The Bilingual Advantage in Preschoolers: Does It Hold for Typologically Distant Languages in a Hybrid Cultural Context?

Abstract

This study focused on the impact of bilingualism on executive function (EF) and theory of mind (ToM) in preschool children. Seventy-two children (age, 4-6 years) were involved: 36 Turkish monolinguals and 36 bilingual children whose first language was typologically distant and second language was Turkish. EF was measured using a Flanker task and ToM was measured using a False Belief task. Contrary to an expected bilingual advantage, monolinguals demonstrated better performance in EF task and were more likely to pass the ToM task. Among the bilinguals, the Arabic-Turkish speakers scored lower on ToM, which might be attributed to socioeconomic differences. The results raise the possibility that distant languages may lead to higher cognitive load and to fewer bilingual advantages. Moreover, the sociocultural context of Turkiye characterized by diverse cultural values and linguistic environments may moderate effects of bilingualism, revealing the need for models of bilingual cognition that are context sensitive.

1. Introduction

Empirical studies of children suggest that bilingualism may enhance EF and ToM. Bilingual children exhibit better inhibitory control and cognitive flexibility than monolingual peers (Carlson & Meltzoff, 2008; Bialystok & Viswanathan, 2009); and neuroimaging studies have found bilinguals to show greater activation in neural systems that support cognitive control during language switching and EF tasks (Bialystok, Craik, & Luk, 2012). Similarly, bilingualism has been associated with enhanced ToM development, especially in tasks that require the understanding of false beliefs and other people's perceptions (Goetz, 2003; Huang, Baker, & Wang, 2023; Kovács, 2009).

However, the robustness of the "bilingual advantage" has been questioned by some researchers. In their recent meta-analyses of studies testing for executive function differences, Giovannoli et al. (2020) conclude that there is evidence of a bilingual advantage for inhibitory control and cognitive flexibility, but that variation in methods and populations across studies makes it difficult to draw definitive conclusions about a bilingual advantage. Lowe et al. (2021) are more pessimistic, suggesting that the evidence for a bilingual advantage is, at best, a modest effect that applies only to response inhibition, and may be non-existent when potential biases are taken into account. In the realm of ToM, a meta-analysis reveals a small advantage for bilinguals that increases after adjusting for language proficiency (Schroeder, 2018). SES has been identified as an influential moderator and bilingual advantages are often found to be restricted or absent when groups are matched on SES measures (Naeem et al., 2018; Morton & Harper, 2007). Still, some studies reveal benefits even when SES controlled conditions are met (Engel de Abreu et al., 2012), which suggests that bilingual effects may be conditioned on some other experiential dimensions beyond SES.

We can assume that the cognitive consequences of bilingualism are context dependent, influenced by SES, language use, typological distance and cultural context. The present study thus aimed to examine whether there are differences between bilingual preschoolers in Turkiye, in terms of their language pairs (typological distance) and EF and ToM performance. Based on previous mixed findings and the possible role of linguistic distance and sociocultural context, we hypothesized that bilingual and monolingual preschoolers would differ in

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terms of their performance on executive function (EF) and theory of mind (ToM) tasks.

2. Method

2.1 Participants

Participants were 72 preschool children (4-6 years, M = 5.37, SD = 0.58) who were recruited from public preschools in Istanbul, Turkiye. This age range was selected because it represents a critical developmental window during which both executive function and theory of mind undergo rapid growth and during which bilingual effects on these abilities have been most frequently investigated (Carlson & Moses, 2001; Kovács, 2009). The sample consisted of 36 monolingual Turkish speakers and 36 bilingual children exposed to Turkish and a language from a different language family (16 Arabic-Turkish, 10 Russian-Turkish, 6 Kurdish-Turkish and 4 English-Turkish). Children were classified using parental reports adapted from standard bilingualism questionnaires. SES was assessed using parental education, occupation, and household income, each rated 1–5. Scores were standardized and averaged to create a composite SES index.

2.2 Tasks

Executive function (EF), specifically inhibitory control was measured by using a child friendly version of the Flanker task (Eriksen & Eriksen, 1974; Rueda et al., 2004). The task was programmed and presented with the PsychoPy program (Peirce et al., 2019). Stimuli were images of fish which were shown on a computer screen, and the child's task was to identify the direction of the central fish during a task in which the child was to ignore the presence of distractor fish around it. ToM was tested using a standard False Belief task (Wimmer & Perner, 1983). Children observed a candy box that actually contained a pencil. After introducing a doll unaware of the box's content, they were asked what the doll would think was inside. Responses of 'candy' were coded as pass.

