Original Article

RBAFS Revista Brasileira de Atividade Física & Saúde
SOCIEDADE BRASILEIRA DE ATIVIDADE FÍSICA & SAÚDE

rbafs.org.br

Physical activity and sedentary behavior among mothers of children and adolescents with autism spectrum disorder: cross-sectional Study

Atividade física e comportamento sedentário de mães de crianças e adolescentes com transtorno do espectro autista: estudo transversal

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DOI

10.12820/rbafs.31e0445i

ABSTRACT

Introduction: Mothers of children with autism spectrum disorder (ASD) could present several problems related to health habits. However, physical activity (PA) and sedentary behavior (SB) remain underexplored in this population. Objective: To analyze the proportion of mothers of children and adolescents with ASD who meet PA and SB recommendations, as well as the factors associated with this adherence. Methods: This is a cross-sectional study including 665 mothers of children and adolescents with ASD. PA and SB levels were assessed using the International Physical Activity Questionnaire (short version). PA was classified as "meeting" or "not meeting" the recommendations (150 min/week), while SB was categorized into quartiles. Binary logistic regression was employed to identify factors associated with PA and SB. Results: Approximately 80% of the mothers did not meet PA recommendations. Older age (OR: 1.040; 95% CI: 1.006 – 1.075) and having younger children (OR: 2.406; 95% CI: 1.404 – 4.124) increased the likelihood of not meeting PA recommendations. Mothers whose children were undergoing therapy (OR: 1.518; 95% CI: 1.015 – 2.272), who were employed (OR: 2.631; 95% CI: 1.770 – 3.911), and younger mothers (OR: 0.972; 95% CI: 0.946 – 0.998) showed a higher likelihood of elevated SB. Conclusion: Most mothers did not meet PA recommendations, especially those who were older and had younger children. Conversely, younger mothers, those with children undergoing therapy, and those who were employed showed higher levels of SB.

Keywords: Physical activity; Sedentary behavior; Mothers; Children; Autism spectrum disorder.

RESUMO

Introdução: Mães de filhos com transtorno do espectro autista (TEA) podem apresentar diversos problemas relacionados aos hábitos de saúde. No entanto, a atividade física (AF) e o comportamento sedentário (CS) ainda são pouco investigados nesse grupo. Objetivo: Analisar a proporção de mães de crianças e adolescentes com TEA que aderem às recomendações de AF e CS, bem como os fatores associados a essa aderência. Métodos: Trata-se de um estudo transversal com 665 mães de crianças e adolescentes com TEA. Os níveis de AF e CS foram avaliados por meio do International Physical Activity Questionnaire (versão curta). A AF foi classificada em "atende" ou "não atende" às recomendações (150 min/sem), enquanto o CS foi categorizado em quartis. Utilizou-se regressão logística binária para identificar fatores associados à AF e ao CS. Resultados: Cerca de 80% das mães não atenderam às recomendações de AF. Maior idade (OR: 1,040; IC 95%: 1,006 – 1,075) e ter filhos crianças (OR: 2,406; IC 95%: 1,404 – 4,124) aumentaram a chance de não adesão à AF. Mães cujos filhos realizavam terapia (OR: 1,518; IC 95%: 1,015 – 2,272), que trabalhavam (OR: 2,631; IC 95%: 1,770 – 3,911) e mais jovens (OR: 0,972; IC 95%: 0,946 – 0,998) apresentaram maior probabilidade de CS elevado. Conclusão: A maioria das mães não atendeu às recomendações de AF, especialmente aquelas mais velhas e com filhos crianças. Por outro lado, mães mais jovens, com filhos em terapia e que trabalhavam apresentaram maiores níveis de CS.

Palavras-chave: *Atividade física; Comportamento sedentário; Mães; Crianças; Adolescentes; Transtorno do espectro autista.*

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental condition affecting social relationships and repetitive or restrictive behavioral patterns[1], and its prevalence has been increasing dramatically worldwide[2]. In Brazil, an estimated 2.4 million individuals

live with this condition[3], and this scenario brings a series of challenges to parents, potentially generating family conflicts[4], insufficient support, and a lack of understanding of their children's limitations by others[5].

