

Adaptive Behavior Differences Between Children and Adolescents With Autism Spectrum Disorder and Those With Typical Development and the Effects of Sociodemographics

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Abstract

Adaptive behavior (AB) concerns skills that enable individuals to be independent. It may be affected by different diagnoses, including Autism Spectrum Disorder (ASD). This study's objective was to investigate AB differences between children and adolescents aged 4 to 21 with ASD only, ASD with other health conditions, and those with typical development and to verify the effects of sociodemographic variables on AB outcomes among individuals with ASD. The sample comprised the caregivers of 309 children and adolescents aged 4 to 21 assigned to a non-clinical group ($n = 181$) and two clinical subgroups: one for ASD only ($n = 47$) and the other for ASD with comorbidities ($n = 81$). ANOVA and T-tests were performed, followed by a bootstrap process to ensure the normality and homogeneity of results. Significant deficits were found in the individuals diagnosed with ASD in all three domains of AB. A significant difference was found in the practical domain between the clinical subgroups. The respondents' educational level and the type of school children and adolescents attended affected the conceptual domain. Sex, on the other hand, only showed an effect in the practical domain. The conclusion is that individuals with ASD present differences in the three domains of adaptive behavior, and sociodemographic characteristics also play a role. However, further studies considering other variables that may influence the findings are needed to ensure greater reliability of the results.

Keywords: child, adolescent, adaptation, psychological, autism spectrum disorder, comorbidity

DIFERENÇAS NO COMPORTAMENTO ADAPTATIVO ENTRE CRIANÇAS E ADOLESCENTES COM TRANSTORNO DO ESPECTRO AUTISTA E COM DESENVOLVIMENTO TÍPICO E EFEITOS DE CARACTERÍSTICAS SOCIODEMOGRÁFICAS

Resumo

Comportamento adaptativo (AB) envolve habilidades que oferecem autonomia ao indivíduo e podem sofrer efeitos de diferentes diagnósticos, incluindo o Transtorno do Espectro Autista (ASD). O objetivo deste estudo foi investigar diferenças do AB entre crianças e adolescentes de 4 a 21 anos diagnosticadas com ASD, ASD e outras condições de saúde, e indivíduos com desenvolvimento típico, e verificar efeitos de variáveis sociodemográficas sobre os desfechos do AB em indivíduos com ASD. A amostra foi composta por cuidadores de 309 crianças e adolescentes de 4 a 21 anos dividida em grupo não-clínico ($n = 181$) e dois subgrupos clínicos, sendo um de ASD ($n = 47$) e outro de ASD com comorbidades ($n = 81$). ANOVAs e Testes-T foram conduzidas, seguidos do processo de *bootstrap* para garantir a normalidade e homogeneidade dos resultados. Déficit significativos foram identificados em indivíduos com diagnóstico de ASD nos três domínios do AB. Ao comparar os subgrupos clínicos, o domínio prático apresentou diferença significativa. Foi observado efeito da escolaridade do respondente e do tipo de escola da criança e do adolescente no domínio conceitual. Já o sexo apresentou efeito somente no domínio prático. Conclui-se que há diferença no comportamento adaptativo de indivíduos com ASD nos três domínios, assim como efeitos de características sociodemográficas. No entanto, novas investigações devem ser conduzidas para contemplar outras variáveis que possam influenciar os achados, oferecendo maior confiabilidade aos resultados.

Palavras-chave: criança, adolescente, comportamento adaptativo, transtorno do espectro autista, comorbidade

DIFERENCIAS DEL COMPORTAMIENTO ADAPTATIVO ENTRE NIÑOS Y ADOLESCENTES CON TRASTORNO DE ESPECTRO AUTISTA CON DESARROLLO TÍPICO Y LOS EFECTOS DE CARACTERÍSTICAS SOCIODEMOGRÁFICAS

Resumen

Las conductas adaptativas (CA) son habilidades que ofrecen autonomía al individuo y pueden verse afectadas por diferentes diagnósticos, como el Trastorno del Espectro Autista (TEA). El objetivo de este estudio fue investigar las diferencias en AC entre niños y adolescentes de 4 a 21 años diagnosticados con TEA, TEA y otras condiciones de salud, e individuos con desarrollo típico, y verificar los efectos de las variables sociodemográficas sobre los resultados de AC en los individuos con TEA. La muestra estuvo compuesta por 309 cuidadores de niños y adolescentes de 4 a 21 años divididos en un grupo no clínico ($n = 181$) y dos subgrupos clínicos, uno para TEA ($n = 47$) y otro para TEA con comorbilidades ($n = 81$). Se realizaron ANOVA y pruebas

T, seguidos del proceso de arranque para garantizar la normalidad y homogeneidad de los resultados. Se identificaron déficits significativos en personas diagnosticadas con TEA en los tres dominios de la CA. Al comparar subgrupos clínicos, el dominio práctico mostró una diferencia significativa. En el dominio conceptual se observó un efecto de la educación del encuestado y del tipo de escuela del niño y adolescente. El sexo, por otra parte, solo tuvo un efecto en el ámbito práctico. Se concluye que existe diferencia en el comportamiento adaptativo de los individuos con TEA en los tres dominios, así como los efectos de las características sociodemográficas. Sin embargo, se deben realizar nuevas investigaciones para considerar otras variables que puedan influir en los hallazgos, ofreciendo mayor confiabilidad a los resultados.

