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Academic Competence, Organizational Skills, and Treatment Response Among Bilingual and Monolingual Children With Attention Deficit Hyperactivity Disorder

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Bilingualism has been associated with executive functioning (EF) advantages while EF is commonly impaired in ADHD. The present study tested applied EF skills (organizational skills and academic competence) in bilingual and monolingual children who exhibit ADHD symptoms pre- and posttreatment. A total of 159 children (M_{age} = 8.32) and their parents participated in multicomponent intervention targeting ADHD impairment in home and school settings. Parents and teachers completed EF and impairment rating scales and teachers completed academic competency scales. Linear mixed effects models were used to compare bilingual and monolingual groups while controlling for income and clustering effects by school. At pretreatment, the monolingual group scored higher on academic engagement, reading, and study skills than their bilingual counterparts; however, these differences diminished when income was controlled. No between-group differences were found on organizational skills pretreatment. While reductions in impairment were found for both groups following treatment, some evidence showed greater reduction in impairment for bilingual children compared to monolingual. Our findings demonstrate that bilingualism per se does not appear to hinder applied EF skills (organizational skills and academic competence) or response to treatment among children with ADHD. Instead, socioeconomic status may play an important role in the bilingualism-EF link in applied settings. Future studies are warranted to explore interventions delivered in multiple languages for children with ADHD with increased attention on environmental resources for these children.

What is the significance of this article for the general public?

Bilingualism does not appear to hinder applied EF skills (organizational skills and academic competence) among children with ADHD. Bilingual and monolingual children with ADHD benefited equally from treatment, with some trends for greater treatment response among bilingual children with ADHD. Understanding the link between bilingualism and ADHD is critical in serving our school-age population with rapidly diversifying linguistic profiles.

Keywords: bilingual, ADHD, intervention, school-age children

Over 12 million children in the United States speak a language other than English at home (U.S. Census American Community Survey, 2019). In the past decade, the number of English language learners in the K-12 student population has increased (U.S. Department of Education, 2017). Correspondingly, there has been an increase in the number of bilingual children having significant inattention, hyperactivity, and impulsivity concerns (Bitsko et al., 2022). A study of bilingualism and

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Attention-Deficit/Hyperactivity Disorder (ADHD) is of particular relevance given that bilingualism has been associated with executive functioning (EF) advantages and EF is commonly impaired in ADHD. In a practitioner review of 50 studies that examined bilingualism in children with neurodevelopmental disorders, no study of ADHD was identified (Uljarević et al., 2016). It thus remains an open question whether the advantages associated with bilingualism reported in typically developing children (Bialystok & Craik, 2022) generalize to children with ADHD. Importantly, understanding the joint effects of bilingualism and ADHD on children's functioning and treatment outcomes is necessary to effectively serve the needs of our school-age students with rapidly diversifying linguistic profiles.

Bilingualism and Executive Functioning

Executive functions (EF) refer to effortful top-down mental processes of controlling goal-directed behaviors (Diamond, 2013). According to the adaptive control model, to manage ongoing coactivation of multiple languages, speakers must reduce interference from cross-language representations while selectively monitoring and attending to the target language (Green & Abutalebi, 2013). A meta-analysis examining cognitive correlates of bilingualism in over 6,000 adult participants showed that bilingualism was reliably associated with positive cognitive outcomes (Adesope et al., 2010). More recently, studies have suggested that bilingual experience may enhance executive attention processes, as speakers must constantly attend to multiple language systems and direct attention to task-relevant information in order to select which language to deploy (Bialystok & Craik, 2022; Chung-Fat-Yim et al., 2017). These findings have been replicated in studies of school-age children. For instance, bilingual experience may accelerate the developmental rates of EF components (e.g., inhibition) and that group differences are found at specific developmental periods (e.g., ages 8–12; Park et al., 2018). These empirical ideas have also been broadly applied in a large-scale study of bilingual children referred for psychiatric services (Toppelberg et al., 2006), which showed that among children with behavioral problems, bilingual language skills were inversely and strongly correlated with problem scores, particularly for attention.

