
Validation of Differential Diagnosis of Autism Spectrum Disorder and Intellectual Disability Scale in Pakistan

Sajjad Ahmad¹, Zahid Mahmood², Ayesha Asghar^{3*}**Abstract**

Due to the recent clinical work's growing awareness of both autistic spectrum disorder (ASD) and intellectual disability (ID), differentiating between the two diagnoses is becoming more difficult, especially in developing countries like Pakistan. The co-occurrence of symptoms and characteristics contributed to the confusion. This tool attempts to address this challenge. From the parents of 20 people, 10 of whom were diagnosed with ASD and 10 of whom were diagnosed with ID, a total of 92 symptoms and traits were elicited, using the phenomenological method. Ten professional psychiatrists and clinical psychologists validated the explored signs diagnostically associated with ASD or ID. The resulting 66 symptoms fit firmly into one of the two categories. Two hundred sixty (260) mothers or teachers of children diagnosed with ASD ($n=110$) or ID ($n=150$) were interviewed, using base ratings. The statistical analyses indicated 36 features with high factor loading and statistical significance for ASD and 7 characteristics for ID. The tool named 'Differential Diagnosis of Autism and Intellectual Disability (DDAID) Scale' showed respectable sensitivity, specificity, positive predictive, and concurrent validity values (78%, 89%, 86%, & 89% respectively). The findings were reviewed for their cultural ramifications, enhancements in differential diagnosis, and their usefulness in creating training programs for certain people.

Keywords: Autism Spectrum Disorder, Differential Diagnosis, Intellectual Disability, Pakistan, Screening Tool, Validation

Received: 02 May 2025; Revised Received: 29 June 2025; Accepted: 02 July 2025

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Introduction

The difficulties faced by parents of individuals with ASD and ID in Pakistan range from a lack of knowledge, inadequate medical care, a lack of expertise, and social stigma to an incorrect diagnosis. These

challenges lead to financial, emotional and social burden on families. The substantial comorbidity of ASD and ID compounds these difficulties.

Autism spectrum disorder (ASD), a complicated disorder, affects individuals differently, impairing their ability to communicate, connect with others, and exhibit constrained, repetitive, or fixed behaviour patterns (Lord et al., 2018). According to the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5), some of the deficits must exist before the age of three to diagnose ASD (American Psychiatric Association [APA], 2013). The same DSM-5TR provides the term Intellectual Disability (ID) as a neurodevelopmental disorder that starts in childhood, involving intellectual challenges, concept difficulty, relationship issues, and

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challenges in daily life activities. These definitions lead to diagnostic ambiguity. Scholars have emphasized the value of differentially diagnosing the two disorders, expressing concern that diagnostic ambiguity could lead to improper referrals and inadequate treatment (Autism Independent UK, 2016). As per recent research (Pedersen et al., 2022; Thurm et al., 2019), clinical traits like social isolation seen in ASD could be present in people with ID, making it more difficult to distinguish between the two disorders.

According to a current surveillance research (Maenner, 2020), ASD has been reported to affect people of all racial, ethnic, and socioeconomic backgrounds, and its prevalence varies from one country to another. ID is one of the developmental disorders with a high comorbidity with ASD. According to Christensen et al. (2016), only 30% of those with ASD may have ID. In a developing nation like Pakistan, there aren't many studies on ASD and ID, which contributes to a lack of knowledge among the public and healthcare professionals (Samadi, 2022). As per the Pakistan Autism Society's estimates, 350,000 people in Pakistan have ASD, which is a large number in the context of Pakistan (Furrukh & Anjum, 2020). As remarked, developing nations face an even greater struggle with the concern of differential diagnosis (Duvall et al., 2022). The current local tool is an attempt to address the urgent need for properly differentiating ASD from IDA in developing countries like Pakistan.

Significance

The developed reliable tool will assist professionals like doctors, psychologists, as well as teachers and other special education experts in drafting an intervention strategy centred on the needs of the individual with ASD, ID, or both ASD and ID.