Palabras-clave: Niño, Adolescente, Adaptación Psicológica, Trastorno del Espectro Autista, Comorbilidad

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that affects different aspects of an individual's life. According to a program funded by the Center for Disease Control and Prevention (CDC), the Autism and Developmental Disabilities Monitoring (ADDM) Network, data from 2020 concerning 11 cities in the USA show a prevalence of ASD of 1 in every 36 eight-year-olds. Additionally, socioeconomic characteristics reveal that the condition is 3.8 times more prevalent in boys than girls and is associated with the low income of the families in the 11 cities investigated (Maenner et al., 2023).

ASD symptoms comprise a set of cognitive, behavioral, and socio-emotional characteristics, such as impaired social interactions and communication, difficulty in verbal communication and socio-emotional reciprocity, repetitive behaviors and interests, inflexible adherence to routine, stereotyped behaviors, and echolalia and interests that are restricted to certain stimuli. Because it is a neurodevelopmental disorder, these symptoms manifest during the development period (American Psychiatric Association [APA], 2022).

Usually, ASD characteristics, such as social impairment and severity of the disorder, are related to adaptive functioning, also known as adaptive behavior (AB). AB is characterized by skills learned and used in everyday life, which enable an individual to be independent. It is classified into three domains: conceptual, which concerns reading, writing, and reasoning skills; the social domain, which encompasses interpersonal skills, social responsibility, and self-esteem; and the practical domain, referring to daily tasks, such as personal hygiene, dressing, and self-management (Schalock et al., 2021; Tassé et al., 2012). AB is related to age as functionality varies according to an individual's age and context, in addition to social, cultural, and environmental aspects and intellectual functioning. However, there is not a causal relationship. Hence, it is a construct susceptible to change through learning, experiences, and therapeutic interventions (Hallberg & Bandeira, 2021).

The last two editions of the Diagnostic Statistical Manual of Mental Disorders (DSM-5) propose the "need for support" to be a new criterion to define the severity of ASD (APA, 2013; APA, 2022; Weitlauf et al., 2014). However, it is unclear how this criterion is operationalized, which may lead to mistaken decisions regarding the severity of one's condition. Thus, other variables, including adaptive behavior, are relevant to understanding and establishing the severity of the disorder more accurately (Mehling & Tassé, 2016; Weitlauf et al., 2014).

Research shows that individuals with ASD in different age groups exhibit impaired adaptive behavior, especially in social skills (Bradshaw et al., 2019; Golya & McIntyre, 2018; Jordan et al., 2019; Kodak & Bergmann, 2020; Lopata et al. al., 2012; Saulnier et al., 2022; Yang et al., 2016). In a study performed in the USA, Kanne et al. (2011) assessed 1089 children and adolescents between 4 and 17 diagnosed with ASD, with verbal and non-verbal cognitive abilities within the expected average range, and identified substantial impairments in adaptive behavior, mainly in practical, socialization, and social communication skills. Pugliese et al. (2015) assessed the adaptive behavior of 447 children and adolescents between 4 and 23 with ASD, showing a

more deficient profile in the practical and socialization domains, regardless of the presence of intellectual deficits.

Several other studies report relationships between different socioeconomic variables and adaptive behavior among individuals with ASD, including age, sex, and parental education level (Giambattista et al., 2021; Lai et al., 2015; Mahendiran et al., 2019; Miniarikova et al., 2023; Rynkiewicz et al., 2016; Sharabi & Marom-Golo, 2018). The literature points to adaptive behavior differences between sexes (Giambattista et al., 2021; Lai et al., 2015; Mahendiran et al., 2019; Nishimura et al., 2023; Rynkiewicz et al., 2016). Giambattista and collaborators (2021) report that boys and girls presented similar communication and social interaction deficits; however, girls present significantly superior understanding of social rules or behavior patterns. Nonetheless, Mahendiran and collaborators (2019) report that girls presented worse social performance than boys, and White et al. (2017) reported more significant losses in everyday skills among 7 to 18-year-old girls, even when their intelligence assessments and ASD symptoms were equivalent to those of boys.

