Research Paper

Determination of Level Autism Spectrum Disorder Diagnosis

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ABSTRACT

Basic characteristic of Autism Spectrum Disorder (ASD) are the particularities of information processing owing to limitations over development of neural nodes between informational stimulus, while objectifiablebehaviors are resultant observable secondary consequences that people with ASD can present in greater or lesser rank and even not present it. For this reason, it´s necessary adjust the diagnostic scales to psychological principles of perceptual-cognitive processing for reduce diagnostic errors possibles of behavior test, especially when it corresponding to level-1 ASD.

This research aims determine the specific level of ASD according the integrated principles, both behavior and belonging to cognitive processing.

A total of 124 kids with ASD have participated. Analysis was found relating 6 dimensions, which are made up by 24 variables, relating to ASD level variable. Data found through the lineal regression analysis show that interactional and perceptual-cognitive dimensions are greatly predicitvefor the specific ASD level diagnosis. In synthesis, psychometric statistics summative means conclusive with the diagnosis to ASD level in percentiles are following: 5.77-7.88 belong to ASD level-1, between 7.88-9.01 to ASD level-2 and a score $\geq$ 9.02 would correspond to ASD level 3.

KEY WORDS

Autism Spectrum Disorder, Diagnosis, ASD Level Scale, Development and Perceptive- Cognitive.

I. INTRODUCTION

Last years, scientific research of conceptualizing the ASD specific diagnosis evolved significantly. In this sense, conclusions regarding to specificity needs of people with ASD are widely recurrent relation to information psychoneurological processing way, both initial perceptual processes, characterized by weak central cognitive coherence and relation to information recovery, but above all, current studies highlight the relational synaptic limitations to do relationships between concepts and conceptual categories that interfere extensive and generalized relational processing to inductive and deductive processes of the learning aim information.Symptomatology related to psychoneurogical processing turns back the ASD diagnostic nuclear aspect, from which restricted behaviors of social interaction- communication and the psycho-affective symptoms set, characterized by deeply psychoaffective comorbidity way or, in other more severe cases, of schizotypal features, as well as the observation of restrictive or repetitive behaviors, which get secondary symptoms of nuclear neuronal synaptic relational limitations, which especially affect to understanding and development of relationships the input- ouput stimuli and their consequent behavioral reactions. These limitations observe along different diagnostic symptomatic sets of ASD levels, however, but, especially, in people with ASD level-1, these needs often present themselves with no significant correlation to ASD diagnostic regarding to observable behavioral criteria indicated by DSM Classification- 5 (1).

Indeed, criteria are included within diagnostic considerations of traditional diagnostic scales- test howevwe, up some studies indicate the presence of these behavior criteria in diagnostic processes are even reduced just 17.8%, therefore the conclusive scores of developmental scales based exclusively on behavioral items can do away the new scientific considerations relating perceptual-cognitive compontents and leave out of diagnosis people who, nevertheless, can present a concurrent specific disorder symptomatology about.

Nonethless, the observation and diagnosis scales currently focus basically in strictly behavioral or behavioral analyses, making very little or no reference to study of psycho-perceptive-cognitive information processing and interrelational nodes.

In effect, a wide number of scales and diagnostic test currently are limited to obsevation of evident behavioral processes, among which highlight the Autism Diagnostic Test, 2nd ed. (ADOS-2) (2-3), published by Western *Psychological Services*, constitutes, in fact, an empirical test, highly contrasted experimentally, to advantage the analysis of tcapacity for creativity, fiction and imagination, based on the use of acquired knowledge and the development of narrative semantic relationships, which synthesizes in six basic dimensions (4): 1) communication, 2) social interaction, 3) play, 4) imagination, and 5) restricted and repetitive behaviors.