Objectives

To develop a reliable scale for determining the difference between ASD and ID, a stepped approach was taken.

- a. To compile a list of traits for ASD and ID that have been mentioned by mothers and are documented in the literature.
- b. To determine the face validity of distinguishing features of ASD and ID through expert ratings.
- c. To demonstrate the clinical and statistical validity of the distinguishing traits.

Method

Tool Development Phase – I (Collection of a Pool of Characteristics from mothers)

The purpose of this phase was to elicit a pool of characteristics as described by the mothers of children with ASD and ID. The moms of 20 people, 10 of whom had ASD or ID diagnoses, were chosen through a purposive sample. Mothers whose children are between the ages of three (3) to fifteen (15) years who had been officially/clinically diagnosed with ASD or ID (based on academic records and verified by a clinical psychologist at the institution) were chosen (ASD Mean Age is 4.5 Years, and Standard Deviation is 3.39, ID Mean Age is 6.5 Years and Standard Deviation is 3.85). For ASD, the moms of individuals who had Asperger's Syndrome (AS), Autistic Disorder (AD), or Pervasive Developmental Disorder-not otherwise specified (PDD-NOS) were included (these participants were referred to as the ASD sample). The moms of those with ID or Down Syndrome (DS) who did not have any other disorders were included in the study. Except for ASD and ID, when they may have happened concurrently, mothers of children under the age of three, those who were older than 15, and those who had multiple disorders were not excluded.

Each respondent was interviewed individually in the national language (Urdu) using a semi-structured interview consisting of 27 open-ended and 59 dichotomous

questions (after ethical considerations such as confidentiality, sharing aims, obtaining consent, and right to withdraw). The questions were supported by the literature (APA, 2000; Flynn & Healy, 2012; WHO, 1992). The maximum age range that was generally recognized for a developmental milestone's achievement was used. The interviews consisted of 50 to 60 minutes, and all of the responses were documented verbatim. The participants were also asked certain questions regarding the possibility of head injury before, during, or after childbirth. As a result, no brain damage was reported.

The meticulous approach produced a comprehensive list of 243 characteristics, of which 104 were reported by both groups (ASD and ID), 33 were specifically connected to ID, and 106 were relevant to ASD only. The features that were reported in both disorders and were identified by fewer than 20% of parents were eliminated, reducing the list to 92 characteristics. They were phrased in a way that would highlight a disorder's positive symptoms. The list of characteristics was mixed up using the inductive approach (Jebb et al., 2017) and given a five-point rating scale, ranged 0-4 "Not at All (0)," "A Little Bit (1)," "Somewhat (2)," "Mostly (3)," "Very much (4)". Finally, the new list was used during the second phase aimed at expert validation.

Tool Development Phase – II (Confirmation of Items by the Experts)

In this phase, a ten-person purposive sample was chosen ($M = 11.18$, $SD = 5.96$), consisting of seven clinical psychologists and three psychiatrists with four years of practical experience with ASD and ID. After ethical considerations, the experts were presented with the same list twice (in two separate forms), and asked to rate the likelihood that each attribute indicated ASD or ID, respectively. They were also asked to list any other traits that they thought were crucial to distinguish between the two disorders. Each

professional took 60 to 70 minutes to rate their opinion. The characteristics that received scores of 2 to 4 from at least 50% of the experts were retained. The overlapping characteristics, such as self-care abilities and developmental indicators, were combined into a single item, condensing the list of final features to 66. The list was broken down into two sections: The Developmental Part (13 features, with a yes or no choice) and the Behavioral Part (53 characteristics, with four rating options: "Not True at All (0)," "A Little Bit True (1)," "Somewhat True (2)," and "Very Much True (3)." This was meant to assess how much the respondent's behaviour deviated from that of a typical individual of a similar age regarding frequency, intensity, and profundity.