A multicenter cohort research was performed in France with 875 children and adolescents with ASD between 2 and 16, investigating adaptive behavior and related factors, including parental educational level. The results indicated that a higher level of parental education is related to the children's better socialization and communication skills, and, among adolescents, maternal educational level is related to daily living skills (Miniarikova et al., 2023). The type of school (public or private) an individual attends indicates different academic performance; superior performance is found in private schools (Sampaio & Guimarães, 2009). Although the previous study does not assess differences in students with ASD or any other neurodevelopmental diagnosis, it shows efficiency discrepancies between public and private education on student performance. These differences may impact adaptive behavior because the school environment promotes skills related to this construct, such as peer interaction and formal learning. Gonçalves et al. (2019) also note differences in cognitive stimulation and educational resources between public and private schools.

A study addressing 3 to 6-year-old children diagnosed with ASD investigated socioeconomic factors associated with adaptive behavior. The results show that higher socioeconomic levels are associated with more preserved social and everyday skills (Ibrahim et al., 2020). Wang et al. (2023) addressed children between 2.5 to 6 with ASD to investigate associations between intelligence level, severity of the disorder, developmental abnormalities, and socioeconomic factors on the variability of adaptive functioning, indicating that maternal educational level is associated with better adaptive skills, especially practical ones.

Despite research on the sociodemographic factors related to AB, few studies address the effects of socioeconomic variables on the adaptive behavior of ASD in the Brazilian context. Such a relationship is essential for understanding the situation in countries with significant socioeconomic differences, like Brazil. The reason is that such a context creates a gap that undermines a comprehensive understanding of AB and disregards the obstacles that might contribute to its outcomes. Furthermore, the assessment of adaptive behavior is primarily

performed with psychometric instruments. Despite the validity evidence of different scales reported by studies addressing international samples, these scales still lack adequate psychometric properties for the Brazilian population or are yet undergoing cross-cultural adaptation, as is the case of ABAS-3 (Bradshaw et al., 2019; Golya & McIntyre, 2018; Jordan et al., 2019; Kanne et al., 2011; Kodak & Bergmann, 2020; Lopata et al., 2012; Mecca et al., 2015; Mecca et al., 2022; Pugliese et al., 2015; Saulnier et al., 2022; Tajuddin et al., 2022; Yang et al., 2016).

Hence, considering current research and based on the importance of adaptive behavior to understand the diagnosis and severity of ASD better (Mehling & Tassé, 2016; Weitlauf et al., 2014), this study aimed to investigate adaptive behavior differences between children and adolescents between 4 and 21 diagnosed with ASD only, with ASD and other health conditions, and those with typical development. Additionally, this study verifies the effects of sociodemographic variables, such as gender, type of school, and the respondents' educational levels, on the adaptive behavior outcomes of children and adolescents diagnosed with ASD.

Our initial hypothesis was that there is a significant difference between the adaptive behavior scores of children and adolescents with typical development and those with atypical development, the latter usually presenting limitations in adaptive behavior development. However, significantly lower scores were expected among individuals with comorbid conditions with ASD compared to individuals diagnosed with ASD only. Adverse effects were expected on the conceptual domain of adaptive behavior resulting from poor parental education and the type of school a child attends, besides adverse effects on the social domain among girls.

Method

This cross-sectional and quantitative study is part of a research project conducted by researchers from Southern Brazil. The objective was to perform the cross-cultural adaptation of the Diagnostic Adaptive Behavior Scale (DABS) to the Brazilian context and identify validity and reliability evidence (Hallberg, 2019; Schütz, 2022). Data were collected between 2020 and 2022 through face-to-face and online interviews with the individuals responsible for assessing the AB of children and adolescents.

Participants

A total of 309 caregivers of children and adolescents between 4 and 21 participated in this study. They were selected according to convenience and assigned to clinical and non-clinical groups. The clinical group comprised the caregivers of 128 children and adolescents, 47 with a diagnosis of ASD and 81 with comorbid conditions with ASD. The non-clinical group comprised the caregivers of 181 children and adolescents with typical development and without any reported health condition. Each participant was responsible for assessing a child or adolescent included in the study; hence, the number of participants equals the number of children and adolescents addressed here.

The sample's groups and subgroups were divided according to the respondents' reports, i.e., presence or absence of a previous clinical condition. Such comorbidities are health conditions

that hinder an individual's development, limiting the acquisition of typical developmental skills, such as speech or visual impairments or emotional disorders. Table 1 presents the descriptive characteristics of each subgroup.

The parents or legal guardians were at least 18 years old and had sufficient knowledge of the Portuguese language to ensure they fully understood the instrument's items. Additionally, only the participants whose children/adolescents were Brazilian and aged between 4 and 21, the age range assessed by the instrument, were included. Some respondents were excluded for not being able to provide sufficient information about the subject's typical behavior during the interview.

