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Cognitive-Perceptive and Psychomotor Relationships in Students with Autism Spectrum Disorder

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ABSTRACT

This article analyzes the relationship between symptomatic groups that make up the diagnosis of people with Autistic Spectrum Disorder (ASD) and the motor structure themselves to design a global intervention program facilitating integrated psychosocial development.

A total of 28 participants with ASD participated in this experimental study. Correlation analysis observed to three variables- dimensions: diagnostic, cognition and psychomotor variables show significant data regarding interactions between to three dimensions statistically calculated. So variables of diagnostic dimension correlate with cognitive variables (r= .896) and with psychomotor dimension (r= 682). Likewise, cognitive dimension correlate significantly with motor dimension (r= .766). Finally, it´s designed an integral systemic psychoeducational program to facilitate global development of people with ASD.

KEYWORDS: Psychomotor skills, cognitive- perceptive, social communication, autism spectrum disorder.

INTRODUCTION

From first research relational studies, it´s been observed the characteristics diagnostic of people with ASD are related to motor specificities associated to psychomotor rigidity and limitations in visuomotor coordination. Indeed, Falcon et al. (2021) conclude that people with ASD show a limited psycho-motor performance over time of execution and reproduction of assigned task regarding their peers, in which inefficiency increases as this task increases in duration time.

Up between 79- 83% of children with ASD have peculiarities and limitations performing psychomotor skills ranging from several years and must predict adaptive functioning to quality of life that may be apparent even earlier (Bremer & Lloyd, 2016; 2021; Crippa et al., 2021; Green et al., 2009; LeBarton & Iverson, 2016; Ruggeri, Dancel, Hohnson & Sargent (2020). Likewise, motor skills observed along childhood and adolescence, both fine and gross psychomotor show severe limitations in several empirical studies analyzed (Downey & Rapport, 2012; Landa & Garrett-Mayer, 2006; Provost, Lopez, & Heimerl, 2007).

These observed characteristics allow conclude that delays along fine and gross psychomotor skills may lead to weak motor coordination impaired postural and balance deficits that have limitations on physical activities and borderline problems to visuomotor of object manipulation skills and the motor balance (Liu, Capistram and ElGarhy, 2021), verified through the BOT-2 test "Bruininks- Osesetsky Test of Motor Profiency- 2" (Bruininks & Bruininks, 2005), from previous studies of Bruininks (1978).

Hypotheses are related to cognitive-process theories specifically referred to central cognitive coherence theory (Happè, 1999), which defines the perceptual-cognitive processing of people with ASD from perspective of weak cognitive central coherence regarding propensity to establish an analysis of learning incoming perceptual stimuli like sequential-progressive way.

Bo et al. (2019) explored role interaction social with functioning motor outcomes following physical programme and these authors found hard relationships between autism and motor criteria, with significant incidence on coordination, body coordination an strength and agility, both fine and gross psycho- motor compared to their normal- typically developing peers.

For this reason, it´s necessary promote specific educational programs to facilitate motor developing. Specifically focused over fine development, but it´s also gross motor skills to improve academic success communication and, above all, on participation social development activities, the both variables are hardly related in people with ASD.

Social reciprocity correlated with motor skills, in which the whole psychoneurological components it make up the perceptual-cognitive structure of children with ASD involve,

it being necessary a multifactorial intervention including both perceptual-sensory, cognitive and psycho-neuromotor items (Gladfelter, Johnson & Odeh, 2020).

In this sense, Center of Modern Psychology (2021) verified these relationships along development of people with ASD from 2- 6 yo, whose results show how only 8.75% of children with ASD did not indicate symptomatic relationships of their criterial structure with motor skills deficits throughout its development.

Therefore, main **aim** of this research is analyze the relationships level between the symptomatic items of people with ASD regarding to motor development.

METHOD

Research design

This study found no-parametric experimental analysis. Data analysis found correlational relationships and the Kruskal-Wallis to level and age. Correlation observed to three variables- dimensions: 1) autism diagnosis variables (**diagnostic**), 2) cognitive variables (**cognition**) and 3) the base- motor variables (**psychomotor**). The autism criteria variables analyzed throughout GARS-2S- Test (Gilliam, 2006), the cognitive variables found with Semantic Integration Evaluation Scale (SIS) for Children with Autism Spectrum Disorder (Ojea y Tellado, 2018) and psychomotor data found from Psychomotricity Scale, Spatial Structure, Rhythm and Laterality of CUMANÍN- Test (Portellanos, Mateos, Martínez, Tapia & Granados, 2002).