Tool Development Phase – (III Test Stage)

Through a purposive sampling technique, a sample of 10 research participants (mothers) and 10 educators (5 each working with ASD and ID in the class) from five Special Education Institutions of Lahore participated in this phase, aimed at testing the user friendliness aspect of the proposed scale. The inclusion criteria were mothers or teachers of individuals between the ages of 3 and 15, and firmly diagnosed with ASD or ID. As being a mother was deemed sufficient, no additional requirements for mothers were applied. The teachers were selected based on three requirements: a minimum of 14 years of successful schooling, one year of work practice in special education, and having worked with the child for at least the last six months. Ninety percent of the classroom teachers had 16 years of completed education ($M = 14.45$, $SD = 1.76$), work experience extended from 1 to 26 years ($M = 9.65$, $SD = 11.40$) whereas the period of working with the child extended from 6 months to 4 years ($M = 1.33$, $SD = 1.01$). After addressing ethical issues, the anticipated 66-item instrument was utilized to conduct a one-on-one semi-structured interview, which lasted

approximately 20 minutes. The mother reported the behaviour based on their observations at home, while class teachers answered from their experience in the classroom and the answers to the developmental portion of the tool were based on the child's admissions history or information gathered from the parents. The class teachers and/or moms were invited to participate in a debriefing following each interview and to offer comments on any language of the questions that they felt were unclear or caused unnecessarily high levels of anxiety. Mothers and teachers did not recommend any improvements and said the tool was suitable for use.

Tool Development Phase – IV (Translation and Retranslation of Concurrent Validation Tool)

The Childhood Autism Rating Scale-Second Edition-Standard Version (CARS-2-ST) (Schopler et al., 2010) was selected to establish the concurrent validity of the intended. After receiving approval from Western Psychological Services (WPS) CARS-2-ST is widely used in Pakistani hospitals and schools. According to research, CARS indicated high agreement with DSM-IV criteria (Flores-Rodríguez et al., 2022). The standard translation and reverse translation method (WHO, 2010) was applied, with the help of a researcher and a psychology graduate who was fluent in both languages (Urdu and English). After receiving the publisher's authorization, both the newly intended tool and the CARS-2-ST were used for the next stage of the study.

Norms Development

To determine the significance of each characteristic in distinguishing the two conditions, a purposive sample of 260 people, 110 with ASD and 150 with ID, was chosen. They included mothers or teachers (any one responder) of those children with ASD or ID who had received a formal diagnosis, were between the ages of 3-15

years old (ASD $M = 4.25$, $SD = 6.75$, ID $M = 3.15$, $SD = 3.60$). There were 65 boys and 45 girls in the ASD group, while there were 106 boys and 44 girls in the ID sample. 85 people with ASD were from a nuclear family system, while 25 came from a joint family system and 66 and 84 for ID, respectively. Apart from ASD and ID, where they could have co-occurred, the mothers or teachers of individuals with other diagnoses were not included. Additionally, 200 people (100 each for ASD and ID) were given the translated version of the CARS-2-ST.

No requirements were put forth for mothers to serve as informants because being a mother is the finest criterion and she understands her child the most. For teachers, again, three criteria were used for classroom teachers must have at least 14 years of successful schooling ($M = 16.10$; $SD = 0.7$) and years of work experience in special education at least 1 year ($M = 5.28$; $SD = 2.62$); and length of time working with the child (at least 6 months; $M = 1.4$; $SD = 0.8$). The class teachers who didn't meet these requirements were eliminated. The study included 195 teachers (80= ASD and 115=ID) and 65 mothers (30=ASD and 35=ID).