Table 1

Sample's sociodemographic characteristics

Characteristic	Group			Statistic
	Non-Clinical (n = 181)	ASD only (n = 47)	ASD w/ C (n = 81)	
	M(sd)	M(sd)	M(sd)	
Age				
M(sd)	10.1(4.86)	9.09(3.62)	8.88(3.63)	F(2, 306)= 7.51, p< 0.001 n2=.047
Sex	n(%)	n(%)	n(%)	
Male	86(47.5)	43(91.5)	65(80.2)	X ² (2)= 45.21, p<0.001
Female	95(52.5)	4(8.5)	16(19.8)	
School				
Public	41(22.6)	38(80.8)	68(83.9)	X ² (2)= 119.21, p<0.001
Private	140(77.4)	9(19.1)	8(9.9)	
Comorbidities				
Intellectual disability			53(65.4)	
Speech impairment			32(39.5)	
ADHD			23(28.3)	
Learning disorder			17(20.9)	
Developmental delay			7(8.6)	
Emotional disorder			5(6.1)	
Visual impairment			5(6.1)	
Other conditions			10(12.2)	
Income				
Up to 3 times the MW	16(9.8)	36(76.6)	63(77.8)	X ² (4)= 141.49, p< 0.001
3 to 10 the MW	64(39.3)	7(14.9)	14(17.3)	
More than 10 times the MW	83(50.9)	83(50.9)	4(4.9)	
Respondent				
Mother	161(88.9)	40(85.1)	69(85.1)	X ² (12)= 12.4, p = 0.413
Father	14(7.7)	5(10.6)	8(9.8)	
Brother	2(1.1)		1(1.26)	
Grandparents	1(0.5)	1(2.1)	3(3.7)	
Uncle	2(1.1)			
Respondent's education				
Incomplete HS	1(0.5)	9(19.1)	21(25.9)	X ² (6)= 152.96, p< 0.001
Complete HS	5(2.7)	19(40.4)	33(40.7)	
Complete HE	57(31.4)	11(23.4)	19(23.4)	
Graduate studies	116(64.1)	6(12.7)	7(8.6)	

Note. ASD w/ C = ASD with comorbidities; HS = High School; HE = Higher Education; ADHD = Attention Deficit Hyperactivity Disorder.

Instruments

Sociodemographic Data Questionnaire to identify the children's and adolescents' socioeconomic characteristics, such as age, sex, respondents' educational levels, family income, and type of school, among other variables.

Diagnostic Adaptive Behavior Scale (DABS) developed by the American Association on Intellectual and Developmental Disabilities (AAIDD) to assess the adaptive behavior of children and adolescents between 4 and 21, according to the report of a caregiver or someone close to the individual, considering the respondents' perceptions regarding the child's or adolescent's level of autonomy to perform typical behaviors expected for their age group (Tassé et al., 2016a; Tassé et al., 2016b). It is used for clinical purposes such as identifying impairments and assisting in diagnosing intellectual disability and other neurodevelopmental disorders. DABS stands out because it covers a large portion of the development period. It is based on the psychometric model of Item Response Theory (IRT), which considers the items' difficulty level, allowing for more individualized results. Furthermore, it assesses adaptive behavior through its three domains: conceptual, social, and practical (Tassé et al., 2012; Tassé et al., 2016b). The items are rated on a scale ranging from 0 = No - rarely or never does this; 1 = Yes - does it after being reminded or helped, but rarely or never independently; 2 = Yes - sometimes does it independently, but other times needs a reminder or help; 3 = Yes - always or almost always does it independently, rarely or never needs to be reminded or helped; and N/A = Not applicable - zero points, the child or adolescent has not had the opportunity to perform such behavior due to environmental restrictions or a lack of direct knowledge to whether such behavior was ever performed. The instrument has 75 items distributed in the three domains (25 for each domain) and presents good psychometric properties, adequate internal consistency, and convergent validity (Balboni et al., 2014; Tassé et al., 2016a; Tassé et al., 2016b).

The scale presents good psychometric properties, including sensitivity to detect the presence of intellectual disability (Balboni et al., 2014; Tassé et al., 2016a). In a study addressing 28 children and adolescents diagnosed with a neurodevelopmental disorder, evidence of convergent validity was found with another instrument assessing AB, resulting in correlations of 0.70 to 0.84 between domains (Tassé et al., 2016a). It also showed stability through test-retest with coefficients ranging from 0.78 to 0.95 in the scores of each domain. In another study with 21 participants, two evaluators interviewed the respondents to verify intra-class stability, i.e., the extent to which evaluators agree regarding the same respondent. In this case, the Intraclass Correlation Coefficient (ICC) resulted in ICCs ranging between 0.61 and 0.87, indicating adequate precision between evaluators (Tassé et al., 2016a).

