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Validation of a Scale to Assess Activities of Daily Living at Home in Children and Adolescents With Autism Spectrum Disorder

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Abstract

Daily living skills may affect repetitive behavior patterns in individuals with autism spectrum disorder (ASD). This study aimed to validate a scale to assess activities of daily living at home (SAADL) in children and adolescents with ASD. Content validity by expert judgment showed Aiken V values between 0.75 and 0.88. The exploratory factor analysis (EFA) showed factor loadings (0.62 to 0.89) and high communalities. The % explanation of variance for dimension 1 (personal care) was 51.5% and for dimension 2 (mobility in the home) was 66.3%. The Cronbach's reliability was 0.87 and the retest values reflected high values of precision and accuracy. The SAADL is valid and reliable and can be used to assess activities of daily living of self-care and mobility at home.

Keywords:

Activities of Daily Living, Autistic, Validity, Reliability, Scale.

Introduction

Activities of daily living (ADLs) are essential and routine tasks that most young, healthy people can perform without assistance (Edemekong et al., 2020). They are characterized by performing fundamental tasks to support participation in school, home, and community settings in diverse populations (James et al. 2014).

ADLs according to the literature are classified as basic and instrumental activities (Edemekong et al. 2020; Law et al. 2005); "Occupational Therapy Practice Framework: Domain and Process (3rd Edition)" 2017). The former refers to activity-oriented personal tasks such as: walking independently, ability to feed oneself, selecting and putting on appropriate clothing, ability to bathe, groom oneself, maintain personal hygiene, control bladder function, and ability to go to and from the toilet.

Meanwhile, instrumental activities have to do with those that require more complex thinking skills. These include organizational activities such as transportation and shopping, managing finances, shopping, food preparation, managing communication, medication management.

Research currently suggests that many people with autism spectrum disorder (ASD) have impairments in daily living

skills relative to their cognitive skills (Bal et al. 2015; Farley et al. 2009; Marsack-Topolewski et al. 2021). Therefore the assessment of functional impairment, including different areas of a person's life, such as education, family, social life, work life, leisure and free time are crucial, both for the diagnosis, as well as for the therapeutic approach of young people with ASD (Rotger et al. 2014).

In general, levels of functioning, measures of adaptive behavior, and in particular daily living skills, are the variables that most affect repetitive patterns of behavior in people with ASD (Farley et al. 2009; Vahia, 2013). In fact, most people with ASD remain at home with their families until they enter adulthood, so parents provide continuous support to their children to overcome daily living difficulties (ADLs) (Dudley et al. 2019; Marsack-Topolewski et al. 2021).

In addition, in recent months, following the COVID 19 pandemic, children, adolescents and adults with ASD have been locked in their homes for more than a year, so ADLs at home could undergo substantial changes.

Therefore, to assess these daily activities at home it is necessary to have a simple, brief and easy to apply instrument. Therefore, this study aimed to validate a scale to assess activities of daily living (ADLs) within the home of children and adolescents with ASD.

Methodology

Type and sample

A cross-sectional study was designed in Chilean children and adolescents with ASD. The sample consisted of 32 boys and 5 girls from public educational institutions in the cities of Talca, Rancagua and Santiago (Chile). The age range ranged from 4 to 20 years old.

The sample selection was non-probabilistic by convenience. All the information about the children and adolescents with ASD was collected through their parents, since they were the ones who answered the survey. The average age of the parents was 36.85±7.61 years. The sociodemographic variables of both the young people with ASD and their parents are shown in Table 1.

Procedures

Parents were contacted via telephone in May 2021. Once contacted, the objective of the research was explained to them. Parents who agreed to participate in the study signed the informed consent. This stage lasted two weeks.

Children enrolled in state special education schools (preschool, primary and secondary) and those living directly with one or both parents were included. Children whose parents did not complete the applied scale and those living with relatives (other than their parents, one or both parents) were excluded. The entire procedure was performed in accordance with the Local Ethics Committee and the Helsinki declaration for human beings.

Validity and reliability of the scale

The SAADL was validated by expert judgment (content validity) and construct analysis, while reliability was assessed by measures of internal consistency and stability (retest).

Content validity was assessed by expert judgment, according to the suggestions described by Wiersma (2001). Six health and education professionals with a minimum of 10 years of professional and research experience in their area were invited to participate as experts. This panel of professionals with extensive experience in ASD reviewed appropriate scale items as described by Schultz (2005)

The SAADL was sent to each of the experts by e-mail. They then evaluated the degree of representativeness, relevance, diversity, clarity, simplicity and completeness of each of the items of the elaborated instrument in an index card. The alternatives presented a scoring scale from 1 to 5 points. Each expert evaluated the SAADL and resubmitted the form for further analysis. In the end, the SAADL consisted of 8 questions and can be seen in appendix 1.