Also, the interview for the diagnosis of the autisms- revised or test ADI-R (5), although with more evolutionary contents of location of the development, elaborates a progressive scale for learned behaviors, based on the classification DSM-5 and the classification of the UCD-10 diseases, which constitute a complementary analysis essential with the ADOS-2 test, so that with the application of both scales the guarantee for the effectiveness and validity of the diagnosis and, above all, of the early detection so necessary in the cases of positive diagnosis is considerably increased. Oosterling et al. (6) integrates a universal diagnostic study of predictive value to elaborate the modified checklist for autism in young children (MCHAT-R/F), refuted by Robins, Fein and Barton (7) and Robins et al. (8). Highlights include the Diagnostic Screening Tool for Autism in Toddlers and Young Children (STAT) (9-12), which is an interactive tool for the preliminary initial screening of people with high-risk ASD, located, above all, from grade 2 of the DSM-5 classification. The STAT is made up of four social and communication dimensions, in order to analyze the capacity for social reaction to relational situations that must be analyzed by emphasizing the processes learned. Other scales are also recognized, such as the Asperger's Syndrome Diagnostic Scale of Myles et al. (13), the Questionnaire of Ehlers et al.(14), the test for the evaluation of Asperger's Syndrome (15), the Socio-Communicative Scale of Verification of Skuse et al. (16), the Social Scale of Communication of Berument et al. (17), the Interactive Screening Test for Autism in Young Children (18-20), the Behavior Checklist forAges 11/2 to 5 years (CBCL/11/2-5), the Achenbach &Rescorla Caregiver-M Report Form(C-TRF) (21).The Children's Asperger's Syndrome Test (CAST) (22), the Autism Spectrum Inventory (IDEA) (23), the Australian Asperger's Syndrome Scale (ASAS) (24), the Gilliam Asperger Disorder Scale (GADS) (25), the Gilliam Autism Rating Scale GARS-2 test (26, 27), the Autism Screening Instrument for Educational Planning (ABC) (28), the Asperger Syndrome Diagnostic Scale (ASDS) (29), the Ages and Stages Questionnaire: Social- Emotional: A parent- completed, child- monitoring system for social emotional behaviors (ASQ- SE) (30), the Infant Screen for Children with Autism Traits (BISCUIT) (31), the Communication and Symbolic Behavior Scales Developmental Profile Infant/ Toddler Checklist (CSBS-DP) (32), the Screening for Emotional and Behavioral Delays: The Early Screening Project (ESP) (33), the Pervasive Developmental Disabilities Screening Test II (PDD ST II) (34), the Social Communication Questionnaire (SCQ) (35), the Screening Tool for Autism in Two-Year-Olds (STAT) (36) or the Temperament and Atypical Behavior Scale (TABS) (37).

Although, latest research, empirical analysis of measurement scales related to psychological processes of relational information has already begun. In this sense, design of Semantic Integration Scale published by Ojea&Tellado (38) develop one Scale to include the disorder behavioral items designate Semantic Integration Scale (SIS). SIS facilitates the quantitative percentile quantification analysis to different phases of perceptual-cognitive processing to people with ASD.

Lately, most complete design achieved through specific analysis of ASD levels through integrated processing scale between basic aspects of evolutive development that was experimentally justified (39).

In this article, an ASD level diagnosis experimental analysis presented with main aim to determine the diagnostic specific concretion of the disorder level, according to application of Integrated Diagnostic Scale of Ojea (39).

II. METHOD

Research design
Research design specifies the diagnosis concretion regarding ASD diagnostic level, based on application of Integrated Diagnostic Scale (39), through statistics frequencies and percentiles analysis corresponding to each ASD level according the sum mean direct score encoded.
Experimental justification of variables- dimensions have found from comparative parameters t for ASD level diagnosis and linear regression analysis.

Variables
Up 25 variables make up whole study. 24 of variables have calculated into 6 general dimensions, throughout statistical calculation option. Hence, each dimension is formed by 4 conceptual or developmental variables. Finally, one variable made up the ASD level full this study.