Procedures

This study was assessed and approved by the Institutional Review Board at the Federal University of Rio Grande do Sul (UFRGS, CAAE: 14409919.9.0000.5334). All participants signed free and informed consent forms, which provided information regarding the study's risks and

benefits and ensured confidentiality. The participants were also ensured the right to withdraw from the study at any time. The applicators were instructed to flag individuals from the non-clinical sample who presented scores indicating significant losses, making the necessary referrals to their guardians.

Data were collected face-to-face or online between 2020 and 2022 during the COVID-19 pandemic. Institutions assisting children or adolescents with intellectual impairment or multiple disabilities, such as health services and facilities (e.g., *Associação de Pais e Amigos dos Excepcionais – APAES*) in different Brazilian regions, were contacted for the face-to-face interviews. The facilities' professionals were trained to properly apply the instrument among parents/guardians during interviews, which lasted approximately 40 minutes each. They were also trained to calculate the scores and administer a brief sociodemographic questionnaire. The data collected online began by disseminating the survey via social media to recruit participants. The authors and research assistants applied the instrument via video calls; on average, the calls lasted the same as the face-to-face interviews. In this case, the calculation of scores was computerized via an online form. The scores of the online interviews were automatically converted to a database, and those concerning the face-to-face interviews were digitalized later.

Data Analysis

Means and standard deviations were transformed into z-scores (Hallberg, 2019; Schütz, 2022). Analysis of variance (ANOVA) was performed to compare the means between the non-clinical group and the clinical subgroups in each DABS domain to investigate the significance levels in the comparisons between each group's z-scores. ANOVA and T-test were performed to verify the impact of sociodemographic variables (respondents' educational levels and the subjects' gender and type of school) on the clinical group's outcomes. Data normality was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests, and Levene's test was performed to verify the homogeneity of variance. As these assumptions were not met, bootstrap procedures were implemented to ensure greater reliability to the results, correct deviations from normality in the sample distribution, and disparities between the groups' sizes, with a 95% confidence interval for the differences between means (Haukoos & Lewis, 2005). Due to the sample's heterogeneity, the Welch correction and post-hoc test using the Games-Howell technique were used (Field, 2018). Cohen's classification (1988), which consists of cutoff points to define small ($\eta^2 < 0.01$), moderate (η^2 between 0.02 and 0.06), and large ($\eta^2 > 0.14$) effects, was adopted to interpret the effect sizes in the comparison analyses.

Results

The results show significant differences in the comparisons between the non-clinical, ASD only, and ASD with comorbidities groups in the instrument's three domains: conceptual [Welsh's $F(2, 95.786) = 154.408, p < 0.001, \eta^2 = 0.54$], social [Welsh's $F(2, 96.370) = 229.770, p < 0.001, \eta^2 = 0.64$] and practical [Welsh's $F(2, 95.447) = 158.791, p < 0.001, \eta^2 = 0.57$]. Table 2

presents the means and standard deviations of each group's z-scores and the comparisons' significance levels. Individuals with typical development differed significantly in all DABS domains compared to individuals with ASD and comorbidities. A significant difference was found only in the practical domain when comparing the subgroup diagnosed with ASD with the one diagnosed with ASD and comorbidities.

Table 2

Z-scores' means and standard deviations of the scores obtained by the groups in each of the Diagnostic Adaptive Behavior Scale (DABS) domains

DABS domain	Group		
	Non-clinical (n = 181)	ASD only (n = 47)	ASD w/ C (n = 81)
	<i>M(sd)</i>	<i>M(sd)</i>	<i>M(sd)</i>
Conceptual	0.77(0.54) ^{ab}	-0.52(0.87) ^a	-0.79(0.80) ^b
Social	0.80(0.49) ^{ab}	-0.75(0.82) ^a	-0.84(0.74) ^b
Practical	0.74(0.50) ^{ab}	-0.45(0.77) ^{ab}	-0.83(0.82) ^{ab}

Note. ASD w/ C=ASD with comorbidities; same letters indicate significant differences at $p < 0.001$, based on Post hoc Games-Howell with Bootstrapping (95%CI Bca).

The analysis of the effects of sociodemographic characteristics considered the clinical subgroups (the children and adolescents diagnosed with ASD and those diagnosed with ASD and comorbidities) as a single group. As for sex, no differences were found in the conceptual [$t(125) = 1.60, p = 0.06, d = 0.40$] or social [$t(125) = 1.61, p = 0.11, d = 0.40$] domains; however, a significant difference was found in the practical domain [$t(125) = 2.05, p = 0.01, \text{Cohen's } d = 0.51$ (95%CI: (.19 - 1.00)], in which boys scored higher ($M = -0.63; SD = 0.84$) than girls ($M = -1.04; SD = 0.64$).