2.3 Statistical Analysis

In the analysis of EF, group differences were tested using General Linear Models (GLMs) with language group (bilingual vs. monolingual) as a between-subjects factor, and age, SES, and gender entered as continuous covariates. To specifically test whether the effect of language group was moderated by SES, an ANCOVA including the SES × Language Group interaction term was conducted for the primary EF accuracy measure. Given that normality assumptions were violated for most dependent variables (Shapiro–Wilk $p < .05$), GLMs were preferred over t-tests to accommodate covariates and heteroscedasticity. All models were estimated using heteroscedasticity-robust standard errors and bias-corrected bootstrapped confidence intervals (1,000 samples). For ToM performance, a binary logistic regression model was implemented, as the dependent variable was categorical (pass/fail).

All analyses were conducted in Jamovi (version 2.6.44; The Jamovi Project, 2023). GLM and ANCOVA analyses were implemented using Jamovi's *GAMLj* and *ANOVA* modules, and bootstrap resampling was performed via the *bootES* module.

3. Results

3.1 Bilingual vs. Monolingual Comparisons on Executive Function and Theory of Mind

Preliminary analyses were conducted to examine whether bilingual (B, n=36) and monolingual (M, n=36) children differed in terms of socio-demographic variables. B and M children did not differ significantly in age (Mann-

Whitney $U = 619$, $p = .746$). The median age in both groups was 5.58, with the bilingual group showing $M = 5.40$ ($SD = 0.56$) and the monolingual group $M = 5.33$ ($SD = 0.61$). A significant difference in SES was found, $t(70) = 2.78$, $p = .007$, Cohen's d = .656. Despite both groups being classified within the middle-class range, the bilingual group (M = 3.57, SD = 0.438) reported higher -SES than the monolingual group (M = 3.33, SD = 0.303). Due to this significant difference, SES was included as a continuous covariate in all subsequent analyses to control for its potential influence. Gender distributions were equivalent between groups ($\chi^2(1) = 1.00$, $p = .317$). The bilingual group included 26 females (72.2%) and 10 males (27.8%), while the monolingual group consisted of 22 females (61.1%) and 14 males (38.9%).

We next examined EF and ToM differences between groups. For executive function (EF), we examined four behavioral measures from the Children's Flanker Task: Accuracy rates (ACC), which represent the proportion of correct responses, Reaction Times (RT), which index the speed of responding on correct trials, the Flanker Effect (FE.), which measures the cost of resolving response conflict (RT difference between incongruent and congruent trials); and the Flanker Accuracy Effect (FAE), which reflects accuracy costs under conflict conditions. ACC scores were computed as the proportion of correct responses across all trials within each condition. RT scores were calculated as the mean reaction time for correct trials only. FE was obtained by subtracting mean RTs for congruent trials from mean RTs for incongruent trials (RT_incongruent – RT_congruent). Similarly, FAE was calculated as the difference in accuracy between congruent and incongruent trials (ACC_congruent – ACC_incongruent).

The overall model for ACC was significant, $F(3, 68) = 5.33$, $p = .002$, $\eta^2_p = .190$. SES emerged as a significant covariate, $F(1, 68) = 8.43$, $p = .005$, $\eta^2_p = .124$, indicating that higher SES predicted greater accuracy. A significant group effect was also found, $F(1, 68) = 11.09$, $p = .001$, $\eta^2_p = .129$, with monolingual children demonstrating higher accuracy than their bilingual peers. For RT, the overall model was significant, $F(3, 68) = 2.17$, $p = .100$, $\eta^2_p = .087$, and a main effect of group emerged, $F(1, 68) = 5.11$, $p = .027$, $\eta^2_p = .071$, showing that monolinguals responded faster than bilinguals, suggesting greater processing efficiency. The model for FE did not reach significance, $F(3, 68) = 0.675$, $p = .570$, $\eta^2_p = .029$. However, the model for FAE was significant in favor of monolinguals, $F(3, 68) = 3.72$, $p = .015$, $\eta^2_p = .141$ (Figure1).

Finally, performance on the False Belief Task (FBT), used to assess theory of mind (ToM), differed significantly across predictors. The overall model was statistically significant, $\chi^2(3) = 16.94$, $p < .001$, explaining 25.7% of the variance (McFadden's $R^2 = .160$). Bilingualism significantly predicted FBT performance, $\chi^2(1) = 7.49$, $p = .006$, OR = 4.97, 95% CI [1.47, 16.86], indicating that monolingual participants were more likely to pass the task. Age also had a significant effect, $\chi^2(1) = 8.70$, $p = .003$, OR = 4.11, 95% CI [1.51, 11.19], such that older children were more likely to pass the FBT. SES was not a significant predictor, $\chi^2(1) = 0.76$, $p = .384$.

The analysis testing the SES × B/M interaction showed that the interaction term was non-significant, $F(1, 67) = 0.09$, $p = .770$, $\eta^2_p = .002$.

