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## Participation Patterns and Associated Factors in Japanese Children with Autism

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Keywords:	Participation, Children, Environment, Family-centered practice, Autism
Abstract:	<p>Background: Children's participation is an important outcome for children, families, and rehabilitation. Objectives: We compared participation patterns (home and community) of 6-12-year-old Japanese children with autism and children with typical development (TD) and explored the associations of participation with familial, environmental, and child-related factors. Methodology: Twenty-five mothers of children with autism and 21 mothers of TD children completed a survey covering their child's participation and environment, family empowerment, autism symptoms, sensory processing, behavior, and demographic characteristics. Results: Children with autism showed restricted home and community participation. Home involvement was associated with family empowerment and the children's age, whereas home frequency was linked to environmental supportiveness and household income. Conclusion: Japanese children with autism need appropriate support to address decreased participation. Occupational therapists may focus on family empowerment and the child's environment to facilitate the home participation of children with autism.</p>

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3 Plain Language Summary Title:

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5 Participation Patterns and Associated Factors in Japanese Children with Autism

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7 Plain Language Summary:

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9 Participation in daily activities is essential for children's health and well-being. We investigated the  
10 characteristics of and factors associated with home and community participation among Japanese  
11 children with autism without intellectual disability. The degree of environmental support at home,  
12 maternal perceptions of family empowerment, annual household income, and the age of the children  
13 were all associated with home participation in children with autism. These findings may be useful for  
14 professionals who support the daily lives of Japanese children with autism. They also suggest the  
15 importance of professionals focusing on children's environment and family when effectively supporting  
16 their home lives.  
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For Peer Review

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## Introduction

Participation, defined as “involvement in a life situation,” is an integral part of children's health and well-being (WHO, 2001). Through participation in a variety of everyday activities, children foster physical and mental health, develop skills, and build interpersonal relationships (Law et al., 2013). Children's participation in valuable, everyday life situations is an important outcome for children, families, and rehabilitation services (Anaby et al., 2022). In recent years, participation has been defined in two dimensions: attendance (the frequency, range, and variety of activities in which children participate) and involvement (the experience of participation, meaning the level of engagement, motivation, persistence, social connection, and emotion) (Imms et al., 2017).

In comparison, children with typical development (TD), children with autism show less frequent and less involved home and community participation (Egilson et al., 2017, 2018), participate in fewer types of extracurricular leisure activities (Hilton et al., 2008), and show less frequent participation in social and informal activities (Hocchauser & Engel-Yeger, 2010).

Longitudinal studies have also reported a decline in participation among children with autism as they transition into adolescence (Simpson et al., 2019). It is important to provide appropriate support to address the participation limitations experienced by children with autism during this transitional phase.

The United States is an individualist society, while Japan is a collectivist society (Markus & Kitayama, 1991). Therefore, the Japanese pay attention to others more than themselves and emphasize the importance of satisfying the expectations of the group and society. Cultural norms may influence children's participation; however, there have been no studies on the participation of Japanese children with autism. In the Japanese context, identifying