Table 3 presents the means and standard deviations of the z-scores for each respondent's educational level in the three DABS domains. No significant effect was found for education in the social [$F(3, 124) = 0.80, p = 0.50, \eta^2 = 0.02$] or practical [$F(3, 124) = 1.09, p = 0.36, \eta^2 = 0.03$] domains. However, individuals whose respondents had attended a graduate program obtained significantly higher scores in the conceptual domain [$F(3, 124) = 2.78, p = 0.04, \eta^2 = 0.06$] compared to the groups where the respondents had incomplete [$\Delta M = 0.78, 95\% \text{CI Bca } (0.28 - 1.31)$] or complete high school [$\Delta M = 0.62, 95\% \text{CI Bca } (0.10 - 1.24)$]; though, not higher than the respondents with a bachelor's degree [$\Delta M = 0.55, 95\% \text{CI Bca } (-0.03 - 1.13)$].

Table 3

Means and standard deviations of z-scores obtained in the Diagnostic Adaptive Behavior Scale (DABS) domains according to the educational level of the guardians of children and adolescents with ASD

DABS Domain	Educational Level			
	Incomplete high school (n = 30)	Complete high school (n = 52)	Higher education (n = 30)	Graduate studies (n = 14)
	M(sd)	M(sd)	M(sd)	M(sd)
Conceptual	-0.98(0.65)	-0.73(0.88)	-0.66(0.87)	-0.11(0.79)
Social	-0.90(0.76)	-0.82(0.82)	-0.80(0.59)	-0.51(0.77)
Practical	-0.80(0.76)	-0.69(0.91)	-0.73(0.80)	-0.31(0.67)

Similar results, without significant differences, were found regarding the type of school (public or private school) in the social [$t(120) = -0.79, p = 0.41, d = 0.20$] and practical [$t(120) = -0.73, p = 0.39, d = 0.19$] domains. However, significant differences were found in the conceptual domain [$t(120) = -2.10, p = 0.04$; Cohen's $d = 0.55$ [95%CI: (-1.06 - -0.03)], in which participants from public schools scored lower ($M = -0.73$; $SD = 0.81$) than their counterparts attending private schools ($M = -0.27$; $SD = 0.89$).

Discussion

This study's objective was to verify differences in the adaptive behavior of children and adolescents diagnosed with ASD only, ASD with comorbidities, and those with typical development. The effects of sociodemographic variables, such as gender, type of school, and respondents' educational levels, on AB outcomes of individuals with ASD were also verified. The results showed significant differences with a large effect size when comparing children and adolescents diagnosed only with ASD, ASD with comorbidities, and those with typical development; as expected, the latter showed higher z-scores. These findings corroborate other studies, which, despite having assessed AB using other instruments, also identified losses among children and adolescents diagnosed with autism and comorbidities (Kanne et al., 2011; Pugliese et al., 2015; Saulnier et al., 2022; Ward et al., 2022). This evidence is relevant for DABS criterion validity, as it shows the instrument's ability to differentiate deficits in the three domains between clinical and non-clinical groups (American Educational Research Association [AERA], 2014).

No significant differences were found between the clinical subgroups in the conceptual domain, which assesses skills related to intellectual functioning (Tassé et al., 2012). This is a significant result since the most frequent comorbidity in the sample is intellectual disability, which could trigger more important deficits in adaptive behavior (Kanne et al., 2011; McDonald et al., 2016). However, some studies present deficient AB scores even when there are no intellectual disabilities (Pathak et al., 2019; Perry et al., 2009; Pugliese et al., 2015). A potential explanation may be related to the fact that most individuals in the clinical sample were recruited from institutions assisting individuals with neurodevelopmental disorders, such as ASD and

intellectual disability. These services focus on individuals presenting significant impairments and requiring support to perform daily tasks, which would explain more symmetrical outcomes. Moreover, some participants may have shown intellectual impairments that were not correctly identified, hindering differentiation between the clinical subsamples, and thus impacting our findings.

Significant differences were found between the clinical subgroups and the non-clinical group in the social domain. The children and adolescents with typical development obtained higher z-scores with a larger effect size than those diagnosed with ASD and comorbidities. This result is aligned with the literature indicating impaired social skills, possibly related to the ASD typical symptoms (APA, 2022; Kanne et al., 2011; Saulnier et al., 2022; Ward et al., 2022). The social domain may not have been impacted by comorbidities but rather by the losses triggered by ASD, considering that the comparison between the two clinical subgroups lacks significance. Nonetheless, this finding should be further investigated, as autism symptomatology and adaptive behavior are independent constructs (Kanne et al., 2011).