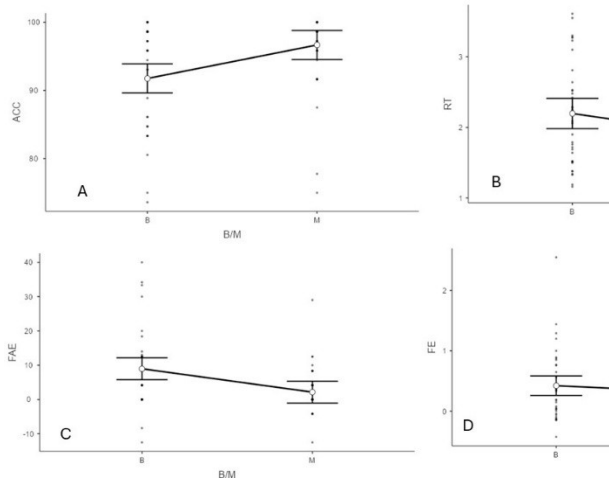

Figure 1.

Group differences between bilingual and monolingual children on executive function measures: accuracy (ACC; Panel A), reaction time (RT; Panel B), flanker accuracy effect (FAE; Panel C), and flanker effect (FE; Panel D). Error bars represent 95% confidence intervals. Higher ACC values and faster RT indicate better executive function performance.

3.2 Arabic–Turkish vs. Other Bilinguals Comparisons within Bilingual Group

Another analysis was performed in order to test for a possible influence of refugee background, which is widespread in the Arab-Turkish subgroup. Exploratory analyses were conducted to examine whether Arabic-Turkish (A, n=16) bilinguals differed in terms of socio-demographic variables from an Other bilingual group (O, n=20), which consisted of Russian-Turkish (n=10), Kurdish-Turkish (n=6), and English-Turkish (n=4) children. Arabic–Turkish bilinguals (A) and other bilinguls (O) did not differ in age (U = 154, p = .847). The median age in both groups was nearly identical (A = 5.58, O = 5.54), with the Arabic–Turkish group showing M = 5.38 (SD = 0.59) and the other bilingual group M = 5.42 (SD = 0.54). Socioeconomic status distributions differed significantly between groups, $t(34.0)$ = 2.36, p = .024, Cohen's d = .791, with the O group (M = 3.72, SD = 0.369) showing higher SES than the A group (M = 3.39, SD = 0.461). Gender distributions did not differ significantly across groups, $\chi^2(1, N = 36)$ = 0.17, p = .677. The A group included 11 females (68.8%) and 5 males (31.2%), while the O group included 15 females (75.0%) and 5 males (25.0%).

As in the previous analysis, four EF measures: ACC, RT, FE, and FAE were taken into account. The overall model for ACC was not significant, $F(3, 32)$ = 2.17, p = .110, η^2p = .169, and no significant group effect emerged, $F(1, 32)$ = 2.57, p = .119, η^2p = .053. Similarly, the model for RT was not significant, $F(3, 32)$ = 0.42, p = .741, η^2p = .038, with no group differences observed. The models for FE, $F(3, 26)$ = 0.49, p = .689, η^2p = .054, and FAE, $F(3, 32)$ = 1.54, p = .223, η^2p = .126, also failed to reach significance, with no significant group effects.

However, performance on the FBT revealed a significant difference between groups. The binary logistic regression model was statistically significant, $\chi^2(3)$ = 5.69, p = .022, explaining 20.1% of the variance (McFadden's R^2 = .118). Group membership significantly predicted FBT outcomes, $\chi^2(1)$ = 5.26, p = .022, OR = 0.17, 95% CI [0.04, 0.85], indicating that participants in the O group were significantly more likely to pass the FBT than those in the A group, which partially explains the group differences between B and M only in the FBT. Neither age, $\chi^2(1)$ = 0.31, p = .581, nor SES, $\chi^2(1)$ = 0.13, p = .722, were significant predictors in the model. The classification table showed that the model correctly identified 73.7% of passes and 64.7% of failures, with an overall accuracy of 69.4% in predicting FBT outcomes.

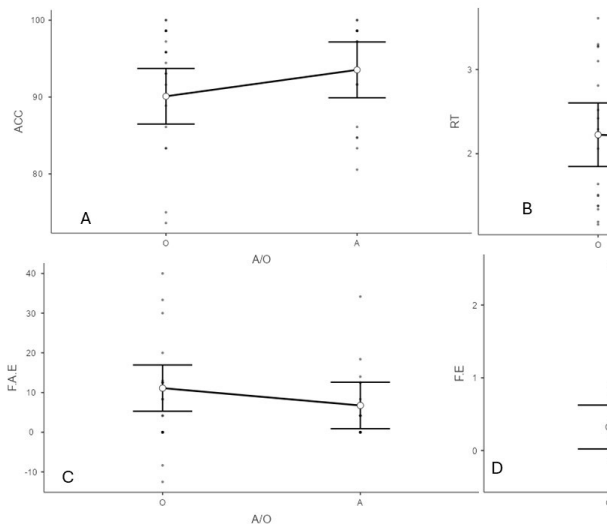

Figure 2.