Given this context, the physical and emotional burdens involved in caregiving, such as high levels of stress, anxiety, and depression[6-8], fall predominantly on mothers, who generally take on the majority of their children's daily demands, thereby enhancing the likelihood of developing health-damaging behaviors[6,9,10]. Another important aspect is that data from the 2021 *Global Burden of Disease*[11] showed that the burden associated with ASD in individuals aged 0-19 years worsened between 1991 and 2021, with a projected increase over the next 15 years. Thereby, exploring modifiable behaviors that may mitigate such health effects in mothers of individuals with ASD, especially children and adolescents, is essential for developing public health strategies for this subgroup.

Regular physical activity (PA) and sedentary behavior (SB) are widely recognized as key actions for improving physical and mental health in the general population[12-15]. Accordingly, international[13] and national[14,15] guidelines recommend that adults engage in at least 150 minutes per week of moderate to vigorous PA and reduce their time spent in SB. To the authors' knowledge, no previous study has investigated the prevalence and associated factors of adherence to these recommendations among mothers of children and adolescents with ASD in the Brazilian context. In general, the results of studies conducted in the United States[7,16] are conflicting, as some indicated lower odds of adherence to PA recommendations among caregivers of children and adolescents with ASD, while others found no differences[17,18]. It is worth highlighting some limitations in these studies, such as small sample sizes[7,18], the inclusion of non-heterogeneous samples, composed only of English-speaker individuals[7], distinct data collection periods for the different outcomes analyzed[17] and a lack of control for potential confounding variables, such as the number of children the mothers have[7].

Based on the aforementioned, it is clear thatb there is a need for further studies on this topic[19], mainly in Brazil. This is even more important considering the various socioeconomic and environmental factors, such as family commitments, lack of time, fatigue, motivation, and income, all of which can interfere with these behaviors in various populations. Therefore, the present study aimed to analyze the proportion of mothers of children and adolescents with ASD who adhere to PA and SB recommendations, as well as the factors associated with such adherence. The hypotheses of this study were a) most of this population do not meet the Brazilian Physical Activity Guidelines for PA and SB recommendations; b) socioeconomic factors are associated with these behaviors.

Methods

Design and ethical questions

This study followed a cross-sectional design in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines[20] and was approved by the Research Ethics Committee under protocol number: 7.305.621. All volunteers signed the Informed Consent Form prior to participating in the study. The data supporting the findings of this study will be made available by the corresponding author upon reasonable request.

Study setting and participants

Mothers of children or adolescents with ASD who brought their children to participate in a holiday camp organized by the Autism Institute were invited to take part in the study. This initiative took place in the metropolitan area of Recife and in some cities in the interior of Pernambuco, in the Northeast of Brazil. The holiday camp was free of charge and was designed to offer a variety of activities aimed at stimulating psychomotor, cognitive, and social skills in children and adolescents with ASD, including dance, painting, sports, aquatic activities, and traditional games. Data collection was conducted between January 6th and 24th, 2025.

Biological mothers aged 18 years or older, with at least one child or adolescent with a medical diagnosis of ASD, who were present at the holiday camp, were eligible for inclusion. Mothers who did not answer the questions about PA and SB were excluded.

Data collection

Interviews were conducted using a structured questionnaire, with an average duration of 15 minutes. A procedures manual was developed beforehand to standardize data collection, and the research team was properly trained. Interviews were conducted individually in a private room, with the researcher reading and explaining each question. Responses were recorded on

the Google Forms platform and subsequently transferred to the Statistical Package for the Social Sciences software (SPSS, IBM, v.25.0).