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3 participation patterns and associated factors in children with autism is crucial for guiding the  
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5 practice of pediatric rehabilitation professionals.  
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8       Familial, environmental, and child-related factors interact with the participation of  
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10 children with disabilities in complex ways. It has been suggested that modifiable process factors  
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12 (e.g., health and well-being of caregivers, beliefs) representing family experiences and actions  
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14 need to be prioritized over status factors (sociodemographic factors, family structure)  
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16 representing family characteristics when intervening in the participation of disabled children  
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18 (Arakelyan et al., 2019). Studies have shown that mothers' participation frequency in everyday  
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20 and leisure activities and satisfaction (Bar et al., 2016; Wang et al., 2023) are factors associated  
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22 with the participation of children with autism. Family empowerment is a conceptual framework  
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24 reflecting family outcomes; it refers to the process by which families actively take control of  
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26 their lives and acquire the knowledge, skills, and resources necessary to improve their quality of  
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28 life (Singh et al., 1995). Increasing family empowerment is a crucial component of family-  
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30 centered interventions (Dunst et al., 2007). Recently, the effectiveness of family-centered  
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32 interventions in promoting the participation of children with disabilities has been reported (Chien  
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34 et al., 2020). Although family empowerment is associated with the home and community  
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36 participation of young children with cerebral palsy (Kalleson et al., 2022), these associations in  
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38 children with autism are currently unknown.  
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44       A child's environment creates opportunities and barriers that enable or limit participation,  
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46 affecting both the frequency and involvement of children in activities (Anaby et al., 2014).  
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48 Environmental factors reported to be associated with participation among children with autism  
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50 include poor access to buildings, services that do not meet their needs, and social prejudice  
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52 (Egilson et al., 2017). Caregivers of children with autism have less environmental support at  
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3 home and in the community and face additional barriers in comparison with caregivers of  
4 children without autism (Egilson et al., 2017, 2018). Although a country's socioeconomic status  
5 influences both environment and participation (Krieger et al., 2022), this relationship in Japanese  
6 children with autism has not yet been studied.  
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12 Also, individual factors related to age, IQ, autism symptoms, and sensory processing  
13 patterns have been associated with the participation of children with autism (Little et al., 2015;  
14 Devenish et al., 2020; Lin, 2020), **no study has yet explored these relationships in the context of**  
15 **Japan.**  
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22 Our primary aim was to compare home and community participation patterns among  
23 Japanese children with autism and children with TD and identify the features of participation of  
24 Japanese children with autism. Our secondary aim was to explore the relationships between the  
25 two dimensions of participation (attendance and involvement) and familial, environmental, and  
26 child-related factors in children with autism.  
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## 35 **Methods**

### 36 ***Research Design***

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39 This cross-sectional study used an anonymous, self-administered survey conducted during the  
40 COVID-19 pandemic from October 2022 to March 2023.  
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### 46 ***Participants***

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48 Participants were caregivers of children with autism and TD children recruited from the  
49 outpatient Clinic of a welfare center for children with disabilities in Nagasaki, Japan. Inclusion  
50 criteria were as follows: (1) the child has received a diagnosis of autism based on the DSM-5  
51 from a pediatrician or pediatric psychiatrist, (2) the child's age is between 5 and 14 years, and (3)  
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3 the child does not have an intellectual disability (ID). Previous studies have reported that  
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5 children with ID show limitations in participation compared to children with TD (King et al.,  
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7 2013). In this study, children with autism without ID were selected to determine differences in  
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9 participation patterns between children with autism and children with TD, considering the effects  
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11 of ID. Therefore, the present study was based on caregivers' reports that all children with autism  
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13 had a full-scale IQ of  $\geq 70$  points, as measured using the Wechsler Intelligence Scale for Children  
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15 Fourth Edition (WISC-IV). The inclusion criteria for children with TD were as follows: (1) the  
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17 child is enrolled in regular classes, and (2) the child has no evident developmental or behavioral  
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19 problems based on the caregiver report.  
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## 24 25 ***Measurements***