The information for the development of the norms was gathered using the proposed 66-item tool and the translated CARS-2-ST. In-person, semi-structured interviews with mothers and class teachers in school settings were conducted after taking care of the ethical requirements. To complete the developmental part of the proposed tool, the interviewer requested the informants to provide the age at which the child attained that milestone. To get the most accurate estimations in the context of any ambiguities, clarifying questions were posed. Zero was circled on the tool if it was missing and was not seen as a divergence from the typical child of the same age. They were requested to mark the extent to which it differed from the

average child of the same age in terms of frequency, intensity, or duration if it was present (without any physical shortcoming or psychological explanation, such as being timid, etc.). Before concluding, additional questions were asked as necessary. With debriefing, each interview lasted roughly 30 to 35 minutes. In the results section, it is mentioned how statistical methods were used and what results were attained.

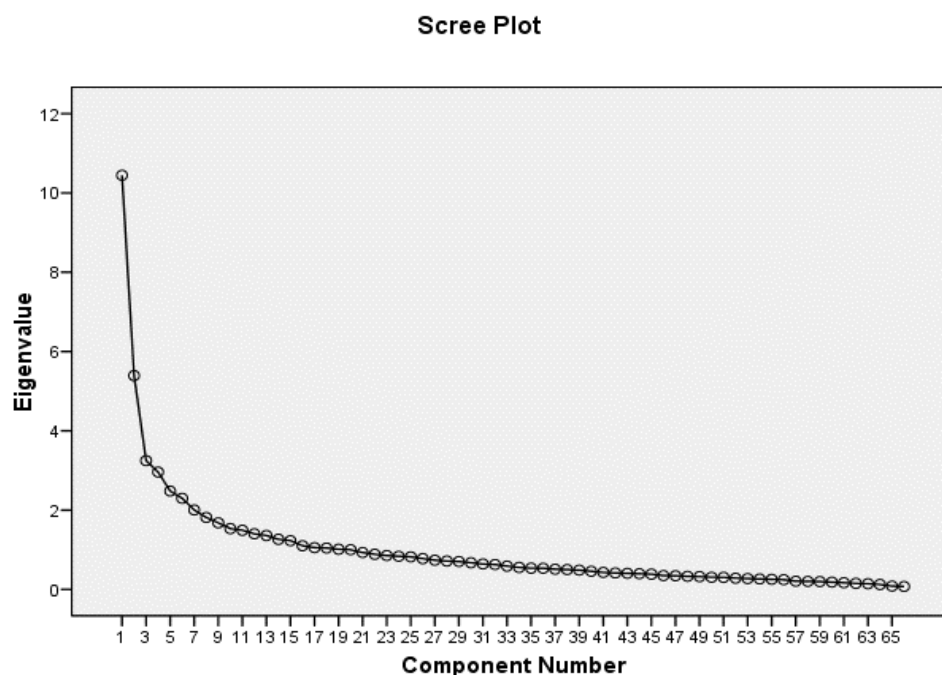
Results

Factor Analysis

Principal Component Factor Analysis with Varimax Rotation was used to establish the link between each attribute with ASD or ID. The four-point choice for the behavioural element was split into two alternatives (0-1 were counted as "No," while the scores of 2-3 were handled as "Yes"), to make both the developmental and behavioural sections into ordinal variables for factor analysis. The Scree Plot (see Figure 1) indicated a possibility of 3-4 factors.

Figure 1

Scree Plot of Principal Component Factor Analysis with Varimax Rotation 66 characteristics of the Proposed Tool



The two-factor solution (Table 1) delivered the most understandable results and provided the best approximation with the least amount of questionable and cross-loading items. The

Eigen values for the two components of the 66 characteristics, as well as the variance percentage and cumulative percentage, are provided in Table 1.