Construct validation was carried out by measuring exploratory factor analysis (EFA), allowing the underlying structure of the data to be determined (Bollen, 1989).

Reliability was assessed by internal consistency, calculating Cronbach's alpha per question and total scale. On the other hand, stability measures (retest) were also used with a 14-day time interval between both measurements. For the second measurement, nine parents were used, representing 24% of the total sample.

Statistics

The normality of the data was verified by the Shapiro-Wilk test. Descriptive statistics were analyzed for frequencies, percentages, range, mean (X), standard deviation (SD), skewness, and kurtosis.

For content validity, Aiken's V (Bulger & Housner, 2007) was used which evaluates the adequacy of the items to the content validity criteria. Higher values of Aiken's V ≥ 0.75 were accepted (Bulger & Housner, 2007).

For construct validity, the exploratory factor analysis (EFA) fit model was considered by adopting the Kaiser Meyer-Olkin (KMO) sample adequacy criteria,

Bartlett's sphericity value was considered to establish the relevance of the factor analysis, Comparative Fit Index (CFI) root mean square error of approximation (RMSEA). The analysis provided the measure of variance explained, factor loadings, communalities and Chi-square approximation. To assess stability measures, the concordance correlation coefficient (CCC) was calculated, using precision (p) and accuracy (A) according to Lawrence and Lin (1989) approach. In addition, the weighted kappa (Cohen, 1968) was calculated to measure the magnitude of agreement between the two scores (test and retest). In all cases, $p < 0.05$ was adopted. The results were processed and analyzed initially in Excel spreadsheets and subsequently in SPSS 18.0 and Med Calc 11.1.0, as appropriate.

Results

The sociodemographic variables of the parents and children are shown in Table 1. Thirty-seven parents were surveyed, corresponding to 51.4% cohabiting families, 40.5% married and 8.1% divorced. The majority of respondents were female (81.1%) and only 18.9% were male. In addition, most of these families lived in urban areas (86.5%) compared to those in rural areas (13.5%). Regarding information on children with ASD, the majority were males (86.5%) relative to females (13.5%). Of the children, 67.7% lived with both parents (67.7%) and 32.4% with their mothers, while 18.9% were only children and 81.1% had one or more siblings.

Table 1.
Sociodemographic characteristics of the sample studied.

Variables	fi	%
Parental Information		
Gender		
Males	7	18.9
Female	30	81.1
Marital Status		
Married	15	40.5
Divorced	3	8.1
Cohabitant	19	51.4
Area where you live		
Urban	32	86.5
Rural	5	13.5
Children Information		
Sex		
Male	32	86.5
Female	5	13.5
Lives with parents		
Both Parents	25	67.6
Mother Only	12	32.4
Father Only	0	0
Number of brothers		
None	7	18.9
1 Brother	15	40.5
2 Brothers	11	29.7
3 Brothers	3	8.1
4 Brothers	1	2.7

Values for the V of Aiken test are presented in Table 2. The values for each question varied from 0.75 to 0.92 while the values for the dimensions were between 0.82 and 0.88. For all of the cases, the values obtained from the judges reflected an agreement of 0.75 to 0.88.

Table 2.
Content validity of the instrument (SAADL) using Aiken's V by question and dimension.

N°	Dimensions/ Items	RP	RE	DI	CL	SI	CO
Personal care							
1	Item 1	0.92	0.83	0.83	0.92	0.88	0.88
2	Item 2	0.88	0.83	0.75	0.79	0.88	0.83
3	Item 3	0.83	0.88	0.96	0.92	0.75	0.92
4	Item 4	0.79	0.83	0.79	0.88	0.88	0.88
	Total	0.85	0.84	0.83	0.88	0.84	0.88
Mobility in the house							
5	Item 5	0.92	0.83	0.96	0.88	0.83	0.83
6	Item 6	0.88	0.83	0.83	0.83	0.83	0.83
7	Item 7	0.83	0.88	0.79	0.92	0.92	0.92
8	Item 8	0.83	0.79	0.71	0.83	0.88	0.88
	Total	0.86	0.83	0.82	0.86	0.86	0.86

Legend: RP: Representativeness, RE: Relevance, DI: Diversity, CL: Clarity, SI: Simplicity, CO: Comprehensibility, T: Total.

