Research article

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Validation of the Pediatric Evaluation of Disability Inventory in an Italian Population with Autism Spectrum Disorder: a Cross-Sectional Study

M.Tofani[1], G. Galeoto[2], D. Cazzetta[3], A. Berardi[3], J. Sansoni[2], D. Valente[4]

[1] Neurorehabilitation Unit, Department of Neurosciences and Neurorehabilitation, Bambino Gesù Children's Hospital; [2] Department of Public Health and Infectious Diseases, Sapienza University of Rome, Rome; [3] Sapienza University of Rome; [4] Department of Human Neurosciences, Sapienza University of Rome, Rome, Italy

Abstract

Objective. to measure psychometric properties of the Italian version of the Pediatric Evaluation of Disability Inventory (PEDI-I) in a population with Autism Spectrum Disorder (ASD).

Methods. The PEDI-I was administered to different children with ASD. The internal consistency was examined by using Cronbach's Alpha, while the intraclass correlation coefficient (ICC) was used to investigate both inter-observer and intra-observer reproducibility. Its concurrent validity was evaluated with the Italian version of the Barthel Index.

Results. The PEDI-I was administered to 60 children with a diagnosis of ASD. Cronbach's Alpha showed statistically significant values (.885-.965). Inter-observer and intra-observer investigations confirm the reproducibility of the scale with a range of high and very high parameters. The Pearson Correlation Coefficient with the Barthel Index showed significant data for all PEDI-I subscales with a $p<0.01$.

Conclusions. The PEDI-I showed good psychometric properties and it is possible to confirm its validity and reliability in ASD population. However, for better understanding of how PEDI-I works in clinical practice, further researches are recommended. ***Clin Ter 2019; 170(6):e460-464. doi:10.7417/CT.2019.2176***

Key words: *PEDI, Autism Spectrum Disorder, Italian, Validation, Child Performance, outcome measure*

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized in the early developmental period by the presence of persistent deficits in social communication and interaction, and restricted and repetitive patterns of behaviour, interests or activities that cause clinically significant impairment in several areas of functioning (1). Individuals with ASD often demonstrate relative strength in daily life activities compared to their social and communication skills (2). Nonetheless, reports also often indicate that many individuals with ASD exhibit significant difficulty in daily life activities relative to their cognitive skills (3).

The concept of 'activity' reflects a child's capacity for doing daily activities, and that of 'participation' indicates a child's actual performance in his or her daily life (4). However, a child's capacity is not always equal to his or her actual performance in daily living (5). Cognitive and communicative abilities are strictly related to daily life activities and influence their development in developmental age (6,7).

It therefore seems necessary to evaluate the adaptive functions of children with ASD via a holistic approach with reference to the International Classification of Functioning, Disability and Health (ICF) (8) which defines 'functioning' as an umbrella term encompassing all body functions, activities and participation. Different assessment tools evaluate children's daily function adopting the ICF framework; however, most do not measure both capacity and performance simultaneously.

The Pediatric Evaluation Disability Inventory (PEDI) represents an exception and has been indicated as the gold standard in paediatric rehabilitation (9) and as a useful instrument for the evaluation of ASD (10,11). Nevertheless, there are no validation studies of PEDI for people with ASD in literature.

PEDI (12) was developed in North America; it is a functional assessment instrument for the evaluation of disabled children aged from 6 months to 7.5 years (13) and measures functional performance and caregiver assistance in the domains of self-care, mobility and social function. PEDI is widely used in different countries such as China(14), Germany (15), Korea (16), Netherlands (17), Norway (18), Taiwan (19) and Uganda (20). Recently, Murgia and colleagues (21) have validated PEDI in an Italian population (PEDI-I) of both non-disabled and spastic cerebral palsy children. PEDI-I showed good psychometric properties and usefulness in measuring functional abilities in the target population. However, to better understand functional skills in children with ASD, a specific population cross-sectional study is required. As previously outlined, there is no validation study of PEDI specifically for people with ASD in the literature although it is important for rehabilitation professionals to understand how PEDI subscales work. Therefore, the present study's objective is to investigate the validity and reliability of PEDI-I in an Italian population with ASD.

Correspondence: Donatella Valente, Department of Human Neurosciences, Sapienza University of Rome, Rome,
E-mail: donatella.valente@uniroma1.it

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Methods

To investigate the psychometric properties of PEDI-I, a cross-sectional study was designed. The study was conducted by a research group composed by medical doctors and rehabilitation professionals from the Sapienza University of Rome and from Rehabilitation & Outcome Measures Assessment (ROMA) association. ROMA association in the last few years has dealt with the validation of many outcome measures in Italy (22–31). The institutional review board approved the study and guaranteed ethical standards and procedures.