Physical activity level and sedentary behavior – outcomes

The levels of PA and SB were estimated using the short-form of the International Physical Activity Questionnaire (IPAQ), validated for the Brazilian population[21]. The IPAQ assesses, by self-report, the frequency (days/week) and volume (minutes/week) on PA performed in different domains (household, work/labor, transportation, and leisure) and walking activity. For the present study, the frequency and volume of leisure-time activities were used, namely moderate PA (light cycling, swimming, dancing, light aerobic exercise, recreational volleyball, light household chores, etc.) and/or vigorous PA (running, playing soccer, fast cycling, heavy household chores, carrying heavy loads, etc.). For the analyses, mothers were classified as "meeting" or "not meeting" the moderate-to-vigorous PA recommendations (≥150 minutes/week)[13-15]. Self-reported sitting time on weekdays and weekends was used as a proxy for SB. As there is no specific cutoff point for total sitting time, and guidelines generally recommend limiting/reducing prolonged uninterrupted sitting [13,14,22], it was decided to categorize total sitting time into quartiles, with the last quartile considered the highest-risk category (1st quartile: 0–60 minutes/day; 2nd quartile: 61–120 minutes/day; 3rd quartile: 121–240 minutes/day; 4th quartile: ≥241 minutes/day).

Independent variables

The demographic data collected includes age, education, income, marital status, and employment status, reflecting the participants' socioeconomic profile. Also analyzed were the number of children, the number of children with ASD, the age group of the child with ASD (up to 10 years vs. up to 17 years), access to therapy, the required support level, and the presence of a support network for the mother.

Sample size

A minimum sample of 552 mothers was calculated considering a population of 100,000 mothers, a prevalence of 50% (due to the study encompassing multiple outcomes), a margin of error of 5 percentage points, a design effect (*deff*) of 1.2, and a 95% confidence interval. In addition, 20% was added to account for potential refusals and losses.

Statistical analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS, IBM, v.25.0). Procedures included descriptive and inferential statistical analysis. Numerical variables were presented as mean and 95% confidence interval, while categorical variables were expressed as relative frequency (%).

Bivariate analyses (t-test and Pearson's chi-square test) were used to identify potential confounding factors for PA and SB levels. Binary logistic regression was used to identify factors associated with SB levels (1st to 3rd quartile = low SB; 4th quartile = high SB) and PA (0 = meets recommendations; 1 = does not meet recommendations), testing all variables with $p < 0.20$ in the bivariate analyses. However, only variables with $p < 0.05$ remained in the final model. The Hosmer-Lemeshow test was used to assess model fit.

Results

Initially, 704 mothers were invited to participate in the study. Twenty-five declined, 10 were excluded for not being the biological mother of the child, and 4 were unable to answer the questions about PA and/or SB. Thus, 665 mothers were included, whose children were between 3 and 18 years old. Table 1 presents the general characteristics of the sample.

It was found that 80.2% of mothers did not meet PA recommendations. Table 2 describes the amount of time mothers spent in moderate or vigorous PA and in SB on weekdays and weekends.

Table 3 shows that participants who were not married, who had a child under 10 years of age, and who had greater paternal support showed greater adherence to PA recommendations ($p<0.05$). Regarding SB, a higher proportion of more SB was observed among mothers who were not employed, had an income of up to one minimum wage, and whose children were undergoing therapy ($p<0.05$), while no difference was observed for SB time on weekends ($p>0.05$).

Table 4 shows that there is a lower likelihood of adhering to PA recommendations for older mothers and those with younger children ($p<0.05$), while for SB, younger mothers, those whose children were in therapy, and those who were employed showed a higher likelihood of being in the top quartile of weekday SB, while no associated factors were identified for weekend SB ($p>0.05$ for all).

Table 1 – General characteristics of the mothers included in the study (n = 665).

Variable	Values
Age (years)	36.5 (36.0 to 37.1)
Education (%)	
Incomplete high school or less	16.6
Complete high school or more	83.4
Income (%)	
Up to 1 minimum wage	65.3
> 1 minimum wage	34.7
Marital status (%)	
Married	38.0
Not married	62.0
Employment (%)	
Yes	24.6
No	75.4
Number of children (%)	
Up to 1 child	44.9
Two or more	55.1
Children with autism spectrum disorder (%)	
Up to 1 child	91.3
Two or more	8.7
Age of child with autism spectrum disorder (%)	
Children (up to 10 years)	81.6
Adolescents (11 to 17 years)	18.4
Therapy (%)	
Yes	65.9
No	34.1
Support level (%) (n=552)	
Support 1	37.1
Support 2	49.1
Support 3	13.8
Support network (%)	
Yes	69.6
No	30.4
Father's support	
Yes	38.2
No	61.8

Data presented as mean (95% confidence interval) or relative frequency. 1 minimum wage = BRL 1,518.00.