Despite views of bilingualism as a protective factor, recent reviews evaluating associations between EF and bilingualism have also revealed mixed evidence (Hilchey & Klein, 2011; Lehtonen et al., 2018). Cognitive advantages among bilingual children have been found on some measures of EF (e.g., attentional control), but not others (e.g., attentional fluctuations) (Haft et al., 2019). The effects have been found in early simultaneous bilingual children, but not late sequential bilingual children (Kapa & Colombo, 2013). The key question for researchers and clinicians is no longer whether there is a "bilingual advantage" or not, but rather a need for clarification of boundary conditions—that is, under what specific circumstances is bilingualism positively associated with which aspects of EF (Poarch & Krott, 2019)? For children who present with cognitive difficulties associated with ADHD, a pertinent question appears to be whether bilingual language experience helps, hinders, or makes no difference in their applied use of EF skills in day-to-day contexts.

Bilingualism and Treatment of ADHD

Two previous studies have directly compared EF skills in bilingual and monolingual university students with and without ADHD diagnoses (Bialystok et al., 2017; Mor et al., 2015). In the first study of Hebrew/Russian bilingual students (Mor et al., 2015), bilingual speakers with ADHD performed lower on EF tasks than monolingual speakers with ADHD, particularly on tasks of interference suppression. Indeed, interference effects were highest (i.e., longer reaction time [RT]) for the bilingual ADHD group compared to the other three groups (non-ADHD bilingual, ADHD monolingual, and non-ADHD monolingual) (Mor et al., 2015). In the second study of university students (Bialystok et al., 2017), a four-group comparison (ADHD bilingual, non-ADHD bilingual, ADHD monolingual, and non-ADHD monolingual) showed that the stop-signal task, or the ability to stop a response after it has been initiated (i.e., response inhibition), was also the lowest for the bilingual ADHD group. A recent third study has compared interference control among monolingual and bilingual children with attentional problems (Hardy et al., 2021). In this study of English monolingual and Spanish/English bilingual children (ages 6–17), bilingualism did not moderate the association between attentional problems and interference control (Hardy et al., 2021). Bilingual children demonstrated disadvantages in verbal fluency relative to monolingual children, though this did not vary with

attention scores. While preliminary, these three studies suggest that bilingual individuals with attentional problems may be at increased risk for EF difficulties, with heightened challenges with inhibitory control and related impairments.

There are, however, several gaps in our understanding of EF skills among bilingual and monolingual children with ADHD. First, previous studies have primarily focused on selected samples of university students. These samples likely excluded those with greater EF deficits and ADHD severity since children diagnosed with ADHD are at-risk for experiencing lower academic achievement and college enrollment compared to their non-ADHD counterparts (Kuriyan et al., 2013). The present study examined these effects earlier in the developmental trajectory (e.g., school-age population). Identifying potential risks and benefits conferred by bilingualism and ADHD earlier has advantages of leading to treatment (which often include parents and teachers) sooner with associated benefits of early intervention (Webster-Stratton et al., 2011).

Second, previous studies have focused on laboratory-based neurocognitive measures of EF among bilingual speakers in contrast to applied EF skills reported by parents and teachers in home and school contexts. It has been demonstrated that EF skills measured or trained in laboratory contexts do not necessarily transfer to real-life situations in broader social contexts, such as the classroom (Titz & Karbach, 2014). Others have suggested that differences in sociocultural contexts (e.g., individualism and collectivism) also influence EF task performance (Tran et al., 2019). As such, the assessment of EF in applied contexts (i.e., home and school environments) is needed to inform treatment for bilingual children with ADHD. In the present study, parent- and teacher-reported applied EF skills were utilized.