Group differences between Arabic-Turkish and Other bilingual children on executive function measures: accuracy (ACC; Panel A), reaction time (RT; Panel B), flanker accuracy effect (FAE; Panel C), and flanker effect (FE; Panel D). Error bars represent 95% confidence intervals.

4. Discussion

In terms of EF, monolinguals were more effective than bilinguals regarding accuracy and speed, although the two groups did not differ in the conflict cost (Flanker Effect). This finding is in line with recent meta-analyses that have cast doubt on strong bilingual advantages in EF (Lowe et al., 2021; Paap, Johnson, & Sawi, 2015) but out of step with previous research that has documented enhanced inhibitory control in bilinguals (Bialystok, 2011; Carlson & Meltzoff, 2008). To comprehend these results, it might be beneficial to consider evidence on how the structural relationship between two languages shapes the cognitive and linguistic demands of bilingualism. Research on bilingual development shows the relationship between two languages can influence the ease of processing or transferring linguistic skills. Moreover, language similarity has been shown to modulate performance in linguistic tasks such that children with two languages sharing more structural overlap perform more strongly in language-based tasks than bilingual peers whose languages are less similar whereas nonverbal executive control advantages appear to be independent of language similarity (Barac and Bialystok, 2012). Findings from young adults show likewise that linguistic accuracy is greater the more overlap exists between the two languages (Oschwald et al., 2018).

A similar pattern appeared for ToM in which monolingual children were better than bilinguals on the False Belief task. This finding is in contrast with research reporting bilingual advantages in ToM (Kovacs, 2009; Huang, Baker, & Wang, 2023), but it is in line with reviews highlighting the inconsistency of the results (Schroeder, 2018). One possible explanation from linguistics deals with the evidential morphology of the Turkish language, which has the Turkish evidential morphemes that encode direct (-DI) and indirect (-MIŞ) sources of information. Exposure to such structures has been associated with the monitoring of epistemic states (Aksu-Koc, 1988). Because children need to follow the source of information when interpreting evidential markers, these forms mean they must also represent what others know, how they know it, and whether that knowledge is reliable. As such, evidentials could operate as a linguistic scaffold that continually reinforces for children the difference in perspective that emerges between their own and another agent's mental access to information. (Ögel-Balaban, Aksu-Koç, & Alp, 2012).

The Arabic-Turkish bilinguals who were more often from refugee and lower SES families showed weaker ToM performance than other bilinguals. This is consistent with ample evidence that SES is a powerful predictor of socio-cognitive

outcomes (Lecce & Hughes, 2010; Noble, McCandliss, & Farah, 2007) and that stress associated with migration (e.g., instability, discrimination) may adversely affect children's development (Eruyar, Maltby, & Vostanis, 2018). In spite of our sampling strategy, the bilingual group had a statistically significant and moderate socioeconomic advantage over the monolingual group (Cohen's d=.66). Given that higher SES is usually linked to better cognitive outcomes, the fact that monolingual children outperformed bilinguals despite this SES disadvantage indicates the robustness of the monolingual advantage as seen in this particular case. In addition to SES-related stressors, bilingual children in minority or migrant situations, such as many of the Arabic–Turkish children in our sample, may also receive disjointed cultural signals about social norms and perspective-taking.

Kagitcibasi's Family Change Model describes a transition from interdependence of the material to interdependence of the psychological - a situation that maintains the emotional closeness while gradual enhancement of personal autonomy is observed. This balance is seen in many of the everyday practices of a family. For example, Turkish children tend to be part of large and well-connected extended families and have regular contact with their grandparents, aunts, uncles, and cousins. These multi-generational exchanges require children to change their behavior to accommodate different expectations and to consider multiple perspectives. At the same time, parents tend to encourage children to say what they like - for example, what to wear, what they think about situations - but there are still expectations that children will be respectful and considerate of others. Shared routines such as those related to eating meals together, engaging in holiday activities, visiting relatives on the weekends, etc. all expose children to situations that involve both independence and relational sensitivity. These concrete social experiences may offer children frequent and natural opportunities to practice self-regulation and perspective-taking.

5. Conclusion

This study counters the conventional understanding of a bilingual advantage that is universal by demonstrating that, in the Turkish context, monolingual preschoolers had better executive function and theory of mind skills than bilingual peers whose languages are typologically distant. These findings suggest that bilingual cognitive outcomes might be influenced by linguistic distance, socioeconomic status and sociocultural context. Managing structurally divergent languages may involve extra processing demands especially during early childhood. Future research should further explore the interplay between typological and contextual diversity and how this affects cognitive development.

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