### 26 27 ***The Participation and Environment Measure for Children and Youth***

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29 The Participation and Environment Measure for Children and Youth (PEM-CY) is a caregiver-  
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31 reported scale measuring a child's participation and environment in the home, at school, and in  
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33 the community (Coster et al., 2011). In this study, the PEM-CY was used to examine children's  
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35 participation and environment in the home and community domains since assessments for the  
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37 school domain has been reported to show low internal consistency for children with autism  
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39 (Ambrose et al., 2021). Caregivers rated their child's participation in terms of both dimensions  
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41 (frequency and involvement) for each activity. Frequency was rated on an eight-point scale (from  
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43 0: "never in the past four months" to 7: "daily"), and involvement on a five-point scale (from 1:  
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45 "minimally involved" to 5: "very involved"). If participation frequency was rated 0 (never),  
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47 involvement in that activity was not rated. The average score of the participation frequency  
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49 scores for all 10 items in each set was calculated and converted to a percentage to obtain the  
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51 participation frequency summary score. The average score of the involvement scores for all 10  
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3 items in each set was calculated and converted into a summary score of involvement. The  
4 participation frequency and involvement scores for each activity item were also calculated.  
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6 Higher scores indicated higher participation frequency and involvement by the child in the  
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8 activity.  
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12 For the environment scale of the PEM-CY, caregivers responded to each question using a 3-point  
13 scale (1: "usually makes it difficult, usually no" to 3: "usually helps, not relevant, not necessary")  
14 for the item that best describes the child's environmental characteristics and resources. The  
15 environmental supportiveness summary score was the sum of scores for each location, and the  
16 total score was converted to a percentage. A higher environmental supportiveness score indicated  
17 higher perceived environmental supportiveness by the caregiver. Both reliability and validity of  
18 the PEM-CY have been well assured (Coster et al., 2011). We used the Japanese version of the  
19 PEM-CY (Takaki et al., 2022). Cronbach's alpha coefficients for home and community in the  
20 present sample of children with autism were, respectively, 0.59 and 0.55 for frequency, 0.90 and  
21 0.78 for environmental support, and 0.66 for involvement at home. **Since many children scored**  
22 **zero for frequency in the community, we did not calculate Cronbach's alpha coefficient for**  
23 **involvement, and the PEM-CY involvement summary scores in the community were**  
24 **subsequently excluded from the analyses.**  
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#### 44 ***Family Empowerment Scale***

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46 The Family Empowerment Scale (FES) is a 34-item, caregiver-reported scale measuring the  
47 empowerment of families of children with disabilities (Koren et al., 1992). Caregivers rated each  
48 item on a five-point scale. The FES includes three subscales: family, services, and community/  
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3 policy. For the present study, we calculated the overall score by totaling the scores for each  
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5 subscale. Higher overall scores indicated higher family empowerment. The FES is highly reliable  
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7 for evaluating the family empowerment of children with disabilities (Koren et al., 1992). The  
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9 Japanese version of the FES in this study has demonstrated adequate internal consistency and  
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11 test-retest reliability when administered to caregivers of children with emotional disorders and/or  
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13 developmental disability (Wakimizu et al., 2010).  
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### 19 ***Social Responsiveness Scale Second Edition***

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21 The Social Responsiveness Scale Second Edition (SRS-2) is a 65-item, caregiver-reported scale  
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23 measuring the severity of autism symptoms (Constantino and Gruber, 2012). Caregivers selected  
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25 the response that best represented their child's behavior for each question on a four-point scale.  
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27 For the present study, the analyses were performed using the raw overall score calculated by  
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29 totaling the scores for all items. A higher raw overall score indicated greater autism symptoms.  
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31 The Japanese version of the SRS-2 for the school-age form used in this study has been  
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33 reported to have good internal consistency (Cronbach's  $\alpha > 0.95$ ) and test-retest reliability  
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35 (intraclass correlation coefficient = 0.96) (Kamio, 2017).  
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### 42 ***Short Sensory Profile***

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44 The Short Sensory Profile (SSP) is a 38-item, caregiver-rated scale measuring a child's atypical  
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46 response to sensory stimuli (McIntosh et al., 1999). Caregivers responded to each question on a  
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48 five-point scale. The SSP consists of eight subscales: tactile sensitivity, taste/smell sensitivity,  
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50 movement sensitivity, under-responsive/seeking sensation, auditory filtering, low energy/  
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52 weakness, visual/auditory sensitivity, and total. We analyzed the total score, which was  
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3 calculated by totaling the row scores for all items. Higher total scores indicated higher overall  
4 sensory-processing difficulties. The internal consistency of each item of the Japanese version of  
5 the SSP used in this study has been reported to have Cronbach's alpha coefficients of 0.54–0.88  
6 (Tani et al., 2015).  
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### 14 *Sociodemographic questionnaire*

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16 Caregivers answered a questionnaire covering their child's sex, age, comorbid conditions, IQ,  
17 relationship to caregiver, caregiver age, and family sociodemographic characteristics, such as  
18 annual household income.  
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### 26 *Procedure*