Table 2 – Descriptive analysis of physical activity and sedentary behavior in mothers of children and/adolescents with autism spectrum disorder (n = 665).

Activity	Values
Moderate physical activity (min/week)	76 (66 to 86)
Vigorous physical activity (min/week)	19 (to 22)
Moderate to vigorous physical activity (min/week)	95 (83 to 107)
Total physical activity (min/week)	132 (118 to 146)
Sitting time on weekdays (min/day)	196 (182 to 209)
Sitting time on weekends (min/day)	218 (202 to 234)

Data presented as mean (95% confidence interval).

Discussion

The findings of the present study indicate that: i) approximately 80% of mothers do not meet PA recommendations; ii) older mothers and those with younger children (up to 10 years) showed a greater odds of not meeting PA recommendations; and iii) mothers who are employed, whose children are in therapy, and younger mothers have a greater odds of presenting more SB only on weekdays.

The present study revealed that 4 out of 5 mothers of children and/or adolescents with ASD reported engaging in less than 150 minutes/week of moderate to vigorous PA. This prevalence is approximately 30 percentage points higher than findings observed in other studies that used self-reported measures. Indeed, studies conducted in United States[7], Netherlands[17], and Japan[23] showed that approximately 50% of fathers, mothers, and/or caregivers did not meet PA recommendations. A possible explanation for these differences is the level of human and socioeconomic development in those three countries compared to Brazil, particularly the Northeast region. Although there is an association between economic inequality and lower PA levels[24], the relationship between these factors in such a specific population as mothers of children with ASD has not yet been well established in the literature.

The present study identified that older mothers were less likely to meet the PA recommendations. These findings are consistent with those observed in caregivers of adults ASD[25], suggesting that older caregivers tend to have lower PA levels, regardless of the age group of the individual with ASD. Furthermore, this pattern also resembles what is observed in the general population, indicating a negative influence of advancing age on PA engagement. Another relevant finding was that mothers of younger children (<10 years) were twice as unlikely to meet PA recommendations, which contrasts with the literature on the general population. For example, data from the *2018* National Health Interview Survey indicated no differences in PA levels between mothers of children and mothers of adolescents[26]. Likely, greater difficulties in communication, socialization, and self-care, mainly during the childhood years of children with ASD, may lead to greater parenting challenges, hampering engagement in PA[27-29]. These findings are even more important give that mothers' PA habits can directly influence their children's PA, especially younger children[30].

The negative health effects of prolonged exposure

Table 3 – General characteristics of the mothers included in the study (n = 665).