Table 1

Results of Factor Analysis (Principal Component with Varimax Rotation, Eigen Values, % of Variance, & Cumulative %) & Mann-Whitney U test for 66 Characteristics of the Proposed Tool

Item No.	Component		<i>p</i> <
	Factor 1	Factor 2	
1	.07	.46	0.026*
2	.06	.61	0.011*
3	.05	.61	0.025*
4	-.09	.71	0.001***
5	-.01	.72	0.001***
6	-.01	.77	0.001***
7	.01	.59	0.001***
8	-.10	.68	0.001***
9	-.12	.43	0.001***
10	.51	-.14	0.001***
11	.02	.39	0.003**
12	.37	-.18	0.001***
13	-.22	-.28	0.056
14	.37	-.07	0.001***
15	.67	.05	0.001***
16	.48	-.22	0.001***
17	.50	-.23	0.001***
18	.70	-.18	0.001***
19	.50	-.21	0.001***
20	.64	-.23	0.001***
21	.65	-.20	0.001***
22	.54	-.10	0.001***
23	.55	.03	0.001***
24	.57	-.01	0.001***
25	.43	.04	0.001***
26	.62	-.12	0.001***
27	.45	.12	0.001***
28	.62	-.24	0.059
29	.46	-.27	0.001***
30	.23	.01	0.059
31	.39	-.08	0.001***
32	.66	.07	0.001***
33	.72	.09	0.001***
34	.71	.07	0.001***
35	.65	.05	0.001***
36	.63	.05	0.731
37	.49	.03	0.001***
38	.34	.25	0.731
39	.52	.08	0.001***
40	-.28	-.11	0.001***
41	.05	.15	0.001***

42	.26	.01	0.029*
43	.01	.26	0.299
44	.47	.10	0.001***
45	.18	-.22	0.001***
46	.44	-.11	0.001***
47	.52	-.26	0.001***
48	.53	-.23	0.001***
49	.41	-.30	0.001***
50	.34	-.20	0.001***
51	-.22	-.19	0.458
52	.13	.13	0.988
53	.41	.07	0.001***
54	.07	.19	0.006**
55	-.16	-.24	0.657
56	-.05	.11	0.390
57	-.07	.16	0.001***
58	.28	.26	0.017*
59	.20	.11	0.304
60	.21	.09	0.214
61	.14	.25	0.036*
62	.35	-.05	0.001***
63	.30	.01	0.002**
64	.38	.14	0.345
65	.36	-.10	0.001***
66	.11	-.17	0.053
Total Eigen Value	10.45	5.40	
% of Variance	15.83	8.17	
Cumulative %	15.83	24.0	

*** $p < 0.01$

Note: The bold font signifies the high loading, i.e., 0.30 or above for that factor.

At this point, those items with high factor loading and $p < 0.01$ were retained (as we were talking about differential diagnosis, it was important to have robust criteria). The two factors comprised 24% of the proposed tool, with component 1 contributing roughly 16% and component 2 contributing 8%. Out of 66 items, 36 items had a high loading (0.30 or above) and $p < 0.01$ for components 1 and 7 had a high loading (and $p < 0.01$) for component 2, whereas 23 items did not meet both criteria (either factor loading was less than 0.30 or p value was greater than 0.01). Therefore, those 23 characteristics were termed as 'Dubious Items.'

According to the range of characteristics, component 1 (36 items) was called as 'ASD Factor'. The ASD scale's characteristics appeared to fall under categories including "poor social interaction" and "communication", "stereotyped movements", "poor self-care", "emotional problems", etc. whereas component 2 (7 items) was named 'ID Factor', and all the ID Scale's qualities appeared to be connected to a child's developmental impairments (including motor and speech delays). Following the identification of both scales, their correlation and internal consistency were evaluated (Table 2).

Table 2*Pearson Correlation and Cronbach Alpha Values of ASD and ID Scales (N=260)*

Correlation	ASD Scale	ID Scale
Pearson Correlation		-.18
<i>p</i>		.003**
Number of Items in the Scale	36	7
Cronbach's Alpha	.94	.82

** $p = < 0.01$

Between the two scales, there was a significant ($p < 0.01$) inverse correlation. The negative relationship between ASD and ID scale is comparatively weak. Cronbach's alpha showed a high level of internal consistency. The name of the new suggested tool is "Differential Diagnosis of Autism Spectrum Disorder and Intellectual Disability

(DDA & ID) Scale". In order to diagnose ID, an individual has to exhibit more than 50% (4 out of 7) of the necessary characteristics. Further statistical processes were applied to the ASD scale (the main goal of which was to enhance ASD diagnosis).