Consequently, to statistical calculation, variables have converted into specific dimensions for ASD level diagnostic analysis, according following mean sum:

1.   DIMENSION- DEVELOPING:
1.1.   *Motricity.*
1.2.   *Language.*
1.3.   *Sphincters.*
1.4.   *Skills.*
2.   DIMENSION- COMMUNICATION:
2.1.   *Oral.*
2.2.   *Tone.*
2.3.   *Social.*
2.4.   *Signals.*
3.   DIMENSION- INTERACTION:
3.1.   *Initiation.*
3.2.   *Contact.*
3.3.   *Understanding.*
3.4.   *Enjoyment.*
4.   DIMENSION-BEHAVIOR:
4.1.   *Stereotypies.*
4.2.   *Sensoriality.*
4.3.   *Recurrent.*
4.4.   *Behavior.*
5.   DIMENSION- ATTENTION:
5.1.   *Joint.*
5.2.   *Creativity.*
5.3.   *Fiction.*
5.4.   *Imagination.*
6.   DIMENSION- COGNITION:
6.1.   *Perception.*
6.2.   *Coding.*
6.3.   *Semantics.*
6.4.   *Recovery.*

The ASD´ levels variable belonging to DSM-5 classification levels: ASD level-1 of lower specific needs level over specific dimensional areas, ASD level-2 to average specific needs level and ASD level-3 highest specific needs level.

Participants

A total of 124 participants of ASD levels participated in this study, of which 81 belong to the diagnosis of level-1, 25 to level- 2 and 18 to level- 3 (see Table 1).

Table 1: Participants.

	ASD Level		Total
ASD level-1	*ASD level-2*	*ASD level-3*	
81	**25**	**18**	**124**

Procedure

Since participants were selected, made up of boys and girls with ASD belonging different educational schools, carried out for several years Autism Spectrum Disorder Integration Scale of Ojea (39) was applied. Data data have been coded to get the sum means corresponding to direct scores observed, regarding to standards average mean of Scale. From direct scores are found, therefore it´s possible relates direct average to corresposding percentile. Finally, percentil summative mean allows determine and specify the data equivalence with ASD diagnosis level.

III. RESULTS

Reliability analysis

Calculated the 24 variables to 6 dimensions of this study through the process of calculating variables with SPSS statistic v. 23, realibility and validity of study items is found to empirical justification throughout Cronbach's Alpha (α) (see Table 2).

Table 2: Reliability to 6 dimensions.

DIMENSIONS	α*
DEVELOPING	**.93**
COMMUNICATION	**.89**
INTERACTION	**.87**
BEHAVIOR	**.89**
ATTENTION	**.88**
COGNITION	**.88**
TOTAL	**.89**

As can be seen, reliability levels of dimensions study show significantly high percentage levels, the highest reliability found observe development dimension: α= .93, while lowest reliability found in Interaction dimension: α= .87, being whole mean: α_μ: .89.

Comparative analysis to ASD levels

Difference comparative analysis of coded data relating Scale to ASD´ level variable, found at means of *t*-statistical parametric test for independent samples, can seen in Table 3.

Table 3: *t*- test for independent samples.

DIMENSIONS		Levene´s test for iquality of variances		t-test for equality of means					Conf. 95%	
		F	**Sig.**	**t**	**Df.**	**Sig. 2**	**Mean difference**	**Error**	**Lower**	**Upper**
DEVELOPING	=σ²	25.08	.00	-2.09	97	.03	-.61	.29	-1.20	-.03
	≠			-3.99	96.46	.00	-.61	.15	-.92	-.31
COMMUNICATION	=σ²	.18	.67	-9.39	97	.00	-3.57	.38	-4.33	-2.82
	≠			-10.21	27.73	.00	-3.57	.35	-4.29	-2.86
INTERACTION	=σ²	2.79	.09	-13.77	97	.00	-4.56	.33	-5.22	-3.90
	≠			-14.08	25.76	.00	-4.56	.32	-5.23	-3.89
BEHAVIOR	=σ²	.01	.92	-10.52	97	.00	-3.41	.32	-4.06	-2.77
	≠			-10.02	23.92	.00	-3.41	.34	-4.12	-2.71
ATTENTION	=σ²	8.49	.00	-8.11	97	.00	-3.36	.41	-4.19	-2.54
	≠			-9.62	31.43	.00	-3.36	.35	-4.08	-2.65
COGNITION	=σ²	15.83	.00	-10.75	97	.00	-3.92	.36	-4.65	-3.20
				-13.34	33.97	.00	-3.92	.29	-4.52	-3.32