The descriptive values of the SAADL are shown in Table 3. Skewness showed values lower than the average (-0.97 to 1.39) while kurtosis ranged from (-1.88 to 2.68). The coefficient of variation in all cases was less than 33% and the values of Cronbach's alpha per question ranged from 0.81 to 0.90 and in the total scale it was $r = 0.87$.

Table 4 shows the factor loadings and communalities obtained after the EFA. The rotated components matrix was obtained through Varimax. The model fit gave the following results: CFI (0.903), RMSEA (0.057), KMO was 0.80, X^2= 165.1 ($p = 0.000$). Factor loadings ranged from 0.62 to 0.89, while communalities were higher than 0.53. Overall, the % explanation of variance of dimension 1 (personal care) reflected 51.5% and dimension 2 (Mobility in the house) 66.3%.

The reliability values analyzed by means of retesting can be seen in Table 5. The DRI was calculated, obtaining CCC values from 0.87 to 1.0, the values of precision (0.96) and accuracy (0.99) were very high, and even the weighted Kappa showed high concordance values (0.74 to 1.0), which guarantee equivalence between both measurements.

Discussion

The results of the study have shown that the scale proposed in this study proved to be valid and reliable for assessing ADLs in the homes of children and adolescents with ASD.

Table 3.

Descriptive analysis of SAADL in children and adolescents with ASD.

No	Questions	Mean	SD	CV	Asymmetry	Kurtosis	Cronbach
1	In personal care for grooming (bathing, washing, combing hair, etc.)	2.7	0.9	33.3	0.65	-1.51	0.813
2	In personal care for dressing, undressing (change of clothes)	2.89	0.9	32.4	0.23	-1.88	0.9
3	In household chores to organize (clothes, utensils, food, other)	2.3	0.7	28.8	2.03	2.68	0.817
4	In household chores to clean the house (sweeping, mopping, washing clothes, other)	2.43	0.7	29.9	1.39	0.44	0.824
5	In mobility inside the house to move around	3.49	0.7	21	1.07	-0.22	0.812
6	In mobility inside the house to get in and out of the bathtub.	3.14	0.9	29.3	-0.28	-1.8	0.816
7	In mobility within the home for getting up and going to bed	3.43	0.8	23.3	-0.97	-0.7	0.809
8	In mobility inside the house when moving around, going up and down stairs, others.	3.49	0.7	21	-1.08	-0.22	0.863

Legend: SD: Standard deviation, CV: Coefficient of variation

Table 4.

Factor loadings and communalities based on exploratory factor analysis.

N°	Questions	Factor loadings		Communalities
		1	2	
1	In personal care for grooming (bathing, washing, combing hair, other)	0.732	0.419	0.71
2	In personal care for dressing, undressing (changing clothes)	0.625	0.546	0.68
3	In household chores to organize (clothes, utensils, food, other)	0.897	0.117	0.82
4	In household chores to clean the house (sweeping, mopping, washing clothes, other)	0.858	0.18	0.77
5	In mobility inside the house to move around	-0.073	0.802	0.65
6	In mobility inside the house to get in and out of the bathtub.	0.409	0.66	0.6
7	In mobility within the home for getting up and going to bed	0.29	0.666	0.53
8	In mobility inside the house when moving around, going up and down stairs, others.	0.273	0.771	0.67

Legend: 1: Personal care, 2: Mobility in the house.

Table 5.

Values that define the concordance between the values of the test and retest of the SAADL.

N°	Questions	CCC	Precision	Accuracy	Weighted Kappa	Standard Error
1	In personal care for grooming (bathing, washing, combing hair, other)	0.93	0.939	0.99	0.84	0.1
2	In personal care for dressing, undressing (changing clothes)	0.951	0.959	0.993	0.9	0.1
3	In household chores to organize (clothes, utensils, food, other)	1	1	1	1	0
4	In household chores to clean the house (sweeping, mopping, washing clothes, other)	0.878	0.91	0.97	0.74	0.13
5	In mobility inside the house to move around	0.878	0.906	0.97	0	0
6	In mobility inside the house to get in and out of the bathtub.	1	1	1	1	0
7	In mobility within the home for getting up and going to bed	0.905	0.932	0.971	0.85	0.13
8	In mobility inside the house when moving around, going up and down stairs, others.	0.878	0.906	0.97	0.74	0.13
	Scale Total	0.95	0.959	0.99	0.74	0.13

Legend: CCC: concordance correlation coefficient

Two validation techniques (content and construct) were used in this study. First, it was validated by expert judgment, where the results reported by the judges highlight broad homogeneity among the experts' responses. This consensus guarantees the criteria of relevance, diversity, clarity, simplicity and comprehensiveness of the scale as suggested by Wiersma (2001). The questions or items of the scale are adequate and exhaustive, allowing to capture the true attributes that measure ADLs in children and adolescents with ASD.