Sensitivity, Specificity, and Predictive Values of ASD Scale

For the populations with ASD and ID, the mean scores were determined. The mean and *SD* were ASD ($M = 65.45$), $SD = 15.47$, and ID ($M = 26.72$), $SD = 15.54$.

The mean of the ASD population on the ASD Scale was significantly higher than that of the ID population. The ASD Scale cutoff score was established following the criteria of deducting one *SD* from the mean for the ASD population and rounding it to the next number ($56.45 - 15.47 = 40.95$, rounded as 41). For the Autism Spectrum Disorder Scale (ASDS), a score of 41 was determined to be the cutoff. Vassar Stats, a web-based statistics toolkit, was used to apply the model proposed by Glaros and Kline (1988) to determine the sensitivity, specificity, and predictive value of the ASD scale. The results showed 78% sensitivity and 89% specificity for the ASD Scale with a cut-off score of 41. The total score had a positive predictive value of 86, which indicates that there was an 86 percent possibility that the case was a real ASD case if it was at or above 41. The negative predictive value of the ASD Scale, on the other hand, was discovered to be 82, which

means that in any given scenario, if the score is under 41, there are 82% possibility that the person does not have an Autism Spectrum Disorder. Males and females, as well as people from nuclear or joint family systems, did not differ statistically from one another.

Concurrent Validity of ASD Scale

Calculations were made to determine the percentage of diagnoses on the ASD Scale that were established with those on the CARS-2-ST (Schopler et al., 2010). The correlation between the ASD Scale and CARS-2-ST scores was 89%. The total ASD Scale scores and CARS-2-ST scores were calculated, and a significant association between the two was established (0.77 , $p < 0.001$).

Additional Statistical Procedures on the ASD Scale

Additional factor analysis was performed on the 36 characteristics to determine how closely related they were to one another. The Scree Plot indicated at the likelihood of two to three factors. The most suitable option originated from three factors, and it included the fewest dubious items, cross-loaded the least number of items, and generated the most comprehensible results. According to Table

4's Factor Analysis and Eigen values, the three factors were identified based on their high loading (0.40 or above).

Table 3

Principal Component Factor Analysis with Varimax Rotation Eigen Values, % of Variance, and Cumulative % for ASD Scale (N=260)

Description	Components		
	1	2	3
Lost speech that he had learnt within first 2.5 years of life.	.09	.41	.11
Problems in social interaction had started appearing before the age of 3 years.	.10	.40	.01
Is below age in social interaction.	.31	.50	.13
Does not establish eye contact.	.37	.55	.21
Plays with hands aimlessly.	.11	.62	.29
Gazes at objects or in space aimlessly.	.24	.59	.16
Remains self-absorbed.	.32	.79	.16
Plays with toys rather than with age fellows.	.12	.63	.07
Plays alone rather than with age fellows.	.24	.75	.09
. Remains absorbed in own play.	.30	.74	.07
. Becomes upset at a new place.	.18	.31	.61
. Becomes out of parent's control at a new place.	.18	.17	.72
. Insists on leaving a new place immediately.	.21	.21	.70
. Does not show interest in strangers.	.35	.48	.01
. Remains indifferent to the environment.	.34	.61	.15
. No emotional attachment.	.34	.41	.08
. Vocalizes un-necessarily.	.28	.58	.36
. Becomes upset or resists if an established routine is changed.	.17	.33	.46
. Does not wait for needs to be met	.27	.16	.55
. Eats with help only.	.72	.21	.25
. Washes hands with help only.	.85	.18	.22
. Washes face with help only.	.86	.18	.24
. Uses bathroom with help only.	.86	.14	.23
. Dresses up with help only.	.85	.12	.26
. Takes a bath with help only.	.82	.13	.19
. Keeps on throwing things more often than age fellows.	.29	.17	.61
. Unable to use even one word meaningfully.	.60	.25	.05
. Does not use two words meaningfully to convey needs.	.59	-.16	-.01
. Rocking movements.	.13	.59	.31
. Hand flapping.	.13	.67	.19
. Spins body or objects unusually.	-.04	.55	.25
. Unusually lines up things or keeps on walking in a straight line.	-.11	.45	.20
. Harms self (bites or cuts).	.15	.15	.40
. Shows anger more often than age fellows.	.10	.08	.68
. More stubborn than age fellows.	-.03	.06	.74
. Keeps on crying or making a noise until demands are met.	.04	.09	.70