Participants

A total of 28 students with ASD of 1-3 diagnostic levels from 1 to 15 yo participated in this research. According the level* age, sample is made up of 12 participants to level 1, 9 of level 2, and 7 belonging to level 3 (N= 28) (see Table 1).

Table 1: Participants (N= 28)

		Level			*Total*
		Level 1	*Level 2*	*Level 3*	
Age	1-3	7	5	2	14
	4-7	2	3	4	9
	8-11	1	0	1	2
	12-15	2	1	0	3
Total		**12**	**9**	**7**	**28**

RESULTS

Within this apart there´s three sections duly differentiated, first refers to basic general statistics of three dimensions, second corresponds to correlation levels between of three study dimensions and, finally, comparative analysis of ranges level of three dimensions found regarding ASD level and participants age.

Basic statistics:

General descriptive statistical data to three variables statistically calculated from sum of scores found in the several subscales that make up each dimension, both for level and age through mean and the standard deviation analysis can be seen in Table 2.

Table 2: Descriptive Statistics

Dimensions	***Level***	***Age (yo)***	***Mean***	***Std. Deviation***	***N***
DIAGNOSTIC	level 1	0-3	6.00	.00	7
		4-7	6.00	.00	2
		8-11	6.00		1
		12-15	4.33	2.35	2
		Total	5.72	.96	12
	level 2	0-3	6.80	.18	5
		4-7	8.77	1.34	3
		12-15	10.33		1
		Total	7.85	1.50	9
	level 3	0-3	10.33	.00	2
		4-7	11.66	.00	4
		8-11	11.66		1
		Total	11.28	.65	7
COGNITION	level 1	0-3	3.00	.00	7
		4-7	3.00	.00	2
		8-11	3.00		1

		12-15	2.50	.70	2
		Total	2.91	.28	12
	level 2	0-3	2.40	.54	5
		4-7	3.33	.57	3
		12-15	4.00		1
		Total	2.88	.78	9
	level 3	0-3	4.00	.00	2
		4-7	5.00	.00	4
		8-11	5.00		1
		Total	4.71	.48	7
PSYCHOMOTOR	level 1	0-3	6.85	.17	7
		4-7	9.33	.00	2
		8-11	9.33		1
		12-15	8.16	3.53	2
		Total	7.69	1.54	12
	level 2	0-3	6.80	.18	5
		4-7	8.55	.38	3
		12-15	10.66		1
		Total	7.81	1.38	9
	level 3	0-3	6.66	.00	2
		4-7	11.33	.00	4
		8-11	11.66		1
		Total	10.04	2.31	7

Correlational analysis:

This analysis constitutes the fundamental study aim, which referred to Pearson correlational study between three dimensions calculated that include all different variables process (see Table 3).

Table 3: Pearson correlation between dimensions

Dimensions	*Statistics*	*DIAGNOSTIC*	*COGNITION*	*PSYCHOMOTOR*
DIAGNOSTIC	Pearson Correlation	1	.896(**)	.682(**)
	Sig. (2-tailed)		.00	.00
	Sum of Squares and cross-products	167.63	57.35	88.93
	Covariance	6.20	2.12	3.29
	N	28	28	28
COGNITION	Pearson Correlation	.896(**)	1	.766(**)
	Sig. (2-tailed)	.00		.00
	Sum of Squares and cross-products	57.35	24.42	38.11
	Covariance	2.12	.90	1.41
	N	28	28	28
PSYCHOMOTOR	Pearson Correlation	.682(**)	.766(**)	1
	Sig. (2-tailed)	.00	.00	
	Sum of Squares and cross-products	88.93	38.11	101.44
	Covariance	3.29	1.41	3.75
	N	28	28	28

**** Correlation is significant to .01 level (2-tailed).**

As can be seen, average scores found in dimension that make up the ASD diagnostic process are significantly related to cognitive- perceptive dimension of people with ASD (*r*= .896) and specific psychomotor dimension (*r*= 682).

Likewise, cognitive- perceptive dimension of psychological neural processing correlate significantly with motor dimension (*r*= .766), therefore it has found significant critical values in all studied dimensions correlations.

Comparative analysis for ASD level and age:

For these analyses, non-parametric tests have been decided realize about, thus it´s more reliable owing small sample size (N= 28).

Different data observed in results. For ASD level group, the following comparative data can be seen on Table 4 to three dimensions: diagnostic, cognition and psychomotor.

Table 4: Kruskal- Wallis to ASD level.

	DIAGNOSTIC	*COGNITION*	*PSYCHOMOTOR*
Chi-Square	24.48	17.22	4.55
Df.	2	2	2
Asymp. Sig.	.00	.00	.10

Indeed, differences are significant for diagnostic level dimension relating with cognition dimension, however, scores the psychomotor dimension aren´t significant to ASD level variable.