Variáveis	Meet PA recommendations	Do not meet PA recommendations	P	> 240 min/day of SB	< 240 min/day of SB	P	> 240 min/day of SB	< 240 min/day of SB	P
Age (years)	35.8 (34.6 to 38.0)	36.9 (36.2 to 37.5)	0.120*	37.0 (36.3 to 37.6)	36.0 (35.0 to 37.1)	0.151*	36.8 (36.2 to 37.4)	36.2 (35.0 to 37.4)	0.409
Education (%)			0.540			0.235			0.524
Incomplete high school or less	18.3	16.1		17.3	13.3		17.1	14.8	
Complete high school or more	81.7	83.9		82.7	86.7		82.9	85.2	
Income (%)			0.362			0.031*			0.779
Up to 1 minimum wage	67.2	64.7		67.8	58.5		65.3	66.7	
> 1 minimum wage	32.8	35.3		32.2	41.5		34.7	33.3	
Marital status (%)			0.042*			0.778			0.064*
Married	30.5	40.2		38.4	37.1		39.9	30.9	
Not married	69.5	59.8		61.6	62.9		60.1	69.1	
Employment (%)			0.572			<0.001*			0.631
Yes	22.9	25.3		20.1	39.0		24.0	26.0	
No	77.1	74.7		79.9	61.0		76.0	74.0	
Number of children (%)			0.694			0.314			0.792
Up to 1 child	43.4	45.3		43.5	48.1		45.1	43.8	
Two or more	56.6	54.7		56.5	51.9		54.9	56.2	
Children with autism spectrum disorder (%)						0.276			0.241
Up to 1 child	88.5	92.3	0.172*	91.0	93.7		91.1	94.3	
Two or more	11.5	7.7		9.0	6.3		8.9	5.7	
Age of child with autism spectrum disorder (%)			0.009*			0.203			0.076*
Children (up to 10 years)	72.8	83.8		80.6	85.5		80.6	88.1	
Adolescents (11 to 17 years)	27.2	16.2		19.4	14.5		19.4	11.9	
Therapy (%)			0.935			0.050*			0.214
Yes	66.4	66.0		63.9	72.3		64.8	70.7	
No	33.6	34.0		36.1	27.7		35.2	29.3	
Support level (%) (n=552)†			0.674			0.893			0.236
Support 1	39.1	36.6		36.7	37.5		37.4	37.4	
Support 2	45.5	50.0		49.8	47.7		50.1	43.8	
Support 3	15.5	13.4		13.5	14.8		12.5	18.8	
Support network (%)			0.622			0.740			0.960
Yes	67.9	70.2		69.5	70.9		69.7	69.4	
No	32.1	29.8		30.5	29.1		30.3	30.6	
Father's support			0.040*			0.541			0.230
Yes	69.5	59.7		38.8	36.1		38.9	33.1	
No	30.5	40.3		61.2	63.9		61.1	66.9	

PA = physical activity, SB = sedentary behavior. Data presented as mean (95% confidence interval) or relative frequency. 1 minimum wage = BRL 1,518.00. † Level of support - 113 mothers were unable to provide information on their level of support.

to SB are widely investigated in the general population. Maintaining SB for more than 5 hours/day has been associated with all-cause and cause-specific mortality, including cardiovascular diseases, respiratory diseases, and cancer[31]. Mothers in our study reported spending around 8 hours per day during the week, which represents a significant risk factor. Our study found that employed mothers are more prone to SB, corroborating universal findings and demonstrating that the work environment is a potential risk factor for SB, including in this population. Furthermore, another novel finding of this study was that mothers whose children are undergoing therapy are more likely to present more SB. This association may seem surprising at first; however, the likely

Table 4 – Factors associated to sedentary behavior on weekdays in mothers of children and/or adolescents with autism spectrum disorder.

Dependent variable	Exposure	Odds Ratio (95% CI)	Hosmer-Lemeshow test	recommendations
Physical activity (Do not meet recommendations)	Age (1-year increment)	1.04 (1.006 to 1.075)	χ^2 = 9.135; p = 0.331	χ^2 = 11.801; p = 0.003
	Child's age (ref=adolescents)	2.406 (1.404 to 4.124)		
Sitting time on weekdays (4th quartile with ≥ 240 min/day of SB)	Work (ref=no)	2.631 (1.770 to 3.911)	χ^2 = 4.486; p = 0.811	χ^2 = 29.191; p < 0.001
	Child in therapy (ref=no)	1.518 (1.015 to 2.272)		
	Age (1-year increment)	0.972 (0.946 to 0.998)		

SB: sedentary behavior. 95% CI: confidence interval of 95%.

accompaniment of these mothers during therapy sessions, as well as transportation to care clinics, may have contributed to this increase in sitting time, particularly during the week. Finally, it was observed that younger mothers showed a greater likelihood of presenting SB and this finding resembles what is observed in the general population. In fact, the study by Celis-Morales et al.[32] showed that younger individuals spend more time sitting compared to middle-aged individuals.