Third, bilingual children are a heterogeneous population with varied language experiences, which intersect with race, racism and discrimination, immigration history, acculturation, and socioeconomic status (SES) in the US (Coker et al., 2016). Income may impact and confound associations between bilingual status and applied EF skills among children in immigrant families. Although bilingual immigrant children excel in school when given sufficient support (Han, 2010), they tend to experience more difficulties, in part because two thirds live in poverty in the US (Kim et al., 2014). Recent studies have suggested that environmental characteristics (e.g., poverty, parenting, availability of food, access to supplementary academic resources) can shape children's EF skills (Ellwood-Lowe et al., 2021). Given that previous studies show immigrant bilingual status and poor EF performance are associated with limited income and resources, this factor was treated as a covariate in the present study.

Finally, to our knowledge, no study to date has compared treatment response among bilingual and monolingual ADHD populations. A robust body of research has demonstrated linguistic disparities in access and quality of mental health care (Sentell et al., 2007). To reduce such barriers, interventions have examined the use of heritage language or bilingual, bicultural clinicians and demonstrated positive treatment outcomes (Haack et al., 2021). Yet, the direct comparison of bilingual to monolingual groups and treatment response remains untested. The present study addresses this critical gap by examining whether there are language group differences at baseline (e.g., potential selection bias given linguistic barriers for service use), and importantly, posttreatment outcomes (i.e., would bilingual and monolingual children respond similarly to treatment if given equal access).

In sum, the present study examined applied EF skills (i.e., organizational skills and academic competence), and related impairments among bilingual and monolingual school-aged youth ($N = 159$) who participated in a school-home behavioral treatment for attention and behavior problems (Pfiffner et al., 2016). The current study tested associations between children's bilingual or monolingual status and applied EF skills as measured in the day-to-day home and school contexts (parent and teacher ratings) to improve ecological validity. Parent language, viewed as a proxy indicator of child's home language environment, was included in the following analyses (Hammer et al., 2003). Income was treated as a covariate, given links between income, EF, and bilingual status (Ellwood-Lowe et al., 2021). Based on neurocognitive lab-studies of EF among bilingual youth with ADHD (Bialystok et al., 2017; Hardy et al., 2021; Mor et al., 2015), we hypothesized that at baseline, monolingual children would have higher parent- and teacher-rated applied EF skills than bilingual children (Hypothesis 1). Second, we hypothesized that bilingual children with ADHD would benefit equally from treatment compared to their monolingual counterparts per teacher-rated academic competence and parent-rated organizational skills and functional impairment (Hypothesis 2).

Method

Participant Characteristics

Participants included 159 children (grades 2–5, M_{age} = 8.32, SD_{age} = 1.08, 72% boys) attending a total of 27 participating schools (n = 5–6 students per school) in an urban public school district in San Francisco, California. Sample size was estimated based on previous findings of effect sizes in the medium to large range for decrease in ADHD symptoms and impairment (Pfiffner et al., 2016). Sociodemographic characteristics are described in Table 1. The bilingual group consisted of higher proportion of Latinx children (i.e., 24% of the monolingual children identified as Latinx whereas 73% of the bilingual children identified as Latinx). The bilingual group also had lower mean household income (p = .01) and primary parent education ($p <$ .01) when compared to the monolingual group. No baseline age or IQ differences were found.

Language Characteristics

Language status was assessed during initial phone screen interviews. Parents were asked to self-report on free response fields to the items "child primary languages" and "parent primary languages." Children and parents who reported English as the only primary language were identified as monolingual speakers. Children and parents who reported English and another language as primary languages were identified as bilingual speakers. Of the children, 120 participants reported that they were monolingual speakers, 37 reported that they were bilingual speakers, and two participants did not answer. Of the parents, 105 participants reported that they were monolingual speakers (104 English monolingual and 1 Spanish monolingual), 47 parents reported that they were bilingual speakers, and 7 did not respond. One Spanish monolingual parent was included in the bilingual parent category instead of monolingual parent category (i.e., consisting of English monolingual parents). Missing language items were assessed by evaluating school records (dual language learner status on school reports), and parent language use during phone screen. Fourteen school sites offered language programs (foreign language class, biliteracy programs, and dual language immersion programs), characteristic of local San Francisco community.