Total Eigen	6.55	6.44	4.87
% of Variance	18.18	17.89	13.51
Cumulative %	18.18	36.07	49.58

Note: The bold font represents the high loading, i.e. 0.40 or above for that factor.

ASD Scale was roughly 50% made up of the three factors. High loading (0.40) for Factor 1 was seen in 8 characteristics. The symptoms, which were mostly connected to the child's inability to fulfill self-care-related tasks as well as the need for others to initiate/maintain contact, were referred to as the "Dependency Factor" based on the face value of the characteristics. The second component, the "Self-Absorption Factor," which is defined as an individual's inability to relate to others and his or her tendency of

engaging in self-stimulating behaviors, exhibited high factor loading for 18 of the characteristics (0.40). An additional 10 characteristics exhibited significant loadings (0.40) for the third factor, known as the "Emotional Dysregulation Factor" (individual's inability to postpone gratification and manifest his emotions through behavioral difficulties). Table 4 presents the association for all three ASD Scale factors.

Table 4

Pearson Correlation of Three Factors of ASD Scale (N=260)

Components	Factors and Correlations		
	Dependency	Self-Absorption	Emotional Dysregulation
1	1	.57(**)	.50(**)
2			.55(**)

** $p < 0.01$

The correlations between all three factors were statistically significant ($p < 0.01$) and were .50 or higher.

Discussion

Differentiating ASD from ID is a big problem, especially in developing countries, where special education facilities or outpatient offerings in the hospital are a time constraint. It was more likely that the diagnosis's accuracy would suffer, also a wrong diagnosis could have an impact on management and treatment. According to Pedersen et al. (2022), distinguishing between ID and ASD is necessary to connect children with the right treatments. The International Classification of Diseases-10 (WHO, 1992) or the Diagnostic and Statistical Manual-V (APA, 2013) do not include instructions on how to document the behavior to make a diagnosis. Hence, the

current study was carried out specifically for the purpose of improving and clarifying the differential diagnosis of ASD and ID, in a real environment where such critical evaluations occur and proposed therapy or management strategies are offered.

The developed tool provides Core Diagnostic Symptoms to identify a child with ASD. According to the Self-Absorption and Emotional Dysregulation elements of the DDAID Scale, ASD is characterized by a lack of social and communication skills as well as stereotypical gestures. The Dependency Factor is a crucial addition because it speaks to the child's reliance on others for both beginning and maintaining communication as well as for self-care

obligations. It was also found that those with ASD exhibited greater symptoms of emotional dysregulation than individuals who have ID. Delaying gratification and needs is more challenging for those with ASD. These three sub-factors resemble those found in the Autism Diagnostic Interview-Revised (Tadevosyan-Leyfer et al., 2003), it emphasizes three main areas such as reciprocal social interaction, communication and language, restricted behaviors, repetitive moments, stereotyped interests and behaviors.