In fact, the V Aiken values have reflected values above 0.80, which are consistent with other studies (Bolivar-Paredes & Villanueva-Ruska, 2017; Gomez-Campos et al. 2021; Lagos-Luciano et al. 2019). Moreover, they exceed the values of 0.70 described in the literature as adequate values (Charter, 2003) and even, the inter-judge reliability standard is higher than 0.75, which are considered excellent (Cicchetti, 1994).

Secondly, the validation by AFE revealed two dimensions, personal care and mobility at home. In addition, the model was stable and met the criteria for goodness-of-fit indices in CFI, RMSEA, KMO, % variance explanation as described in the literature (Dini et al., 2014; Hu & Bentler, 1999; Schermelleh-Engel, Moosbrugger, & Müller, 2003).

On the other hand, the factor loadings obtained in this study were higher than 0.62, while the communalities >0.53, reflecting acceptable values between item and dimension (Fabrigar et al. 1999; Knekta et al. 2019; MacCallum et al. 2001). These values are similar to those reported in recent studies in youth with ASD (Cassidy et al. 2021; Zhou et al. 2017).

Regarding reliability, data were analyzed by internal consistency and retest. For the first case, Cronbach's alpha was used evidencing high reliability values r = 0.87, being similar to other studies conducted in ASD populations (Breidbord & Croudace, 2013; Brugha et al. 2020; Skuse et al. 2005). In general, the scale proposed here reflects internal consistency among its items according in line with what is suggested in the literature (Nunnally, 1994; Streiner, 2003), highlighting a minimum of 0.80.

In the second case, the retest was used as a measure of stability. The scale was applied to the parents on two occasions with an interval of 14 days, in which it is proposed to consider between 10 and 14 days (Terwee et al. 2007). This time interval has allowed reporting concordance between both measures and high levels of precision and accuracy. This shows that the scale presents stability in the scores of both tests, so they remain without substantial changes when measured on different occasions (Michalos, 2014). In addition, the values obtained in this study are consistent with research that has evaluated reliability by retesting (Berthoz & Hill, 2005; Dutil et al. 2017; Pereira et al. 2008). Re-testing (test and re-test) as quality control criteria for scales in general are crucial, especially if the scales are intended to be applied in treatment interventions. This is because instruments are required to be stable in their results, especially in scales that have to do with ADLs (Dutil et al. 2017).

In general, this study presented some limitations that deserve to be clarified. A relatively small sample was used, and the scale was applied in COVID-19 pandemic time, through google drive. Probably, these factors could have affect the results obtained in the study. However, despite this, the validity and reliability techniques have shown consistent results. It is even one of the first studies that seeks to propose a new scale to be used in the ASD populations that can serve as a baseline for comparing post-pandemic ADLs. It is suggested that future studies expand the study sample, apply other validity and reliability techniques to achieve external validity of the scale.

Conclusion

This study concludes that the SAADL for children and adolescents with ASD is valid and reliable. These psychometric properties warrant its use and regular application to assess daily activities of self-care and mobility in the home in youth with ASD. For the ability to perform ADLs at home can serve to improve safety conditions, greater participation in the home, alleviate family or caregiver overload, and improve their quality of life.

Disclosure statement

The authors reported no potential conflict of interest.

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Appendix 1

Scale to assess activities of daily living at home in children and adolescents with autism spectrum disorder

Part 1. Sociodemographic data of parents:

Date of Birth: ____/____/_____

Marital status: Married ( ) Single ( ) Widowed ( ) Divorced ( )

Area where you live: Urban ( ) Rural ( )

Part 2. Sociodemographic data of the child, adolescent, young person.

Date of birth: ____/____/ _____ Sex: Male ( ) Female ( ).

Lives with: Father ( ) Mother ( ) Both ( ) Other relatives ( ).

Has brothers: 1 ( ) 2 ( ) 3 ( ) >4 ( ).

n	Questions	Independently	With supervision	With assistance (support)	With full support
1	In personal care for grooming (bathing, washing, combing hair, shaving)	4	3	2	1
2	In personal care to get dressed and undressed	4	3	2	1
3	In household chores for shopping (clothes, food...)	4	3	2	1
4	In household chores to clean the house (sweeping, mopping, etc.)	4	3	2	1
5	In mobility within the home to move around	4	3	2	1
6	In mobility inside the house to get in and out of the bathtub.	4	3	2	1
7	In mobility inside the house for getting up and going to bed	4	3	2	1
8	In mobility outdoors to go up and down stairs	4	3	2	1