, family SES was found to be a significant predictor of conflict inhibition ($p<0.05$). However, neither school type nor subjective income predicted conflict inhibition. Furthermore, while the interaction of age and school type was not significant, the other interaction term, family SES and subjective income, was found to be significant while predicting conflict inhibition ($\beta = -0.14$, $p=0.02$). However, the direction of the relationship is unexpected and the magnitude of the correlation is small³.

Prediction of working memory The first model was found to significantly predict the working memory ($p<0.001$). None of the sociodemographic variables significantly predicted working memory although age remained significant from the first to the third model ($p<0.001$).

Discussion

The primary findings, which partially supported the hypotheses, indicated that SES was significantly and positively associated with preschoolers' EF, such that as preschoolers' SES levels increased, their EF scores increased. While there was a positive association between SES and composite EF, SES was not associated with preschoolers' working memory, suggesting strong biological roots for children's working memory (D'Esposito, 2007; Shah & Miyake, 1999). Furthermore, regarding the SES variables, all sociodemographic variables measured in the study, fathers' and mothers' education and objective household income, showed strong intercorrelations. Similarly, subjective income was found to be related to all objective SES variables; however, it was not independently related to EF. Lastly, school type was not significantly related to preschoolers' EF.

This study is essential as it investigates the possible relations between EF development that go beyond SES. While SES is an essential environmental dynamic for children's cognitive development (Lawson et al.,

Table 3. Hierarchical regression models predicting cognitive flexibility, conflict inhibition, working memory and composite EF.

Predictor variable	Cognitive flexibility					Conflict inhibition					Working memory					Composite EF				
	B	SE	95% CI	ΔR^2		B	SE	95% CI	ΔR^2		B	SE	95% CI	ΔR^2		B	SE	95% CI	ΔR^2	
Step 1																				
Gender	0.33**	0.12	[0.09, 0.57]	0.230***		0.07	0.12	[-0.17, 0.32]	0.213***		0.23	0.13	[-0.03, 0.48]	0.140***		0.63*	0.25	[0.14, 1.12]		
Age	0.05***	0.01	[0.04, 0.07]			0.05***	0.01	[0.04, 0.06]			0.04***	0.01	[0.03, 0.06]			0.14***	0.01	[0.12, 0.17]		
Family SES	0.07**	0.03	[0.02, 0.12]			0.08**	0.03	[0.03, 0.13]			0.03	0.03	[-0.03, 0.09]			0.18***	0.05	[0.08, 0.29]		
Step 2																				
Gender	0.33**	0.12	[0.09, 0.58]	0.001		0.06	0.13	[-0.19, 0.31]	0.005		0.22	0.13	[-0.04, 0.48]	0.001		0.61*	0.25	[0.12, 1.11]		0.001
Age	0.05***	0.01	[0.04, 0.07]			0.05***	0.01	[0.04, 0.06]			0.04***	0.01	[0.03, 0.06]			0.14***	0.01	[0.12, 0.17]		
Family SES	0.07*	0.03	[0.02, 0.13]			0.08*	0.03	[0.02, 0.14]			0.03	0.03	[-0.03, 0.10]			0.18**	0.06	[0.06, 0.30]		
School type	-0.07	0.14	[-0.34, 0.20]			0.14	0.14	[-0.14, 0.41]			0.04	0.14	[-0.24, 0.32]			0.11	0.28	[-0.43, 0.65]		
Subjective income	0.01	0.07	[-0.12, 0.14]			-0.04	0.07	[-0.17, 0.09]			-0.03	0.07	[-0.17, 0.11]			-0.06	0.13	[-0.32, 0.20]		
Step 3																				
Gender	0.31*	0.13	[0.06, 0.55]	0.006		0.01	0.13	[-0.24, 0.26]	0.020		0.24	0.13	[-0.02, 0.50]	0.007		0.56*	0.25	[0.06, 1.06]		0.006
Age	0.05***	0.01	[0.04, 0.07]			0.05***	0.01	[0.03, 0.07]			0.04***	0.01	[0.02, 0.05]			0.14***	0.02	[0.10, 0.17]		
Family SES	0.07*	0.03	[0.01, 0.13]			0.07*	0.03	[0.01, 0.13]			0.03	0.03	[-0.03, 0.10]			0.17**	0.06	[0.05, 0.29]		
School type	-0.06	0.14	[-0.32, 0.22]			0.16	0.14	[-0.11, 0.43]			0.04	0.15	[-0.24, 0.33]			0.15	0.28	[-0.40, 0.69]		
Subjective Income	0.01	0.07	[-0.12, 0.14]			-0.04	0.07	[-0.17, 0.09]			-0.02	0.07	[-0.16, 0.12]			-0.05	0.13	[-0.32, 0.21]		
Age × school type	0.00	0.01	[-0.03, 0.03]			0.00	0.01	[-0.03, 0.03]			0.01	0.02	[-0.02, 0.04]			0.02	0.03	[-0.04, 0.07]		
Family SES × Subjective income	-0.04	0.03	[-0.09, 0.02]			-0.07*	0.03	[-0.12, 0.01]			0.03	0.03	[-0.02, 0.09]			-0.08	0.06	[-0.19, 0.04]		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

2018; Singh & Rajendra, 2024) only 48% of the developmental psychology literature reported SES information. Among those, SES has typically been studied in WEIRD samples that tend to be mid- to high-SES (Singh & Rajendra, 2024). The current study was conducted on a Turkish sample with a broader range of SES.