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28 This study was approved by the Ethics Committee of the University Graduate School of  
29 Biomedical Sciences (approval number: 22071403). Participants were recruited using  
30 convenience sampling. To recruit caregivers of children with autism, nurses distributed a study  
31 advertisement to patients at the outpatient clinic of a welfare center for children with disabilities  
32 in Nagasaki, Japan. Caregivers who showed interest in the study were provided an informed  
33 consent form, survey form, and return envelope. To recruit caregivers of children with TD,  
34 informed consent forms, survey forms, and return envelopes were distributed by teachers at a  
35 public elementary school in the same city. If they consented to study participation, caregivers  
36 sealed the completed survey form in the return envelope and mailed it to the research facility.  
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Receipt of the survey form was considered to indicate consent to study participation.

### *Data Analysis*

The Shapiro–Wilk test was used to confirm the normality of children’s and caregivers’ demographic characteristics and the variables of each scale. Descriptive statistics were used to calculate the percentage, mean, standard deviation, median, and interquartile range for each variable. **Given the relatively small sample size of this study, we used non-parametric statistics for all analyses.** The chi-squared test and Mann–Whitney U test were performed to compare differences for each variable between the two groups. Cohen’s d or r values were calculated as appropriate for each test to analyze the effect size. Cohen’s d values of 0.2, 0.5, and 0.8, and r values of 0.1, 0.3, and 0.5, were considered to indicate small, moderate, and large effects, respectively. The Spearman’s rank correlation coefficient was calculated for **the PEM-CY frequency summary scores (home/community) and involvement summary scores (home)** with family factors (household income, FES overall score), environmental factors (PEM-CY environmental supportiveness summary score), and child factors (child age, IQ, SRS-2 overall score, SSP total score) for children with autism. All statistical analyses were performed using SPSS statistical package version 20.0 with a statistical significance level of  $p < .05$ .

### **Results**

The response rate of the autism group was 75% ( $n = 30$ ), and that of the TD group was 15% ( $n = 21$ ); all data were free of missing values. Since three of the children with autism were toddlers, and two were junior high school students, 25 children were included in the analysis of the autism group after their exclusion. Table 1 shows the characteristics of children and caregivers.

**«Insert Table 1 here»**

### ***Comparison of Participation Summary Score and Item Score***

As shown in Table 2, regarding the participation summary score, the participation frequency in the community of the autism group was significantly less than that of the TD group ( $U = 168.0, p = .037, r = 0.31$ ). However, the frequency of home participation was not significantly different between the groups ( $U = 195.5, p = .139, r = 0.22$ ). **Home involvement also did significantly differ between groups ( $U = 126.0, p = .003, r = 0.45$ ).** Regarding the item scores for each activity, the autism group was significantly less likely than the TD group to frequently participate in two types of home activities: getting together with people ( $U = 159.0, p = .019, r = .35$ ) and school preparation ( $U = 178.5, p = .005, r = .41$ ) (Table 3). The autism group was also significantly less likely to be involved with three types of household activities: household chores ( $U = 117.0, p = .001, r = .51$ ), personal care management ( $U = 160.0, p = .014, r = .36$ ), and school preparation ( $U = 160.0, p = .026, r = .33$ ). In the community, the autism group was significantly less likely to frequently participate in two types of activities: **Unstructured physical activities** ( $U = 115.5, p = .001, r = .49$ ) and getting together with other children in the community ( $U = 121.0, p = .001, r = .47$ ) (Table 4).

«Insert Table 2 here»

«Insert Table 3 here»

«Insert Table 4 here»

### ***Relationships between Participation and Familial, Environmental, and Child-related Factors***

As shown in Table 5, for home activities, participation frequency showed a positive correlation with annual household income ( $r_s = 0.49, p = .013$ ) and the PEM-CY environmental supportiveness summary score ( $r_s = 0.42, p = .039$ ), while involvement showed a positive

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3 correlation with the FES overall score ( $r_s = 0.52, p = .008$ ). No variable significantly correlated  
4 with the frequency of community participation. In addition, the only child-related factor that  
5 showed a significant association was child age, which correlated with home involvement ( $r_s =$   
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0.47,  $p = .019$ ).