Participants

The pre-established sample size was determined by analysing the original Italian validation study(21), thus a probability convenience sample of a minimum of 58 individuals was required. To be enrolled in the study, participants had to fit the following inclusion criteria: diagnosis of ASD according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (1); aged between 6 months and 7.5 years; or aged between 7.5 and 12 years with functional abilities below those expected in 7.5-year-old children without disabilities. Functional abilities were clinically determined by paediatric neurologist examination. All participants who have age > 7.5 and without a diagnosis of ASD were excluded.

Data measurements

PEDI-I. PEDI-I contains three scales that may be used together or separately: 1) the Functional Skills Scale (FSS) that identifies clinical patterns of deficiencies in functional skill attainment; 2) the Caregiver Assistance Scale (CAS) that indirectly measures capability and evaluates actual performance by assessing the extent of help a parent provides in daily functioning; and 3) the Modifications Scale (MS) which is a frequency count of the type and extent of environmental modifications that support functional performance (21). Each scale includes the domains of self-care (SC), mobility (M) and social function (SF).

FSS consists of 197 items in total, divided as 73 items in self-care, 59 items in mobility and 65 items in the social function domain. Each item in this scale is scored as unable (0) or able (12).

CAS consists of 20 items, divided as 8 items in the self-care domain, 7 items in mobility and 5 items in social function. Caregiver assistance for each item is rated from 5 (independent) to 0 (totally dependent), yielding an aggregate score for each domain (12).

MS consists of the same 20 items as the CAS section which are rated on the modifications element (i.e. the environmental or technical adaptations required to facilitate performance): N (none); C (child-oriented modification); R (rehabilitation equipment or assistive devices required); or E (extensive modifications required). This modification section of PEDI is not a true measurement scale, but rather a frequency count of the type and extent of environmental modifications the child depends upon to support functional performance (12).

PEDI can be administered by parents, caregivers or therapists of the children.

IcaBI. The Italian version of the Barthel Index (IcaBI) (32) includes 10 activity of daily leaving items and the individual is scored by his or her degree of independence in performing each item. The original 10-item form includes feeding, bathing, grooming, dressing, bowel and bladder control, toilet use, transfers (bad to chair and back), mobility, and stairs climbing. Items are rated in terms of whether people can perform the task independently, with assistance or are totally dependent (scored as 0, 5 or 10; 15 points per item for transfers and mobility) (33). As reported in the literature, the Barthel Index has no age limit and was used in developmental disabilities (34,35).

Procedures and Data Analysis

First, the researchers (an occupational therapist, a physical therapist and a neurologist) assessed participants according to the aforementioned inclusion criteria. Then, in a face-to-face gathering, the research group explained the objective of the study to the legal guardians of the participants, and they signed the informed consent on behalf of their children (36,37). All participants were asked to complete a socio-demographic questionnaire followed by the administration of the PEDI-I and the IcaBI assessments.

Reliability

The internal consistency of PEDI-I was examined using Cronbach's alpha in order to obtain an indication of the connectedness of items within the scale. As recommended by Nunually (38) the lowest alpha coefficient was set at 0.70.

The intraclass correlation coefficient (ICC) was calculated to assess reproducibility. To evaluate intra-observer reproducibility the same patient was evaluated twice by the same professional; to ensure that no clinical changes occurred, the second evaluation was scheduled 4 or 5 days after the first interview. To assess inter-observer reproducibility, two evaluators assessed the child at the same time. Two-way random ICC for absolute agreement was adopted to evaluate reproducibility. ICC ranges from 0 (no agreement) to 1 (perfect agreement) and was interpreted as follows: 0.00–0.25 = little, if any, correlation; 0.26–0.49 = low correlation; 0.50–0.69 = moderate correlation; 0.70–0.89 = high correlation; and 0.90–1 = very high correlation (39).

Validity

To evaluate concurrent validity, PEDI-I and IcaBI were administered together and the Pearson correlation coefficient (PCC) was calculated. Pearson's correlation coefficient can be interpreted as follow: 0 indicates no linear relationship; +1/-1 indicates a perfect positive/negative linear relationship; values between 0 and 0.3 (0 and −0.3) indicate a weak positive (negative) linear relationship through a shaky linear rule; values between 0.3 and 0.7 (0.3 and −0.7) indicate a moderate positive (negative) linear relationship through a fuzzy-firm linear rule; values between 0.7 and 1.0 (−0.7 and −1.0) indicate a strong positive (negative) linear relationship

through a firm linear rule (40). All statistical analyses were carried out using Statistical Package for Social Sciences (SPSS) version 18.0.

Results

Participants

Participants were recruited from June to September 2018 through the Department of Human Neurosciences at Sapienza University of Rome and the autism centre "Amici di Nico" in Lecce. PEDI-I was administered to 60 children and IcaBI to 34 individuals. The characteristics of the sample are summarized in Table 1.

Data Analysis

Reliability. Cronbach's alpha for all subscales showed statistically significant values within a range of good and excellent internal consistency. Reproducibility was determined for 34 participants and ICC values showed high and very high inter-observer reproducibility. Intra-observer reproducibility registered very high performance for all subscales (1.00). The results are summarised in Table 2.