Finally, the only domain with significant differences between the three groups was the practical domain, in which the individuals with typical development obtained higher z-scores, followed by those with ASD only and with ASD and comorbidities. The results corroborate the findings of Ray-Subramanian et al. (2011), Pugliese et al. (2015), and Yang et al. (2016), indicating deficits in practical skills. These studies showed that practical skills were more preserved than social and communication behaviors, though losses were found in different age groups and intelligence levels (Di Rezze et al., 2019; Kanne et al., 2011; Pugliese et al., 2015). A factor that is possibly related to significant impairments in the practical domain of individuals with ASD is that the comorbidities varied, including conditions other than neurodevelopmental disorders, such as speech and visual impairments. Considering that the practical domain assesses behaviors related to everyday tasks, such as dressing, safety, and self-management (Tassé et al., 2012), these conditions hinder the development of specific skills by imposing limitations, consequently leading to higher impairment scores. Furthermore, the clinical groups comprised of children and adolescents were predominantly recruited from institutions that specialized in assisting individuals requiring support to perform daily tasks, which may have led to lower scores.

The effects of sociodemographic characteristics on the AB outcomes were verified. As for the implications of sex on adaptive behavior outcomes among individuals with ASD, only the practical domain showed a significant difference with a large effect size, with girls scoring lower than boys. Practical skills concern self-management behaviors in everyday life, such as personal hygiene, dressing, and eating (Tassé et al., 2012). The results are consistent with studies showing impairments in girls' adaptive behavior, especially regarding social communication and language (Lai et al., 2015; Mahendiran et al., 2019).

Not finding significant differences in the social domain may be attributed to more preserved social skills in girls, facilitated by their inclination to emulate interaction behaviors—a

phenomenon referred to as the ‘camouflage effect’—which creates the illusion of a broader repertoire of social skills in various situations. Tubío-Fungueiriño et al. (2021) define “camouflage” as behaviors that hide the symptoms of autism, arguing that the effect may be a mechanism for individuals to adapt to their context, especially among girls, but which have negative implications, such as a late diagnosis and a lack of timely interventions. The interviewers may also have difficulties identifying impairments in these behaviors due to expectations toward each sex. Culturally, girls are expected to show more reserved functioning, being classified as “shy” and having less initiative to establish interpersonal relationships, which may affect the parents’ perception and, consequently, lead to more deficient results (Giambattista et al., 2021; Rynkiewicz et al., 2016).

Corroborating the findings of Ratto et al. (2018), large effect sizes were found for sex on the practical skills of children and adolescents with ASD. A potential explanation is associated with sex-based expectations. It is plausible that boys might enjoy more liberty and independence in manifesting behaviors in their daily lives than girls. Additionally, parental responses to assessment tools might vary depending on their children’s gender, influenced by distinct expectations towards boys and girls, leading to asymmetric scoring patterns (Ratto et al., 2018).

The caregivers’ educational levels significantly impacted conceptual skills, with large effect sizes. Conceptual skills concern behaviors promoted at school, such as reasoning, reading, and writing (Tassé et al., 2012). Children and adolescents whose respondents had graduate degrees obtained higher z-scores than those whose respondents presented other educational levels. It is worth highlighting that, even though we refer here to the educational level of the respondents, more than 90% of them were the children’s mothers or fathers; hence, it is a variable that primarily refers to parental education. Sharabi and Marom-Golo (2018) note that children with ASD whose parents have an education above high school receive greater formal and informal support. Miniarikova et al. (2023) argue that caregivers with high educational levels access better resources to support their children with everyday tasks. Furthermore, studies highlight the relevance of the school context in the development of adaptive functioning among individuals diagnosed with ASD (Badia et al., 2023; Ilan et al., 2023; Schneider et al., 2022). Therefore, evidence suggests that parental education contributes to preserving conceptual skills due to greater access to higher-quality services, such as better-structured schools and specialized healthcare.

Such a relationship is also found in this study when it comes to the type of school children and adolescents with ASD attend. Those from private schools obtained higher z-scores in the three domains than those attending public schools, which substantially affected the conceptual domain. This finding indicates that the quality of education offered by private schools may be relevant in the development of conceptual skills among children and adolescents with ASD. Sampaio and Guimarães (2009) highlight the unequal academic performance of students attending different institutions in Brazil, with private schools achieving performance superior to public ones. Although the study above was not intended to assess students with a