«Insert Table 5 here»

### Discussion

Relative to the TD group, the autism group had significantly lower involvement summary scores in the home and lower participation frequency summary scores in the community, which is consistent with the results of previous studies conducted in Iceland and Israel (Egilson et al., 2017; Golos et al., 2023). The results of the present study suggest that Japanese children with autism face significant limitations regarding the involvement of home participation and the frequency of community participation. However, the PEM-CY is a measure of participation that reflects a Western perspective, and children's participation may differ across cultures, requiring careful interpretation. It has been reported that the community participation frequency of children with TD in Hong Kong decreased compared to before the COVID-19 pandemic (Chien, 2022). The PEM-CY community frequency summary scores reported in the present study, which was obtained during the COVID-19 pandemic, were lower for both groups than those reported in previous studies conducted before the COVID-19 pandemic (Egilson et al., 2017; Devenish et al., 2020). This finding implies that the COVID-19 pandemic may have forced Japanese children with and without autism to refrain from unnecessarily going out into the community and decreased their opportunities for community participation.

It has been reported that children with high-functioning autism prefer activities that can

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3 be performed alone and participate in social activities less frequently (Hilton et al., 2008). Since  
4 many of the PEM-CY home activities (e.g., watching television, housework) included items that  
5 could be performed alone and did not require social interaction, the home frequency summary  
6 scores did not differ significantly between the groups. At the item level, the autism group  
7 participated significantly less frequently in "getting together with others" (home) and "getting  
8 together with other children in the community" (community) than did the TD group, which was  
9 consistent with the results of other studies (Egilson et al., 2018). These activity items refer to  
10 interactions with friends, family, and other individuals inside and outside the home. Considering  
11 that children with autism have challenges with social communication, these results are  
12 reasonable. Therefore, the PEM-CY can provide comprehensive information on the participation  
13 of children with autism in Japan and may be useful for occupational therapists working in Japan  
14 in assessing and setting goals for interventions for children with autism.  
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31 Consistent with the findings of other studies (Egilson et al., 2018), the autism group  
32 participated significantly less frequently in "school preparation" at home and was significantly  
33 less involved in "housework," "personal care," and "school preparation" at home compared to the  
34 TD group. Household chores can be divided into two categories: self-care for oneself and one's  
35 home space and family care for family members and their shared space (Amaral et al., 2014).  
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42 According to the PEM-CY definition, "school preparation" and "personal care" activities are  
43 categorized as self-care, while "housework" falls under family care. Our results suggest that  
44 children with autism may have a lower interest in household chores and less willingness to help  
45 others, which could lead to reduced participation frequency and involvement in household  
46 chores. Engagement in household chores contributes to a sense of belonging within the family  
47 (Amaral et al., 2014) and is thought to promote competence and positive identity development,  
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3 including spontaneity and independence (Lerner et al., 2005). Consequently, interventions aimed  
4 at encouraging household chore participation among children with autism may have a positive  
5 impact on various domains, such as daily living independence, social skills, and the cultivation  
6 of self-awareness. However, previous research on household chores in children with autism is  
7 limited, highlighting the need for further investigation.  
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15 The autism group was found to participate in "unstructured physical activities in the  
16 community" significantly less frequently than the TD group, which supports the findings of  
17 previous studies (Egilson et al., 2017). Children with autism have demonstrated decreased  
18 participation in physical activities as they age (Simpson et al., 2019), and it has also been  
19 reported that they have a higher prevalence of comorbid obesity than TD children (Curtin et al.,  
20 2014). Thus, our results indicate the importance of increasing opportunities for participation in  
21 physical activity to maintain the long-term health of children with autism.  
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31 Overall, higher family empowerment, as perceived by mothers, was associated with  
32 increased involvement of children with autism in family activities. The study extends the  
33 association between family empowerment and child participation to school-aged children with  
34 autism, which is consistent with the results of a previous study involving young children with  
35 cerebral palsy (Kalleson et al., 2021). The provision of information to families has been reported  
36 to be linked to higher levels of empowerment (Fordham et al., 2012). Mothers with higher  
37 perceptions of empowerment are more likely to possess knowledge and coping strategies for  