Another, analysis regarding age group indicates significantly different data. Data found show significant differences for motor dimension, while no significant critical levels are found to diagnostic and cognition dimensions (see Table 5).

Table 5: Kruskal- Wallis to age.

	DIAGNOSTIC	*COGNITION*	*PSYCHOMOTOR*
Chi-Square	6.53	7.18	17.15
Df.	3	3	3
Asymp. Sig.	.08	.06	.00

CONCLUSIONS

These observations allow conclude there´s significant correlation between three analysis dimensions, then all statistical data show a close relationship between diagnosis of autism criteria (diagnostic), cognitivo- perceptive dimension regarding psychomotor limitations on people with ASD, both balance, visual and audiomotor variables.

Hence, allow conclude close and significant relationships between ASD diagnostic process and great limitations of motor variables which influence along psycho-personal development is experimentally justified.

For this reason, it´s necessary the psycho- educational intervention should be an integral systemic process integrated by communication social and cognitive- perceptive processes and psychomotor variables. Therefore, it´ll possible generate neuronal networks that facilitate perceptual-cognitive processing and, consequently, learning develop in people with ASD.

From this holistic perspective, the application of integrated experiential functional method are proposed, which is formed by three successive steps along perceptual-cognitive processing. As example, both phases show along following activity oh this educative intervention program.

Integrated intervention program:

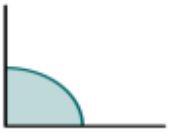
Therefore, program requires the integration of different main components it make up statistical correlation, hence all learning improvement involves development adjusted to cognitive- perceptual processing regarding psychomotor integration in order to facilitate the input stimuli through each cognitive sensory pathways. However, above all, allow the integral development the psychomotor level of people with ASD.

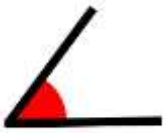
In the following example, the five successive steps of program experimental application can be observed: 1) presentation of categorical- concept, 2) playful learning of processing, 2) visuomotor practice execution, 3) motor experience of learning, 4) keep of learning concept, and 5) verification of learning understanding (following images are duly authorized by the family).

1. Learning categorical- concept.

In geometry teaching, fifth grade kids acquire the meaning of geometric acute angle is conceptualized and the materials necessary to make an acute angle are indicated (see Image 1).

Image 1: Concept of geometric acute angle: "the arc formed from union of two lines".





***Materials.**

2. ***Learning processing.***

Second time, a labyrinth is selected as a game to carry out the visual neuromotor execution throughout task with pencil and paper, which consists of walk around this labyrinth formed by several rectangular shapes (see Image 2).

Image 2: Playful learning.

3. ***Psychomotor execution***.

Among third step, a graphic psychomotor and visuomotor learning manifestation is proposed: -psychomotor expression- (see Image 3), through free graphic expression with finger painting.

Image 3: Graphic expresion.

4. Practical experience psychomotor.

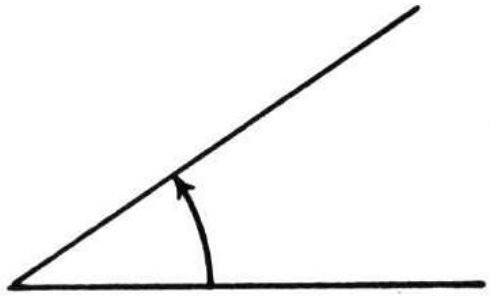
Fourth step involves the practical motor experiential lived of the labyrinth playful paths made before, which stimulate integrally cognitive-perceptual and motor coordination (see Image 4).

Image 4: Practical psychomotor experience.

5. Verification of learning understanding.

Finally, different tests carried out regarding direct realization of acute angles of different degrees, through the materials proposed in step 1. Highly educator mediation are need, while the concept verification understanding reiterates as many times as necessary.

Image 5: Comprehension understanding.



Consequently, learning program carried out this way integrates as whole the cognitive- perceptive and psychomotor components with social communication allowing improvement the learning process of all variables-dimensions highly correlated in this study, making systemic whole program that facilitates the psychoneurogical and educational information processing proposed, as well as the basic curricular contents.

Thus, integrating these three dimensions: diagnostic, cognitive- perceptive and psychomotor, the general development over different development variables is improved. Beside the psychomotor development associated with same learning processes is increased, making up an integrated and global development psychoeducational program and, above all, the experiential perspective of learning at motor level is absolutely necessary especially when dealing with highly abstract learning concepts or categories.

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