Study Design and Procedure

A 2-level cluster randomized controlled design accounted for treatment (CLS or business as usual, BAU) within level 2 (two schools). Schools within cohorts were randomized to CLS (n = 12) or BAU (n = 11). In addition, four schools (n = 4) received the CLS program in Spanish (Haack et al., 2019). Given minimal changes to the program and consistent structure (e.g., number of sessions, training model, size of group), content, and treatment effect

Table 1
Baseline Sociodemographic Characteristics of Monolingual and Bilingual Children With ADHD Symptoms

Demographics	Monolingual	Bilingual	Total	Comparison
Gender, *n* (valid%)				
Female	32 (27)	12 (32)	44 (28)	X^2 = 0.47,
Male	88 (73)	25 (68)	113 (72)	p = 0.49
Race, *n* (valid%)				
Mix	26 (22)	1 (3)	27 (17)	
White	34 (28)	1 (3)	35 (23)	X^2 = 37.39,
Black	12 (10)	0 (0)	12 (8)	$p <$ 0.001
Asian	19 (16)	8 (22)	27 (18)	
Latinx	29 (24)	27 (73)	56 (35)	
Household income, *n* (valid%)				
<$30,000	20 (26)	14 (56)	34 (33)	X^2 = 24.44,
$30,000–$60,000	11 (14)	7 (28)	18 (18)	p = 0.01
$60,000–$90,000	9 (12)	2 (8)	11 (11)	
>$90,000	37 (48)	2 (8)	39 (38)	
Primary parent education, *n* (valid%)				
Less than high school graduate	5 (4)	10 (28)	15 (10)	
High school graduate or GED	10 (8)	9 (25)	19 (12)	X^2 = 30.48,
Some college	33 (28)	4 (11)	37 (24)	$p <$ 0.001
College or graduate degree	72 (60)	13 (36)	85 (54)	

sizes, the two groups were combined for secondary analyses in the present study. For recruitment, school mental health professionals and their school principals were invited to participate in the CLS program. Those agreeing to participate initiated the recruitment of students. Student participants were referred by school staff for inattention and/or hyperactivity/impulsivity and related academic or social problems. Inclusion criteria were (a) at least six symptoms of inattention and/or hyperactivity/impulsivity, (b) cross-setting impairment as reported by parents and teachers, (c) Full Scale IQ (FSIQ) of higher than 79, and (d) one parent and one classroom teacher who were available to participate. Children taking medication were eligible if their regimens were stable. Students with significant visual or hearing impairments, severe language delays, psychosis, or pervasive developmental disorders, or those who were in full day special day classrooms were excluded. Consent forms and assent forms were approved by the institutional committee on human research and completed by students, parents, and teachers. Parents and teachers were each compensated $50 for completing measures at each timepoint (baseline, posttreatment, follow-up).

Collaborative Life Skills (CLS) Program

CLS was adapted from an evidence-based clinic-delivered intervention for ADHD for implementation in schools by school mental health professionals (Pfiffner et al., 2016). Locating the intervention in schools was intended to maximize access, because school is the setting where most children receive mental health services for ADHD. The 10–12 week treatment program consisted of 10 parent training groups (each 60 mins), 10 child skills training groups (each 40 mins), and a classroom component, including 2 group meetings with teachers, 2 to 3 individual 30-minute meetings attended by the parent, the student, and the student's individual teacher, and use of daily report cards in the classrooms. Parents and teachers learned strategies to increase motivation, self-regulation, and address EF impairments. Behavioral consequences (e.g., positive consequences such as reward, and negative consequences such as ignoring) were established across home and school settings by parents and teachers. Children learned independence, organizational, and socioemotional skills, which were reinforced across settings. This comprehensive treatment provided support for child behaviors across multiple impairment domains in an active partnership with parents, teachers, and mental health professionals. School mental health professionals conducted parent (94%) and child groups (97%) with high levels of fidelity. Parent attendance averaged above 79% and child attendance averaged above 92% of groups. Parents (mean 4.3 out of 5; 1 = *no days*, 5 = *every day*) and teachers (mean 4.1 out of 5; 1 = *one weekday*, 5 = *five weekdays*) reported using strategies to address home and classroom behaviors on most days.