38 effectively managing their children with autism at home, enabling them to provide appropriate  
39 challenges for their children. As a result, children may be more motivated and engaged in  
40 activities through participation opportunities. The findings of this study suggest that family-  
41 centered interventions aimed at promoting empowerment may enhance the involvement of  
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3 children with autism in family activities at home. On the other hand, family empowerment was  
4 not significantly correlated with the frequency of participation in the community. Activities in  
5 the community may represent a more distant ecosystem (Bronfenbrenner & Morris, 2007) and  
6 may be more complex than activities at home. Therefore, caregivers may face challenges in  
7 controlling their children's opportunities for community participation. Furthermore, it is  
8 important to consider the impact of the COVID-19 pandemic, which has added complexity to  
9 community participation (Wang et al., 2023). Consequently, the present study's results should be  
10 interpreted with caution.  
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22 Annual household income was significantly associated with the frequency of home  
23 participation of children with autism. Considering economic resource constraints make it  
24 difficult for parents to provide their children with opportunities and experiences (Arakelyan et  
25 al., 2019), it may be postulated whether children of caregivers with higher annual household  
26 income have more economic resources to participate in activities at home.  
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33 Higher home environmental supportiveness perceived by caregivers was strongly  
34 associated with participation frequency in-home activities by children with autism. This finding  
35 is consistent with the results of past studies reporting that the environment influences the  
36 participation of children with autism (Egilson et al., 2017). Our results indicate the potential  
37 importance of preparing environmental supports in the home for improving participation  
38 frequency in in-home activities among children with autism.  
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47 Children's sensory processing difficulties were not significantly associated with each  
48 dimension of participation at home, which contradicts the results of previous studies (Little et  
49 al., 2015). It has been reported that environmental sensory features are perceived as primarily  
50 supportive of home participation and barriers to community participation (Golos et al., 2023). It  
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3 is possible that caregivers adapt environmental features in the home based on the children's  
4 sensory processing difficulties, thereby facilitating their participation at home. Therefore, the  
5 results of the present study highlight the importance of clinicians intervening in environmental  
6 features that may influence participation rather than addressing the child's sensory processing  
7 problems directly in order to promote home participation for children with autism.  
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12 The age of children with autism was significantly associated with home involvement. The  
13 association between age and participation in children with autism has produced mixed results  
14 across studies (Little et al., 2015; Devenish et al., 2020). These discrepancies may be attributed  
15 to variations in sample characteristics and the utilization of different scales for measuring  
16 participation, which could impact the observed relationship between children's age and their  
17 level of participation.  
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22 Children's IQ was found not to be significantly related to each dimension of home  
23 participation. No other study has examined these associations; thus, we cannot draw between-  
24 study comparisons. Since the sample of the present study consisted of children with autism with  
25 IQs of  $\geq 70$ , future studies involving children with IQs of  $< 70$  would enhance the validity of the  
26 present results.  
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31 In addition, children's autism symptoms were not significantly related to their  
32 participation at home. This result is inconsistent with those of other studies that identified a  
33 significant association between core symptoms of children with autism and community  
34 involvement (Devenish et al., 2020). The overall SRS-2 score (mean = 83.7, SD = 24.3) of the  
35 sample in the present study was lower than that of the sample in the previous study (mean =  
36 101.38, SD = 26.26) (Devenish et al., 2020). Further studies involving a larger sample and  
37 autism symptoms  
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3 ranging in severity are needed to clarify the present results.  
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5 No family-, environmental-, or child-related factors were significantly associated with the  
6 **frequency of community participation** of children with autism. It has been reported that, during a  
7 pandemic, patterns of participation are dictated more by public health regulations than by  
8 environmental factors (barriers and supports) or child factors (age and functional problems)  
9 (Wang et al., 2023). In the present study, we speculate that not only environmental and child  
10 factors but also family factors may be less related to the frequency of community participation  
11 due to the COVID-19 pandemic. Corroborating studies conducted after the COVID-19 pandemic  
12 are needed.  
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## 26 **Limitations**