The present study stands out for being one of the largest ever conducted with mothers of children and adolescents with ASD and the first conducted in Brazil. Our results allowed for the identification of potential factors for the development of interventions aimed at increasing PA and reducing SB. Thus, given that 80% of mothers of children with ASD do not meet PA recommendations and exhibit high SB levels, and considering the associated factors, the present study suggests: a) breaking up SB in the workplace itself[33]. Different SB-breaking strategies have been suggested, such as standing, taking short walks, or even performing isometric exercises[13-15,34,35]; and b) creating intervention policies focused on PA for mothers and other caregivers at clinics while their children are in therapy. Moreover, the modeling and support provided by physically active parents are among the main determinants of children's PA participation, especially when practiced together[36,37].

Despite the practical applications, some limitations must be considered. First, data were collected through self-report, and although the IPAQ questionnaire is widely used, memory bias cannot be ruled out, nor can underestimation or overestimation of PA patterns and SB through sitting time. Finally, due to the cross-sectional design, it is not possible to establish causal relationships between exposures and outcomes.

In conclusion, most mothers did not meet PA recommendations, especially those who were older and had younger children. On the other hand, younger mothers, those whose children were undergoing therapy, and those who were employed showed higher levels of SB. These findings reinforce the need for interventions to promote PA and reduce SB in this population, considering the most vulnerable subgroups identified in the present study.

Conflicts of interest

The authors declare no conflicts of interest.

Funding

This study was supported by the Coordination for the Improvement of Higher Education Personnel – Brazil (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* - CAPES).

Authors' contributions

Silva CEL: Conceptualization; Methodology; Investigation; Data curation; Data presentation design; Original manuscript writing; Approval of the final version of the manuscript. Santos AG and Dias JV: Investigation; Writing – review and editing; Approval of the final version of the manuscript. Andrade-Lima A: Resources; Writing – review and editing; Approval of the final version of the manuscript. Barros MVG and Germano-Soares AH: Conceptualization; Writing – review and editing; Approval of the final version of the manuscript. Farah BQ: Conceptualization; Methodology; Data analysis; Data curation; Supervision; Project administration; Data presentation design; Writing – review and editing; Approval of the final version of the manuscript.

Declaration regarding the use of artificial intelligence tools in the manuscript writing process

The authors used Claude.ai (https://claude.ai) for English language review. All suggested revisions were reviewed and approved by the authors.

Research data and materials availability

The data supporting the findings of this study will be made available by the lead author upon reasonable request.

Acknowledgements

The authors thank the mothers who volunteered to participate in the study.

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Received: 09/15/2025
Revised: 01/14/2026
Approved: 03/05/2026

Cite this article as:
Silva CEL, Santos AG, Dias JV, Andrade-Lima A, Barros MVG, Germano-Soares AH, Farah BQ. Physical activity and sedentary behavior among mothers of children and adolescents with autism spectrum disorder: cross-sectional Study. Rev. Bras. Ativ. Fis. Saúde. 2026;31:e0445i. doi: 10.12820/rbafs.31e0445i

Reviewers' assessment

The reviews of this article were originally conducted in Portuguese. This version has been translated using ChatGPT and subsequently reviewed by the Chief Editors.

Reviewer A

Alcivandro de Sousa Oliveira

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- In the manuscript Abstract, in the introduction, replace the repeated word "worse" with another synonym to avoid repetition.
- Still in the introduction, better justify the research problem.
- I suggest introducing in the Abstract the abbreviation and use of Sedentary Behavior (SB), and also using (PA) when referring to Physical Activity, as well as throughout the text.
- In the Abstract conclusion, I recommend making it more consistent with the research problem and avoiding concluding with the study objectives; instead, justify the manuscript's rationale.
- At the end of the introduction, clearly state the study objective to justify its conduct; there is no need to cite it in that form.
- In the methods, line 10 (PA and SB), organize the paragraph more clearly, such as separating PA levels: 1) moderate, 2) vigorous… and their respective activity types such as walking, running, etc.
- In the conclusion, try to respond directly to the study objectives and research problem.
- For the references, include more recent studies, preferably from the last five years.