neurodevelopmental diagnosis, it shows the context of Brazilian public education as a potential factor imposing obstacles to the development of adaptive behavior in students with ASD. Gonçalves et al. (2019) also discuss unequal repercussions between public and private institutions, arguing that private education might present a greater repertoire of cognitive stimuli and educational resources. In this case, the relevance of inclusive education addressing the needs of each student stands out. Even though inclusive education remains a challenge, it has the potential to benefit this population significantly (Martínez et al., 2022; Romero et al., 2022; Sainato et al., 2015). Note that the analysis of sociodemographic variables, considering the respondents' education and the type of school the children attended, only considered the clinical subgroups of individuals diagnosed only with ASD or with ASD and comorbidities. The most frequent comorbidity found was intellectual disability, a neurodevelopmental disorder that causes intellectual impairments and deficits in adaptive skills (APA, 2022; Kanne et al., 2011; McDonald et al., 2016; Perry et al., 2009). Such a factor may contribute to the poor scores obtained in conceptual skills, considering that, in addition to the diagnosis of ASD, the group comprises individuals with significant cognitive impairments.

Despite the critical findings identified, this study presents some limitations. For example, the sample presents differences that may have influenced the results, including high numerical disparities between the non-clinical and clinical subgroups, especially in socioeconomic terms. The non-clinical sample generally comprised people with higher socioeconomic levels, while the clinical sample was mainly recruited from non-profit institutions supporting individuals with disabilities; hence, people were from lower socioeconomic levels. Although psychometric analyses were performed to decrease asymmetries, one should remember them when interpreting the results. Additionally, the outcomes were assessed during the COVID-19 pandemic, when families were dealing with many changes caused by social isolation and adapting to remote learning. Quezada-Ugalde et al. (2023) suggest that the social isolation during the pandemic may cause developmental delays. Thus, the outcomes found here possibly reflect these changes, which we must consider when interpreting the findings.

Another limitation concerns how the sample was allocated. The criteria used to determine the clinical and non-clinical subgroups were the respondents' reports of whether the subjects presented a clinical condition. We did not adopt standardized instruments to assess ASD diagnostic criteria, level of intelligence, or the severity of the disorder. The same applies to individuals with comorbidities, the characteristics of such conditions, and related effects. Such a gap restricts the reliability of information, considering the variables addressed here are solely based on the respondents' reports. Hence, these limitations must be accounted for when interpreting the results, as these are important factors explaining the effects on AB. Additionally, school performance variables and access to mental health services, which are relevant aspects for adaptive behavior outcomes, were not investigated.

As for the sociodemographic variables, the respondents' educational level concerned guardians with different levels of kinship, including grandparents, an uncle, and a brother,

besides parents. Even though 90% of the respondents in the group and subgroups concern mothers and fathers, this limitation may interfere with the findings concerning the effects of parental education on AB, as the sample included caregivers other than mothers and fathers. Hence, future studies are suggested to address these limitations to confer greater reliability to the results and contribute even more to autism diagnosis by including an AB assessment. Thus, understanding individuals' restricted autonomy levels and identifying their needs more accurately can support and direct interventions to improve the independence of children and adolescents with autism.

Final Considerations

The results show that children and adolescents diagnosed with Autism Spectrum Disorder present impairments in DABS domains compared to children and adolescents with typical development. Hence, a diagnosis of ASD implies different levels of AB. A significant difference between individuals diagnosed only with ASD and individuals with ASD and other comorbidities was found only in the practical domain. This finding indicates that adaptive behavior, especially practical skills and potential deficits, is essential to consider in an autism diagnosis when other health conditions are identified. These findings provide insights into the influence of other health conditions on AB and also to more precisely identify an ASD diagnosis and the impact of concurrent health conditions. The individuals' sex was also found to affect the outcomes concerning practical skills. It is conceivable that societal expectations regarding gender norms could have influenced adaptive behavior assessment. Therefore, professionals must recognize these gender-related nuances and integrate them into the assessment process to ensure its accuracy and reliability.

Effects of parental education were only found in the conceptual domain. Individuals whose respondents had a graduate degree obtained higher z-scores than other levels. The children and adolescents attending public schools obtained lower z-scores than students from private schools. This information is vital because conceptual skills are related to the schooling process. Therefore, identifying the effects of these variables helps professionals understand and consider social implications in individual outcomes, contributing to the planning of public health policies that consider the individuals' specificities within their socioeconomic context.

This study aimed to assess the adaptive behavior of children and adolescents with ASD and verify the effects of sociodemographic variables. Hence, adaptive behavior was assessed, which provides important information about an individual's independence. These findings emphasize the importance of considering an AB assessment for the identification of ASD, indicating potential impaired autonomy and supporting the implementation of appropriate interventions to provide the support these individuals require. Finally, few studies verify the effects of sociodemographic variables on the adaptive behavior of children and adolescents with ASD. For this reason, this study opens up the path for new studies on the topic in the Brazilian context, considering the country's significant socioeconomic differences.

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