The main findings were in line with previous literature. In particular, SES was not related to working memory. While some studies have found associations between SES and auditory working memory (Arán-Filippetti & Richaud de Minzi, 2012; Last et al., 2018), others do not find relations between SES and visual-spatial working memory (Last et al., 2018; Raz & Shaul, 2025). Accordingly, the null findings in the current study might be because the balloon task is more like a visual-spatial working memory task than an auditory one. Further, given that working memory has a strong biological component (D'Esposito, 2007; Shah & Miyake, 1999) any relations of SES may not appear until later in development.

Another dimension of EF, conflict inhibition, was found to be associated with SES. Although also involving a strong biological component, conflict inhibition is open to the effects of contextual factors, such that neighborhood poverty resulted in lower inferior frontal gyrus activation for children which is related to inhibitory behavior (Tomlinson et al., 2020). In the present study, similar to its role in conflict inhibition, SES was found to be associated with cognitive flexibility. Already in infancy, the effects of low- versus high-SES have been shown (Clearfield & Niman, 2012). This suggests that for some parts of EF, the potential effects of SES might emerge during the very early stages of life, making cognitive development more susceptible to sociodemographic factors. Similarly, the literature shows that conflict inhibition (St. John et al., 2019) and cognitive flexibility (Conway et al., 2018; Howard et al., 2020) performances of preschool children are related to SES (Raz & Shaul, 2025). All findings indicated that children's cognitive inhibition and cognitive flexibility skills may be more prone to SES variables from an early age.

In the current study, SES was measured based on both parents' education and income (Davis-Kean et al., 2021; Singh & Rajendra, 2024). However, an even wider range of SES dynamics that include the type of occupation, home conditions, or neighborhood characteristics, could be considered in future studies (Chen & Paterson, 2006; Hackman & Farah, 2009). The home environment refers to the dynamic microsystem that directly shapes the child's cognitive, linguistic, and socio-emotional development through parental interactions and physical stimuli (Sarsour et al., 2011). Not including the home environment might be considered a limitation since it has strong links with SES levels and, consequently, children's EF. During early childhood, learning experiences available to the child within the family context constitute one of the important ways that SES relates to the psychological and cognitive development (Brooks-Gunn & Duncan, 1997; Yeung et al., 2002).

The home environment can also be affected by the stress parents experience under economic pressure, which raises emotional distress and marital conflict (Conger et al., 1992). This stress might foster harsher and less consistent parenting and operate not directly but through disrupted caregiving (Conger & Donnellan, 2007). Families with greater resources, by contrast, can direct their means toward the books, learning materials, and enriching experiences that support cognitive growth (see Family Stress Model, Conger et al., 1992). A family's capacity to provide a cognitively stimulating home environment and materials is a structural factor that is directly associated with children's performance on achievement tests and EF (Brooks-Gunn & Duncan, 1997; Sarsour et al., 2011; Yeung et al., 2002). In addition, given the mixed findings in the literature regarding the role of language between SES and EF relations, child language abilities could be investigated further (Gooch et al., 2016; Noble et al., 2005). Thus, incorporating language and the richness of the home learning environment into the model could enable a clearer understanding of the causal links between SES and EF.

Even though those SES related constructs were not included in the current study, it was important that we were able to test school type and subjective income. The annual rate of change in the consumer price index (the index which aims to measure inflation), 2023 December was reported as 64.77% (Turkish Statistical Institute, 2023, 2025). Given this, it was important to understand how parents evaluated their income levels as only three mother participants reported the highest level of subjective income, whereas 31 were classified within the highest objective income level. However, it is still an important variable to be considered as it was observed to be significantly correlated with all SES dynamics, and an unexpected interaction was revealed for conflict inhibition (in which the direction of the relation was negative).