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28 This study has some limitations. First, this study employed a convenience sampling  
29 strategy focused on caregivers with children residing in a specific region of Japan, resulting in a  
30 small sample size. Therefore, the results may lack generalizability. Future studies need to collect  
31 data from children residing in diverse regions of Japan, including urban and rural areas. Second,  
32 data regarding involvement in the community were excluded from the analysis due to a  
33 significant number of respondents rating the frequency of participation in each activity in the  
34 PEM-CY as 0. Additionally, the number of respondents related to the involvement in community  
35 activities was limited. Third, a cross-sectional study design was employed, and future research  
36 should consider longitudinal studies to elucidate the causal relationships between participation  
37 and each variable.  
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## Conclusion

The results of this study highlight an urgent need to develop effective interventions and support systems to address the restricted participation of Japanese children with autism. Establishing family empowerment and environmental support may be useful targets for occupational therapy interventions seeking to facilitate the home participation of children with autism.

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For Peer Review

**Table 1***Characteristics of the child and caregiver participants.*

Variable	Autism (n = 25)	TD (n = 21)	p
Child age, years, <b>median (IQR), min–max</b>	<b>10.0 (3.3), 6.5–12.7</b>	<b>9.7 (3.4), 7.3–12.8</b>	<b>.55<sup>a</sup></b>
Child sex, n (%)			
Male	21 (84.0)	10 (47.6)	.01 <sup>b*</sup>
Female	4 (16.0)	11 (52.4)	
Comorbidity, n (%)			
Attention Deficit Hyperactivity Disorder	16 (64.0)		
Developmental Coordination Disorder	3 (12.0)		
Medication use, n (%)	15 (60.0)		
methylphenidate	5 (20.0)		
atomoxetine	2 (8.0)		
guanfacine	8 (32.0)		
Aripiprazole	3 (12.0)		
Risperidone	1 (4.0)		
Type of classroom			
Regular classes	15 (60.0)	21 (100)	
Special support services in resource rooms	3 (12.0)		
Special support classes	7 (28.0)		
FSIQ, mean (SD)	102.4 (13.5)		
SRS-2 total score, mean (SD)	83.7 (24.3)		
SSP total score, mean (SD)	84.3 (22.8)		
Respondent's age, <b>median (IQR)</b>	<b>43.0 (7.0)</b>	<b>40.0 (7.0)</b>	<b>.18<sup>a</sup></b>
Respondent's education, n (%)			.05 <sup>b</sup>
High school and below	20 (80.0)	11 (52.4)	
Bachelor's degree and above	5 (20.0)	10 (47.6)	
Respondent's occupation, n (%)			.00 <sup>b**</sup>
Unemployed	0	8 (38.1)	

Full-time employment	24 (96.0)	7 (33.3)	
Part-time employment	1 (4.0)	6 (28.6)	
Annual income, n (%)			
<3,000,000 yen	1 (4.0)	1 (4.8)	.70 <sup>b</sup>
3,000,000–5,000,000 yen	5 (20.0)	5 (23.8)	
5,000,000–7,000,000 yen	6 (24.0)	7 (33.3)	
7,000,000–10,000,000 yen	11 (44.0)	5 (23.8)	
>10,000,000 yen	2 (8.0)	3 (14.3)	
FES Total, mean (SD)	104.8 (19.7)		

*Note.* TD = typical development; IQR = interquartile range; SD = standard deviation; FSIQ = Full-scale intelligence quotient; SRS-2 = Social Responsiveness Scale Second Edition; SSP = Short Sensory Profile. a = Mann–Whitney U test; b = Chi-squared test for independence.