Indeed, significant critical levels given for equality of means through *t*-test, indicate significant levels for 6 dimensions, it means that encoded data of Integrated Scale show significant differences according ASD level. This data is highly significant owing shows this Scale is sensitive to diagnostic side when it´s given all dimensions to analysis, including semantic perceptual-cognitive dimensions and not only behavioral criteria of traditional reference scales.

Predictive analysis of dimensions

Predictive analysis of 6 dimensions has been found by means of multiple linear regression analysis to conclude with most predictive dimensions of calculated process and deduce dimensions tah more significant critical level (see Table 4).

Table4: Regressionanalysis.

Model	DIMENSIONS	Coefficients no standarized		Coefficients standarized	t	Sig.
		B	Error.	Beta		
1	(Constant)	-.80	.38		-2.11	.03
	DEVELOPING	-.04	.04	-.06	-1.03	.30
	COMMUNICATIÓN	.03	.03	.09	.99	.32
	INTERACTION	.18	.04	.59	4.16	.00
	BEHAVIOR	.05	.03	.14	1.64	.10
	ATTENTION	-.17	.05	-.49	-3.11	.00
	COGNITION	.17	.05	.52	3.14	.00

As can be seen, although model "constant" shows significant data over diagnostic processes incidence of ASD level (Sig= .03), however, the most highly predictive dimensions of specific diagnostic are interaction (behavior) dimension (Sig= .00), attention (perceptive- cognitive processing) (Sig= .00) and cognition (perceptive- cognitive processing) (Sig= .00).

Oher behavior dimensions don´t present significant critical scores to diagnostic levels, which corroborates our study hypotheses regarding the specific dimensions of perceptive- cognitive information processing like basic nuclear variables to determine ASD level diagnostic.

Diagnosis for ASD level

Hence, based over mean sum of Scale encoded data, which are made up of the direct scores of the test, according the 6 dimensions (24 variables) found to ASD level variable allows finding following percentile parametric statistical data with goal analyze the probability of specific diagnostic critery of ASD level.

Thus, in this study data found for disorder level- 1 can be seen in Table 5.

Table5: ASD LEVEL- 1 (n: 81).

		DEVELOPING	COMMUNICATION	INTERACTION	BEHAVIOR	ATTENTION	COGNITION	TOTAL X̄
X̄		9,06	5,12	4,61	5,48	5,33	5,04	5.77
PC	5	6,50	3,25	3,25	4,25	3,25	3,25	3.96
	10	6,50	3,25	3,25	4,25	3,25	3,25	3.96
	15	6,50	3,25	3,25	4,25	3,25	3,25	3.96
	20	8,50	3,25	3,25	4,50	3,25	3,25	4.33
	25	8,50	3,25	3,25	4,50	3,25	3,25	4.33
	30	9,75	3,25	3,25	4,50	3,25	3,25	4.54
	35	9,75	4,25	3,50	4,50	4,25	3,25	4.92
	40	9,75	5,25	4,25	5,10	5,25	5,30	5.82
	45	9,75	5,25	4,25	5,25	5,25	5,50	5.87
	50	9,75	5,25	4,25	5,25	6,50	5,50	6.08
	55	9,75	5,25	4,25	5,35	6,50	5,50	6.10
	60	9,75	5,25	5,25	6,25	6,50	5,50	6.42
	65	9,75	5,72	5,25	6,25	6,50	6,50	7.70
	70	9,75	6,50	5,50	6,25	6,50	6,50	6.83
	75	9,75	6,50	5,50	6,50	6,50	6,50	6.87
	80	9,75	6,50	6,50	6,50	6,50	6,50	7.04
	85	9,75	6,50	6,50	6,50	6,50	6,50	7.04
	90	9,75	7,25	6,50	6,50	7,75	6,50	7.37
	95	9,75	7,50	6,50	6,72	7,75	6,75	7.49

Mean data found for ASD level- 2 can observed in Table 6.