Furthermore, a seven Core Diagnostic Symptoms for ID is also linked to the child's developmental delay. Further, it suggests the fundamental distinction between ASD and ID. Using the DDAID Scale (both the ASD and ID sub-scale), one may distinguish between individuals who have autism and those who do not (as opposed to CARS-2-ST, Schopler et al., 2010), resulting in three categories:

- a. Individuals without intellectual disability (ID), indicated by a score below 4 on the ID Scale, but who meet criteria for autism spectrum disorder (ASD) with a score of 41 or higher on the ASD Scale.
- b. Individuals with intellectual disability (scoring above 4 on the ID Scale), but who do not meet criteria for ASD, as indicated by a score below 41 on the ASD Scale.
- c. Those who have ASD as well as ID (scored more than 41 on ASD Scale and more than 4 on ID Scale). It is impossible to ignore the significant comorbidity between the two conditions. Combining the two measures allows us to surmise that a child has both ID and ASD.

Another significant finding is the early developmental milestones that Western culture considers to be "red flags" for autism spectrum disorder (ASD) such as sitting up, walking, babbling, and smiling were not found to be highly significant in the current study ($p < .05$) but were found to have a high

factor loading for ID. This suggests that healthcare professionals in our culture should pay particular attention to gross motor movements delays (sitting, walking, etc.) and speech and language delays (babbling, etc.) rather than social delays (social grin or reacting to parents) when differently diagnosing ASD and ID at a young age. Early developmental delays in a child's motor and speech are more suggestive of ID.

Additionally, the majority of diagnostic techniques are based on a person's existence or absence of certain symptoms, paying little attention to the underlying causes of the behavior, which may obscure the importance of a symptom. For instance, shyness or difficulties related to ASD may be the cause of someone not making eye contact. A medical professional should be able to identify the cause of the person's inability to make eye contact when making a diagnosis. Is this due to the child's shyness, the fact that his or her parents have taught them not to make eye contact with seniors (a cultural element), or a lack of support to build confidence? Is it possible, on the other hand, that the child's neurological system is structured in such a manner that it prevents him from making eye contact with anyone? Even while the behavior (not making eye contact) is the same, there may be multiple causes behind it. The diagnosis can be hit or miss if the healthcare professional is unable to make this distinction (identify the cause of a specific type of behavior).

Implications of the Study

The current study provides a scale to differentiate between ASD and ID (diagnostic implication). The assessment findings are useful in the development of a functional profile of the child. The ASD Scale also directs the development of a management strategy for the child based on his or her functional profile. The DDAID Scale is useful in clinical settings for making differential diagnoses as well as for

highlighting how to create an Individualized Training Program (ITP) for a child with ASD.

Limitations

The number of samples for ASD was comparatively small, as only educated and prepared parents take their children to the hospital or special schooling services. Many individuals might remain unidentified, mostly because of poor literacy rates and a lack of awareness. Due to the significant comorbidity of ASD and ID, there might be certain degree of retardation in some of the individuals with ASD. In some cases, the parents were unsure about the developmental milestones of the child, and it is important for the interviewer to make decisions based on the provided information. However, it might have been quite puzzling to rule out ID in ASD cases.

Suggestions

The predictive validity of scales should be compared with the diagnosis of Diagnostic and Statistical Manual for Mental Disorders (DSM) and/or International Classification for Disorders (ICD) in upcoming with a larger sample. It is preferable to assess the child's intelligence level to determine the relationship between the degree of retardation and the characteristics.

Ethics Statement

All the ethical standards of APA were met. Informed consent was taken in written form from all the respondents to participate in this study.

Credit Acknowledgement

The current study was supervised by the late Prof. Dr. Zahid Mahmood. This research paper is submitted as part of the project under the Department of Clinical Psychology, Government College University, Lahore, Punjab, Pakistan.

Contribution of Authors

Sajjad Ahmad: Conceptualization, Investigation, Methodology, Data Curation, Formal Analysis, Writing – Original Draft

Zahid Mahmood: Methodology, Writing - Reviewing & Editing, Supervision

Ayesha Asghar: Methodology, Writing - Reviewing & Editing

Conflict of Interest

There is no conflict of interest declared by the authors.

Source of Funding

The authors declared no source of funding.

Data Availability Statement

The datasets of the current study are not available publicly due to ethical reasons but are available from the corresponding author [A.A.] upon the reasonable request.

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