\*  $p < .05$ , \*\*  $p < .01$

**Table 2**

*Comparison of participation summary score between the two groups.*

<b>PEM-CY subscale</b>	<b>Autism</b>	<b>TD</b>	<b>z</b>	<b>r</b>	<b>p</b>
Home frequency, median (IQR)	82.9 (12.1)	88.6 (14.3)	-1.5	0.22	0.139
Home Involvement, <b>median (IQR)</b>	<b>3.70 (0.70)</b>	<b>4.43 (1.19)</b>	<b>-2.1</b>	<b>0.31</b>	<b>0.037*</b>
Community frequency, <b>median (IQR)</b>	<b>27.1 (17.9)</b>	<b>40.0 (13.6)</b>	<b>-3.0</b>	<b>0.45</b>	<b>0.003**</b>
Home environmental supportiveness, mean (SD)	76.3 (13.1)				
Community environmental supportiveness, mean (SD)	80.0 (11.2)				

*Note.* TD = typical developing; IQR = interquartile range. Mann–Whitney U test. \* p< .05, \*\* p<.01

**Table 3***Comparison of home participation between the two groups.*

Items	Frequency, Mean Rank		U	Involvement, Mean Rank		U
	Autism	TD		Autism	TD	
1. Computer and video games	25.92	20.62	202.0	24.38	18.69	165.5
2. Indoor play and games	22.14	25.12	228.5	21.16	21.88	212.5
3. Arts, crafts, music and hobbies	25.60	21.00	210.0	21.85	22.18	226.5
4. Watching television, videos, and DVDs	20.90	24.21	247.5	25.00	21.71	225.0
5. Getting together with people	19.36	28.43	159.0*	18.80	25.36	160.5
6. Socializing using technology	21.70	25.64	217.5	19.55	21.45	181.0
7. Household chores	23.78	23.17	255.5	17.68	30.43	117.0***
8. Personal care management	23.14	23.93	253.5	19.40	28.38	160.0*
9. School preparation	20.14	27.50	178.5**	19.17	27.38	160.0*
10. Homework	21.82	25.50	220.5	19.83	26.62	176.0

*Note.* TD = typical developing; U = value for Mann–Whitney U test. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

**Table 4**

*Comparison of community participation frequency between the two groups.*

Items	Frequency, Mean Rank		U
	Autism	TD	
1. Neighborhood outings	25.38	21.26	215.5
2. Community events	20.22	27.40	180.5
3. Organized physical activities	20.38	27.21	184.5
4. Unstructured physical activities	17.62	30.50	115.5***
5. Classes and lessons	24.22	22.64	244.5
6. Organizations, group, clubs, and volunteer or leadership activities	22.28	24.95	232.0
7. Religious or spiritual gatherings	23.30	23.74	257.5
8. Getting together with other Children in the community	17.84	30.24	121.0***
9. Working for pay	22.50	24.69	237.5
10. Overnight visits or trips	20.84	26.67	196.0

*Note.* TD = typical developing; U= value for Mann–Whitney U test. \* p< .05, \*\* p<.01, \*\*\* p<.001.

**Table 5**

*Relationships between participation of children with Autism and familial, environmental, and child-related factors.*

Variable	Frequency in home	Involvement in home	Frequency in community
Family's variable			
Family income	0.49*	0.28	0.34
FES total score	0.29	0.52**	0.18
Environmental variable			
Home environmental supportiveness	0.42*	0.16	-
Community environmental supportiveness	-	-	0.18
Child's variable	□		
Age	0.17	0.47*	0.04
FSIQ	0.18	-0.05	-0.05
SRS-2 total score	0.02	-0.13	0.04
SSP total score	-0.19	-0.27	-0.17

*Note.* FES = Family Empowerment Scale; FSIQ = Full-scale intelligence quotient; SRS-2 = Social Responsiveness Scale Second Edition; SSP = Short Sensory Profile; Spearman's correlation ( $r_s$ ). \*  $p < .05$ ., \*\*  $p < .01$ .