Measures

Demographics (Parent Report)

Family demographics (age, gender, race, household income, parent education level), household structure, and child's treatment history (medication, psychotherapy, special education classrooms) were collected during phone screening interviews with participating parents.

Academic Competence (Teacher Report)

The Academic Competence Evaluation Scales (ACES; DiPerna & Elliott, 2002) is a 73-item teacher rating scale that assessed academic skills (reading, mathematics, critical thinking) and academic enablers (interpersonal skills, engagement, motivation, study skills). Each item was answered on a 5-point rating scale (1 = *Never*; 5 *Almost always*). Teacher ratings showed high internal consistency (*alphas* = .96 for reading, .96 for mathematics, .98 for critical thinking, .92 for interpersonal, .91 for engagement, .93 for motivation, and .89 for study skills).

Organizational Skills (Parent and Teacher Report)

The Children's Organizational Skills Scale (COSS; Abikoff et al., 2009) is a parent- and teacher-rated scale used to assess the frequency of behaviors associated with organization and planning in home and school settings. Items were rated on a 4-point scale (1 = *Hardly ever or never*; 2 = *Sometimes*; 3 = *Much of the time*; 4 = *Just about all of the time*.) Total scores (i.e., sum of material management, organized action, and task planning subscales), were used for analysis. Ratings showed high internal consistency (*alphas* = .95 for parent-report, .93 for teacher-report).

ADHD Impairment (Parent Report)

Children's Impairment Rating Scale (CIRS; Fabiano et al., 2006) is a parent-rated scale that

assessed children's degree of problem and need for treatment or special services using a 7-point scale (0 = *No problem; definitely does not need treatment*, 6 = *Extreme problem; definitely needs treatment*). Parents scored across areas of functioning including, degree of problems with peers, siblings, and parents; academic progress at school; self-esteem; and impact on family. In addition, parents reported overall degree of problem and need for treatment or special services.

Plan of Data Analysis

All main study outcome variables (see Table 2) met criteria for normality. We tested study hypotheses using linear mixed effects models of mean baseline scores between bilingual and monolingual groups, controlling for clustering effects by school (two-tailed) and income. We conducted all analyses using the Linear and Nonlinear Mixed Effects Models package (nlme) and Linear Mixed Effects Models using Eigen and *SE* package (lme4) in R (R Core Team, 2020). All data analyses were carried out with the full sample (i.e., CLS and BAU).

Results

Children's Organization Skills and Academic Competence at Baseline

No group differences were found on parent-rated ($B = -3.05$, $p = .50$) or teacher-rated ($B = 4.28$, $p = .18$) total organization scores between monolingual and bilingual groups. Monolingual children performed higher on engagement ($B = -.56$, $p < .001$), reading ($B = -.41$, $p < .01$), and study skills ($B = -.29$, $p = .03$) compared to their bilingual counterparts. Similarly, monolingual children performed marginally higher on interpersonal scores ($B = -.23$, $p = .06$) and critical thinking ($B = -.26$, $p = .08$). No group differences were found on mathematics ($B = -.12$, $p = .43$) or motivation ($B = -.08$, $p = .57$). However, once income was entered into the models as a covariate, children's language status no longer predicted academic competence for all subscales ($-.24 < B < .06$, $.12 < p < .73$) except engagement ($B = -.48$, $p < .01$). Parent language status was associated with differential outcomes on engagement ($B = -.37$, $p = .01$) and reading ($B = -.34$, $p = .01$), such that children with monolingual parents performed higher on these scales compared to those with bilingual parents. Again, once income was entered into the model as a covariate, parents' language status no longer predicted academic competence ($-.26 < B < .18$, $.11 < p < .19$).