Table6: ASD LEVEL- 2 (n: 25).

		DESARROLLO	COMUNICACIÓN	INTERACCIÓN	COMPORTAMIENTO	ATENCIÓN	COGNICIÓN	TOTAL X̄
X̄		9,55	6,85	8,19	7,67	7,63	7,48	7.89
PC	5	7,05	3,25	3,25	4,25	3,25	3,25	4.05

10	8,95	4,00	5,20	5,60	5,20	5,20	**5.69**
15	9,75	5,62	6,72	6,50	6,50	6,50	**6.93**
20	9,75	6,50	7,50	6,50	6,50	6,50	**7.21**
25	9,75	6,50	7,50	6,50	6,50	6,50	**7.21**
30	9,75	6,50	7,50	6,50	6,50	6,50	**7.21**
35	9,75	6,50	7,50	6,50	6,50	6,50	**7.21**
40	9,75	6,50	7,50	6,50	6,50	6,50	**7.21**
45	9,75	6,50	8,37	6,50	7,20	6,50	**7.47**
50	9,75	6,50	8,75	7,50	7,50	6,50	**7.75**
55	9,75	7,05	8,97	7,50	7,57	6,80	**7.94**
60	9,75	7,75	9,50	8,70	8,35	8,10	**8.69**
65	9,75	7,75	9,50	9,50	8,75	8,72	**8.99**
70	9,75	7,75	9,55	9,50	9,75	9,55	**8.99**
75	9,75	7,75	9,75	9,50	9,75	9,75	**9.31**
80	9,75	7,75	9,75	9,50	9,75	9,75	**9.38**
85	9,75	7,75	9,75	9,52	9,75	9,75	**9.38**
90	9,75	8,55	9,75	9,75	9,75	9,75	**9.55**
95	9,75	9,75	9,75	9,75	9,75	9,75	**9.75**

Likewise, corresponding data for diagnosis level- 3 are suitabled in Table 7.

Table7: ASD LEVEL- 3 (n: 18).

		DESARROLLO	COMUNICACIÓN	INTERACCIÓN	COMPORTAMIENTO	ATENCIÓN	COGNICIÓN	TOTAL $\overline{X}$
$\overline{x}$		**9,68**	**8,70**	**9,18**	**8,90**	**8,70**	**8,97**	**9.02**
PC	5	8,50	6,50	6,50	5,50	6,50	6,50	**6.67**
	10	9,62	6,50	6,50	6,40	6,50	6,50	**7.00**
	15	9,75	6,50	6,50	6,50	6,50	8,20	**7.21**
	20	9,75	7,50	8,90	8,10	6,70	8,50	**8.24**
	25	9,75	7,75	9,50	8,50	8,25	8,68	**8.74**
	30	9,75	7,75	9,67	9,20	8,75	8,75	**8.98**
	35	9,75	7,75	9,75	9,50	8,75	8,75	**9.04**
	40	9,75	8,35	9,75	9,50	8,75	8,75	**9.30**
	45	9,75	9,30	9,75	9,50	8,75	8,75	**9.46**
	50	9,75	9,75	9,75	9,50	8,75	9,25	**9.61**
	55	9,75	9,75	9,75	9,50	9,20	9,75	**9.71**
	60	9,75	9,75	9,75	9,50	9,75	9,75	**9.71**
	65	9,75	9,75	9,75	9,50	9,75	9,75	**9.72**
	70	9,75	9,75	9,75	9,57	9,75	9,75	**9.75**
	75	9,75	9,75	9,75	9,75	9,75	9,75	**9.75**
	80	9,75	9,75	9,75	9,75	9,75	9,75	**9.75**
	85	9,75	9,75	9,75	9,75	9,75	9,75	**9.75**
	90	9,75	9,75	9,75	9,75	9,75	9,75	**9.75**
	95	9,75	9,75	9,75	9,75	9,75	9,75	**9.75**