Final decision

- Major revisions required.

Reviewer B

Jessica Fernanda Correa Cordeiro

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For author and editor

The manuscript entitled "Physical activity and sedentary behavior of mothers of children and adolescents with autism spectrum disorder: a cross-sectional study" aims to describe the prevalence of mothers of children with ASD who meet physical activity (PA) recommendations, as well as to analyze factors associated with physical activity level and sedentary behavior. Although this topic is still underexplored in the literature, it is important to focus attention on these mothers; however, the justification for selecting this specific population was not sufficiently clear in the text. Overall, the study is well written.

Title

- The title is appropriate and follows STROBE guidelines, but it is somewhat long. Suggested revision:
- "Physical activity and sedentary behavior in mothers of individuals with autism spectrum disorder: a cross-sectional study."

Abstract

- The abstract is well structured and clearly written. Suggestions for improvement:
- Make minor language adjustments (e.g., "sedentáiro" → "sedentary" and correct verb agreement in some passages).
- Add a sentence in the methods explaining how sedentary behavior was operationalized (which IPAQ item, unit used, and weekday/weekend cut-off).
- Include a sentence indicating model adjustments (e.g., "models adjusted for …" or "adjusted for demographic and child-related variables").
- Revise the conclusion to accurately reflect what the ORs indicate (especially for age and sedentary behavior), addressing the study objective.
- Standardize the abstract text to ensure consistency with the rest of the manuscript.

Introduction

- The introduction is well written and structured. Suggestions include strengthening the context of caregiving demands in ASD and their possible impact on maternal routine, better highlighting the research gap by emphasizing the scarcity or inconsistency of studies on PA prevalence and sedentary levels in mothers of children/adolescents with ASD, and clarifying the study's contribution by noting that it provides prevalence estimates and identifies associated factors, supporting planning

of actions and interventions. Additionally, ensure conceptual consistency between PA and sedentary behavior by explaining that sedentary behavior is not merely "low PA" and justifying why both are assessed. Finally, end the introduction with a short, direct paragraph linking the objective, study design (cross-sectional), population, and outcomes, keeping the objective consistent with the abstract.

Methods

- The design and sections are well organized. However, to ensure reproducibility, important details are missing, such as:
- Sampling procedure (e.g., convenience? recruitment in clinics/associations? networks?).
- Response rate and participant flow.
- Handling of missing data.
- Justification and operationalization of sedentary behavior by quartiles.
- Specification of which IPAQ variable represents "sedentary behavior" (sitting time) and how it was calculated.
- Rationale for using quartiles (e.g., alternative to absolute cut-off, recommendations, or percentiles used in the literature).

Results

- The results section could be strengthened with clearer presentation:
- Introduce each table with a sentence summarizing what it shows, highlighting the key finding rather than simply repeating the table.
- For sedentary behavior categorized into quartiles (Q4), report the category limits; otherwise, readers cannot interpret "high sedentary behavior."
- For continuous variables (such as age), indicate the unit of effect (e.g., "per 1 year" or "per x years"), as well as reference categories when applicable.

Discussion

- The topic is relevant and applicable, considering caregiving mothers of individuals with ASD and potential health vulnerabilities. The text acknowledges key limitations, such as cross-sectional design and self-report. Suggestions:
- In cross-sectional studies, avoid causal language (e.g., "leads to," "causes") and prioritize terms like "associated with."
- Structure the discussion more clearly, for example: summary of main findings (1 paragraph), comparison with literature (2–3 paragraphs), plausible mechanisms/barriers, limitations with direction and magnitude, and implications/recommendations (without overgeneralization).
- Clarify the importance of the study and the rationale for selecting this population.

Conclusion

- The conclusion addresses the objective but could be more concise. Also suggested:
- Explicitly define what was considered "high sedentary behavior."
- Align statements precisely with results, especially regarding age and sedentary behavior.

References

- Review formatting to ensure consistency. The manuscript includes 34 references, 18 of which were published in the last five years.

Final decision

- Major revisions required.