Between-Group Comparisons of Treatment Response

Parent-Rated Impairment

A mixed effects model predicting parent-reported child functioning showed a marginal trend for an interaction between treatment group (CLS and BAU) and language status (bilingual and *monolingual;* $B = 1.36$, $p = .06$) while considering baseline impairment and income (Figure 1a). A simple slope analysis was conducted to understand the interaction of treatment x language effect on impairment. We found that while treatment effects

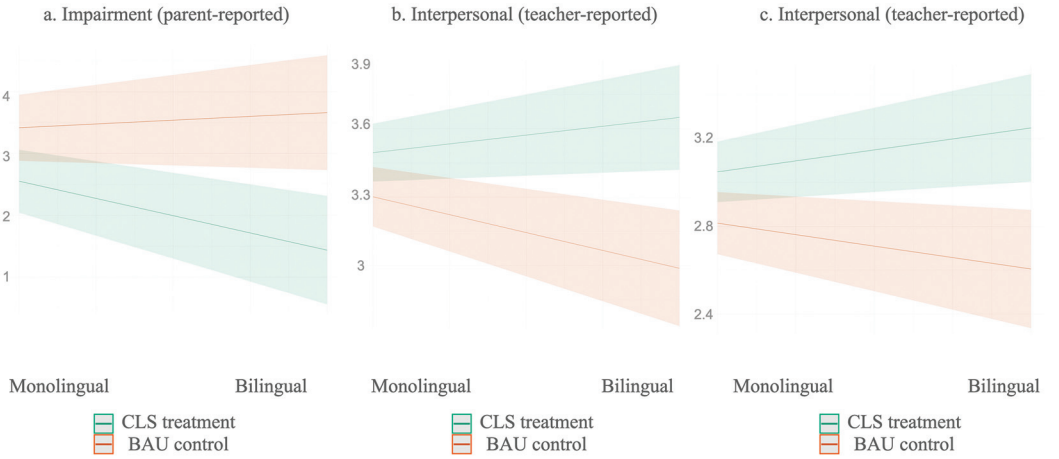
Table 2
Baseline M and SD for Main Study Variables by Monolingual and Bilingual Groups

Main study variables	Monolingual baseline mean (*SD*)	Bilingual baseline mean (*SD*)	Baseline group comparison	Monolingual postmean (*SD*)	Bilingual postmean (*SD*)
ACES					
Critical thinking	2.57 (0.75)	2.16 (0.67)	$t = 3.15$, $p = 0.002$	2.72 (0.67)	2.23 (0.59)
Engagement	3.07 (0.79)	2.50 (0.81)	$t = 3.73$, $p < 0.001$	3.21 (0.87)	2.71 (0.85)
Interpersonal	3.24 (0.67)	3.01 (0.57)	$t = 2.04$, $p = 0.045$	3.46 (0.67)	3.20 (0.57)
Mathematics	2.47 (0.81)	2.21 (0.73)	$t = 1.86$, $p = 0.067$	2.60 (0.81)	2.26 (0.67)
Motivation	2.34 (0.71)	2.24 (0.69)	$t = 0.75$, $p = 0.450$	2.59 (0.70)	2.42 (0.68)
Reading	2.61 (0.75)	2.06 (0.63)	$t = 4.44$, $p < 0.001$	2.68 (0.73)	2.06 (0.61)
Study skills	2.75 (0.66)	2.45 (0.69)	$t = 2.33$, $p = 0.023$	3.01 (0.71)	2.79 (0.68)
COSS					
P Total score	157.0 (22.8)	153.0 (23.8)	$t = 0.91$, $p = 0.36$	141.0 (22.1)	137.0 (25.7)
T Total score	96.1 (15.8)	101.0 (16.7)	$t = -1.54$, $p = 0.13$	90.6 (16.4)	96.5 (17.5)

Note. P = parent-reported data; T = teacher-reported data.