Tab. 1. Characteristics of the sample

	Total (60)	**Reliability (34)**
	Mean (SD)	Mean (SD)
Age	7.18 (2.7)	5.42 (1.2)
GENDER	N (%)	N (%)
Female	19 (31.6)	9 (26.5)
Male	41 (68.4)	25(73.5)
EDUCATION		
Kindegarten	21 (35)	7 (20.6)
Primary School	32 (53.3)	25 (73.5)
Secondary School	7 (11.7)	2 (5.9)

Validity

PEDI-I and IcaBI showed significant correlation (PCC 0.556–0.881) with $p<0.001$, indicating that PEDI-I has good concurrent validity. The PCCs for each subscale are reported in Table 3.

Discussion

PEDI is one of the most commonly used assessment tools for developmental disabilities. This is the first validation study of PEDI specific to a population with ASD. For the present work, the Italian version of PEDI was used and its reliability and validity were investigated.

The ICC for inter-observer reproducibility showed very high values for both FSS (0.96–0.97) and CAS (0.90–0.96), as did the ICC for intra-observer reproducibility on both subscales (1.00). These results are consistent with the Italian validation of PEDI (21) and with other validation studies (14–17,19,20). Excellent reproducibility is a fundamental prerequisite for confidence in a measurement to be used for repeated assessment and follow-up. The high ICC values indicate that PEDI-I could consistently measure functional performance in children with ASD.

The internal consistency evaluation revealed high and very high values for Cronbach's alpha (FSS 0.94–0.96 and CAS 0.88–0.96). Our findings therefore confirm the homogeneity of the PEDI-I and that all items positively contribute to the total score.

The concurrent validity of PEDI-I and IcaBI showed positive and significant statistical data ($p<0.01$). This finding demonstrates high relationship between the assessment tools because both are useful for evaluating functional ability

Tab. 2 Cronbach's α and reproducibility of the PEDI-I in ASD population

		α Cronbach	**Inter-Observer Reproducibility**				
			Mean (SD)	**Mean (SD)**	**ICC**	**IC Lower Bound**	**Upper Bound**
Functional Skill Scale	Self-Care	.965	34.35 (14.64)	34.50 (13.31)	.967	.833	.934
	Mobility	.940	49.26 (9.41)	49.32 (7.52)	.961	.921	.980
	Social	.950	18.82 (11.05)	20.12 (10.33)	.970	.940	.985
Caregiver Assistance Scale	Self-Care	.961	16.88 (11.79)	16.53 (10.92)	.964	.929	.982
	Mobility	.885	24.79 (6.57)	25.59 (5.56)	.905	.810	.953
	Social	.923	7.38 (5.19)	6.71 (4.79)	934	.868	.967

Tab 3. Pearson Correlation Coefficient of PEDI subscales and IcaBI

	FSS Self-care	FSS Mobility	FSS Social	CAS Self-care	CAS Mobility	CAS Social	IcaBI
FSS Self-care	1	.651**	.712**	.921**	.658**	.725**	.881**
FSS Mobility		1	.423**	.567**	.773**	.340**	.787**
FSS Social			1	.669**	.406**	.859**	.556**
CAS Self-care				1	.576**	.714**	.845**
CAS Mobility					1	.432**	.695**
CAS Social						1	.558**
IcaBI							1

FSS: Functional Skill Scale; CAS: Caregiver Assistance Scale; IcaBI: Italian Barthel Index; ** p<0.01

in the target population; however, it is possible to state that PEDI results are more reliable and specific for both developmental disabilities and ASD paediatric population (10,11) than IcaBI. Indeed, it is specific for paediatric population and it has different items to investigate several developmental areas.

Despite these encouraging results, the present study has some limitations. First of all, similar to the Chinese study on the validation of PEDI in a cerebral palsy population (14), data collection for intra-observer reproducibility was carried out by one occupational therapist and so values could be overestimated. Further research could investigate this aspect by involving different professionals to confirm the high psychometric properties of the scale. Furthermore, PEDI was administered to a heterogeneous group of children with ASD presenting different clinical and functional characteristics. Further studies might investigate functional ability in a homogeneous group of children with ASD, in order to better understand children' development profile and determine future objectives for rehabilitation.

Conclusion

Based on our findings, it is possible to confirm that PEDI-I is a valid and reliable assessment tool for people with ASD and Italian healthcare professionals can now use it with more confidence. However, for better understanding of how PEDI-I works in clinical practice, further researches are recommended.

Data Availability: the data used to support the findings of this study are available from the corresponding author upon request.

Conflict of Interest: the author(s) declare(s) that there is no conflict of interest regarding the publication of this article

Statement of Human and Animal Rights: All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Informed consent was obtained from all patients for being included in the study.

Statement of informed Consent Informed consent was obtained from all individual participants included in the study.

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