Finally, diagnostic conclusions are delimited by statistical means found to specific analysis of each dimension and, defintely determine ASD diagnostic level (see Table 8).

| DIMENSIONS (μ) | | | | | | ASD LEVEL DIAGNOSTIC |
DEVELOPING	COMMUNICATION	INTERACTION	BEHAVIOR	ATTENTION	COGNICIÓN	
9.06- 9.54	5.12- 6.84	4.61- 8.17	5.48- 7.66	5.33- 7.62	5.04- 7.47	ASD LEVEL-1
9.55- 9.67	6.85- 8.69	8.19- 9.17	7.67- 8.89	7.63- 8.69	7.48- 8.96	ASD LEVEL-2
≥9.68	≥ 8.70	≥ 9.18	≥ 8.90	≥ 8.70	≥ 8.97	ASD LEVEL-3

Table 8: Determination of ASD diagnostic level.

IV. CONCLUSIONS

This study includes a partial analysis of further research that includes the whole Integrated Test for end experimentally justifies the importance of determination the ASD level specially into case of borderline specific diagnostic situations regarding ASD diagnostic level- 1.

Significance level adjusted to statistic percentiles of each level, elaborated from the standard summative encoding of Scale applied, allows conclude it highly reliability contrast of the diagnostic level and the reduction of intervals error on ASD specific diagnostic levels.

Indeed, inside ASD diagnostic situations of level- 2-3, these criterial diagnostic implications seem highly evident; however, upon level- 1, consequent diagnostic errors owing sometimes conductual imperceptible symtoms, evalated almost by exclusively behavioral scores scales, it can be psycho-educational and health severe problem.

First, when nucleus diagnosis of ASD can confused with psychoaffective personality limit disorders, highlighting obsessive-compulsive neuroses, anxiety, emotional timidity, attention deficit, hyperactivity behavior or strange bordeline personalities characterized owing social skills deficits and, into most severes situations, schizotypal traits.Although it´s right there´s may be several comorbidity symptoms along ASD diagnostic groups, it´s essential determining the nuclear diagnosis to desing subsequent therapies and interventions.

Psycho-psychiatric and educational intervention is fully different when nuclear psycho-affective diagnosis from diagnosis related to ASD diagnosis regarding other neurotic disorders. In this sense, ASD people basic diagnosis need a structural intervention, based onrelational learning contexts creation for deepenpsicho-educational interactive development of learning relationhsips, since those intrinsic relational deficits are where specific basic needs are found. Nevertheless, if diagnosis is failed these nuclear- basic elements will be ignored and it can keeps erroneous medical- psichyatric and psicho- educational treatments and programs throughout their human development.Educational field, the evidence of ASD diagnostic errors can set up irreversible consequences to childs. Generally they are diagnosed with deficits or learning needs, with intervention programs supported of reiteration and insistence, correction and evaluation, based on conventional strategies, but it´s precisely highly error that multiplies those same difficulties. Well, if mediating programs aren´t set for structural nodal- relationships between new curricular content and the concepts or conceptual categories previously learned related, being those relationships new concepts themselves, then learning development will be greatly limited. The learning failure will increasing progressively, thus lack intrinsic motivation will be increased as well, which is necessary to continue their studies with success.

Thus, along high percentage of academic personal situations, people with probable ASD diagnosis but untreated as ASD, simply leave the studies when school age don´t be compulsory or they are get to basic vocational training programs.

And, although the realization of these specific professional training programs can constitute a good academic and laboral final outcome, many of these students with a straight diagnostic specification and the right psycho-educational treatment could have carried out studies of greater academic entity and, consenquently, have more options and greater possibilities of decision to transition active, adult and working life.

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