Figure 1

Treatment x Language Interactions Predicting Posttreatment (a) Parent-Reported ADHD Impairment and (b) Teacher-Reported Interpersonal and (c) Motivation Skills



Note. See the online article for the color version of this figure.

were significant in both samples of monolingual ($B = .92, p = .009$) and bilingual children ($B = 2.39$, $p = .001$), the effects were stronger for the bilingual group. That is, greater reduction in impairment was reported among bilingual children compared to monolingual children following CLS treatment.

Teacher-Rated Academic Competence

Similarly, mixed effects models predicting teacher-reported academic competence showed an interaction effect between treatment group and language status for two subscales: interpersonal ($B = -.46$, $p = .02$) and motivation ($B = -.41$, $p = .05$) scores, while controlling for baseline impairment and income (Figures 1b and 1c). Simple slope analyses showed that language status moderated the effect of treatment, such that greater improvements in interpersonal and motivation subscales were found among bilingual children ($B_{int} = -.65$, $p < .001$, $B_{mot} = -63$, $p = .04$) than monolingual children ($B_{int} = -.19, p = .05, B_{mot} = -.23, p = .03$) posttreatment. No interaction effects were found on other subscales of academic competence.

Discussion

The present study tested group differences in applied EF skills between bilingual and monolingual children who exhibit ADHD symptoms pre- and posttreatment. Our results showed that monolingual children performed higher on applied measures of EF at baseline, including teacher-rated study skills, engagement, and reading than bilingual children with ADHD. However, parent-rated organizational skills did not differ between language groups. The between-group differences on teacher ratings of applied EF skills diminished when controlling for income. We found that bilingual children benefited equally from behavioral interventions for ADHD than compared to their monolingual counterparts, with some evidence of marginally greater benefits for the bilingual group on interpersonal functioning, motivation as well as greater reduction in global impairment.

There are several interpretations for the between-group differences in applied EF skills. First, consistent with the literature showing limited transfer effects of EF skills measured in the laboratory versus home- and school- contexts, it may be that previously reported differences found in laboratory measures of inhibitory control (e.g., Stroop Task), do not translate to organizational skills in daily contexts that require the use of several higher order EF skills (e.g., *Once my child gets ready to do schoolwork or projects, they have trouble knowing how to start*). Previous studies have suggested the study instrument used to measure organizational skills (COSS) is best represented as a domain-general or bifactor model (Molitor et al., 2017), rather than a subscale that specifically measures attention or inhibitory control. Our results indicate that the bilingual-EF link

previously demonstrated in controlled, laboratory settings may not necessarily generalize to applied EF skills, such as organizational skills, suggesting one type of boundary condition.

Second, the differences found on the academic competence scales (in the hypothesized directions) diminished once income was considered, suggesting that cognitive differences found between bilingual and monolingual groups were small to none, relative to the robust associations with income. The baseline differences found between bilingual and monolingual groups are especially pronounced on language-based academic skills (e.g., reading), and less so on academic enablers (e.g., motivation). In the present sample, bilingual children were overrepresented by children in lower income brackets. Previous studies have suggested that availability of resources in a child's environment may shape EF (Ellwood-Lowe et al., 2021) as well as academic achievement (Morrissey et al., 2014). In a study of school-age children with ADHD whereby bilingual group had higher SES than monolingual group, ADHD-related behaviors were fewer among bilingual children (Sharma et al., 2022). Our findings suggest that providing additional supports to increase resources in the home and school environments (e.g., high quality extracurricular or after school programs) may be more helpful than interpreting bilingual status as a risk factor.