Another environmentally relevant variable was the type of school that preschoolers attended. In some studies, school type is considered to be related to SES (Ardila et al., 2005; Piovesan et al., 2011). In the

current study, SES was found to be associated with school type ($p < 0.001$). Since SES was associated with school type and the regression models showed the role of SES, most of the variance could be explained by this variable and we might not see the unique effect of school type. In addition, the majority of the sample was from children who attended a state school (65.6%) and this might have resulted in lower power to understand the difference from children who attended a private school. While including school type in the analysis was an advantage of the current study, the categorization was binary (public versus private). However, this indicator does not fully capture school quality, which is increasingly understood as a multidimensional construct encompassing features such as class size, instructional resources and teacher–child interaction (Schneider, 2017). In line with this, from different countries and various studies, the quality of teacher-child interactions revealed links with working memory and inhibition dimensions of EF in 2–12-year-old children (for a detailed meta-analysis see Vandenbroucke et al, 2018). Since these specific classroom dynamics or overall classroom quality were neither observed nor controlled for in the present study, it will be crucial for future research to incorporate other school quality dynamics.

Implications

Regardless of the type of school children attend, previous studies also found that participation in early childhood education was associated with better cognitive developmental outcomes compared to not participating across different countries (i.e. Cambodia, Mongolia, and Vanuatu) (Rao et al., 2019). In addition, the cumulative duration of early childhood education, which represents the total hours the child attends preschool, was associated with better cognitive development in four countries: Cambodia, Mongolia, Vanuatu, and China (for details see Rao et al., 2019).

In line with this, different kinds of interventions (e.g., family-based behavior oriented, cognitive training oriented) can improve brain signaling, cognitive functioning, and behavioral regulation of children living in low-SES circumstances (Neville et al., 2013; 2015; Segretin et al., 2014). Another intervention program found that although low-SES preschool children showed more EF-related problems in the classroom than their middle- and high-SES peers, the intervention, ‘Put Your EF Glasses On,’ had positive effects on preschoolers from low-SES backgrounds while showing no effects on preschoolers from middle or high-SES backgrounds (Kellens et al., 2023). These findings suggest that preschoolers from low-SES backgrounds may need more social and educational support to improve their EF development. Hence, the current study suggests more practical implications for community and educational support systems, especially those aimed at improving cognitive flexibility and cognitive inhibition skills for preschoolers living in low-SES.

Limitations and future directions

While the current study emphasizes the importance of interventions and provides essential insights into the relationship between preschoolers’ SES and EF, it also highlights several theoretical and methodological future directions. Of those future directions, the theoretical ones highlight SES operationalization, home environment dynamics and school type formulation.

In addition, there are methodological future directions. While including a range of sociodemographic factors, the current study utilized mother reports for collecting demographic information. Previous literature showed that the same family members might report differently for objective financial indicators such as household income (Zagorsky, 2003) and for subjective social status parents residing in the same household often provided differing evaluations (Gage-Bouchard & Devine, 2014). Consequently, inferring a family’s overall socioeconomic position based on a single parental report may lead to an incomplete representation of the household’s resources.

Another methodological limitation was that the present study had a cross-sectional design, which did not give the chance to observe the changes in EF through time. Also, even though the data was collected from various SES regions in Ankara, the data was collected from a single city. Future research might consider collecting data from various cities in Türkiye, including rural regions, and use a longitudinal design to observe the effects of SES on EF over time.

While evaluating sociodemographic variables, the current study focused on SES, subjective income and school type. Future research might go beyond the current one by including more assessments of the current sociodemographic variables and addressing the methodological limitations. In doing so, our study contributes to the recent calls for more systematic and context sensitive reports in developmental science (Singh & Rajendra, 2024).

Notes

1. This study used a sub-set of data from the PhD dissertation of Önoğlu Yıldırım which had 249 valid mother-child dyads (29 dyads were excluded for incomplete or problematic data and child testing problems).
2. All measures of SES (i.e., mother education, father education, objective income) were equally weighted.
3. The post hoc power analyses using G*Power were conducted to further interpret this finding (Faul et al., 2009). The power of the third block was found to be 0.44 which was underpowered (Cohen, 1988) and thus, the result should be evaluated with caution.

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Author contributions

CRedit: **Eda Önoğlu Yıldırım**: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Writing – original draft, Writing – review & editing; **Fatma Sude Çelebi**: Conceptualization, Investigation, Writing – original draft, Writing – review & editing; **Erin Ecem Eroğlu**: Conceptualization, Investigation, Writing – original draft, Writing – review & editing; **Hazal Memiş**: Conceptualization, Investigation, Writing – original draft, Writing – review & editing; **Jedediah W. P. Allen**: Conceptualization, Formal analysis, Methodology, Resources, Supervision, Writing – original draft, Writing – review & editing.

Ethics statement

The study was approved by the Bilkent University Ethics Committee for research with human participants (#2023_05_08_02). All parents provided written consent for both mothers' and preschoolers' participation in the study. In addition, preschoolers were asked to report verbal assent.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

In accordance with the funding terms stipulated in the contract with the Scientific and Technological Research Council of Türkiye (TÜBİTAK), the anonymized data will be made available upon request, seven years after the completion of the project.

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