The findings also serve a cautionary note for clinicians and educators who express concerns that exposure to multiple languages may be simply "too much" for children with neurodevelopmental disorders and therefore advise against providing bilingual environments (Drysdale et al., 2015). Indeed, in a meta-analysis comparing bilingual and monolingual groups with neurodevelopmental disorders (i.e., intellectual disability, communication disorders, autism spectrum disorder), no systematic adverse effects of bilingualism were found on language development or other aspects of functioning (Lim et al., 2019; Uljarević et al., 2016). Importantly, our findings also show that bilingualism does not appear to hinder applied EF skills (organizational skills and academic competence) among children with ADHD.

Bilingual children benefited equally from treatment for ADHD compared to their monolingual counterparts, and to our surprise, showed a trend for greater treatment response in the subdomains of teacher-reported academic competence, including interpersonal and motivation, as well as overall parent-reported impairment. One explanation may be that because the bilingual group in the present study had lower levels of prior treatment (less medication for ADHD, individual psychotherapy, and parent training or family therapy), they had greater room for improvement. Another explanation may be that for bilingual children, receiving treatment that focused on socioemotional skills in their second language may have been particularly helpful. Previous studies have shown that second language use may promote down-regulation of negative emotion, which may be conducive to learning emotion regulation skills in clinical settings (García-Palacios et al., 2018; Thoma, 2021). While our sample size was too small to test such effects, causal explanations for the relatively higher treatment response among bilingual group warrants further examination.

Finally, bilingual status often intersects with immigrant status. It may be that a multicomponent home- and school-treatment increased resources in the environment, which in turn, resulted in improvements in their motivation, interpersonal competence, and overall functioning. By collaborating with and bridging communication between parents and teachers via the CLS program, the treatment may have provided a consistent, shared language (e.g., "home challenge" "reward" "routines") for immigrant parents and school teachers who may view child's behaviors from differing sociocultural lenses (Haack et al., 2021). Future studies should directly examine whether programs like CLS foster cross-cultural bridging, improves consistency between parents and teachers, and results in improvements in children's behavior and EF (e.g., whether reliability scores of parent and teacher ratings on child increase across treatment, and may predict treatment effects). Future studies may explore the role of bilingual intervention (beyond monolingual intervention or heritage-language only intervention) on children's treatment outcomes.

There are several limitations to this study. First, while our sample size reflects the broader issues of disparity in treatment for language minorities, including bilingual speakers, future studies should actively recruit more bilingual children to better address language status questions. Second, the present study measured bilingual and monolingual status based on parent reports of current language use (and school reports in case of missing data). Given that previous studies have shown differential associations between various aspects of bilingualism and EF, multiple measures of bilingualism

(i.e., proficiency, use, learning trajectory, language attitudes; Marian & Hayakawa, 2021), including longitudinal designs, should be tested in the future. Such an approach may also distinguish effects between subgroups of bilingual children, for instance, those who are bilingual due to family immigration history and those who are bilingual due to educational contexts (e.g., immersion school). Moreover, it should be noted that the present study consisted of majority Spanish/English bilingual children, and while this is representative of local community as well as U.S. national prevalence, future studies may include other language combinations to consider cultural effects. Third, given the intersectionality of bilingual language status with other sociodemographic factors, future studies may include additional measures of risk and protective factors that impact EF (e.g., acculturative stress, racism, cultural values). Finally, while SES was treated as a covariate in the current analyses, bilingual and monolingual comparisons among racially- and SES-matched samples would provide a more robust study design.

In sum, the present study serves as a first step in comparing bilingual and monolingual children with ADHD before and after participating in a school-home intervention. Importantly, the study extended the literature on bilingualism and EF into ecologically valid measures of organizational skills and academic competence among bilingual children with ADHD. The findings suggested that EF differences between bilingual and monolingual children with ADHD were small relative to effects of income. For bilingual children with ADHD, it may be more protective for healthy development to increase resources in the child's environment than to view their bilingual status as a potential risk. Given that bilingual children are likely to benefit from treatment equally, and possibly benefit more, future studies are warranted to understand the mechanisms and strengths that bilingual status confers in increasing treatment benefits among children living with ADHD.

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