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RESEARCH ARTICLE

DEVELOPMENT OF COGNITIVE RELATIONS IN STUDENTS WITH AUTISM SPECTRUM DISORDER

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ABSTRACT

People with autism spectrum disorders (ASD) have limitations at the level of perceptual-cognitive development, which are specified in a particular processing to analyze and codify the characteristics of concepts, as well as to establish relationships or conceptual links. This study presents have a basic aim develop an experimental analysis of the effectiveness of a specific program for conceptual and categorical coding and the creation of conceptual relationships along learning. A total of 33 students with ASD participated, which have been distributed in three experimental groups (EG). EG1 (n= 14) followed the application of a development specific program of conceptual and categorical relationships. EG2 (n= 9) participants learned the relationships development throughout curricular learning process. EG3 (n= 10) continued a regular curricular development without specific guidance. Results found along three successive measurements (total= 8 months), analyzed through non-parametric statistical tests (*Kruskall-Wallis Test*) lets conclude the EG1 participants improved significantly in tasks of semantic comprehension, compared with your peers. Finally, it concluded that creation of conceptual relations and semantic coding processes are significant related cognitively (*Friedman Test*, sig = .00).

INTRODUCTION

People with autism spectrum disorders (ASD) present important and recurrent limitations in two basic dimensions of development [1], which are related to the psycho-social and communicative ambit, operationalized along a continuum of three degrees of intensity levels. Both dimensions are interdependent and are closely related to a third dimension, related to cognitive-perceptual development, it concreted in a particular way of information processing, characterized by the presence of deficits in global understanding of stimuliand, therefore, the presence of difficulties in the coding processes, memorization and their subsequent recovery of information learned [2,3]. These specificities are also related to six general limitations in regarding to: 1) the hypothesis planning processes in an autonomous shape to lead an action or behavior towards a specific aim, 2) deficitsin flexibilization of behavior to modify different criteria of action in different social situations, 3) intense performance of working memory during this process of coding information that exhaust the activity process itself and increases personal stress, 4) the hardship to creating links or relationships between new incoming information and previously obtained knowledge, 5) the inefficiency in evaluative analysis of initiated processes and their monitoring, and 6) the deficit to perform processes of inhibition in a specific action by another more priority.Experimental evidence suggests that these limitations are based on the neurobiological deficits of perceptual-cognitive development in people with ASD.

Indeed, interpretation regarding the operation of information processing are based on development of a series of continuous activation-inhibition phases along input - output of sensory memory registered information, which follows a course of synaptic relationships, which turn around neural cognitive networks and are activated according to priority attribution perform by perceiver himself. Then, information processes output is impaired if the semantic level has not been taken to new concept a link relation with previous information. But, it´s more significant is the cognitive networks work interactively,

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such that limitations or partial deficits impact in whole processing system with evident effect throughout successive phases that make up the development of semantic attribution [4- 7]: 1) Initial analysis of the features or elements characteristic of concept, 2) analysis of analytical convergence areas of features of concept related to other affined concepts, 3) analysis of other characteristics of concept and its relationships in the specific context, 4) analysis of belonging conceptual category regarding concept, and 5) analysis of similar and differential features with other conceptual categories.

These studies are widely related to the theory of networks or cognitive nodes proposed by Collins & Loftus [8], which present the existence of an activation between cognitively related systems if it have been acquired semantically by central cognitive executive through the following process interrelated: 1) the posterior attentional network, which lead the attentional process towards concept considered priority, 2) the surveillance attentional network , which keeps active attention on stimulus or concept selected, and 3) the previous attention network, which already active a voluntary control over situations of greater cognitive request. From this sequential process, information´ relationship and its recovery will depend on its functioning acting in parallel, in which the semantic memory is organized as a systemic network through [9]: 1) the association of images related to concept, 2) the information encoded with semantic components associated with this concept, and 3) the fluency in performance of related neural networks. Plaisted [10] confirms this data and affirms the particularities of people with ASD among analytical adjudication of holistic features of concepts, as well as the limitations to establish conceptual relationships and the creation of relational nodes or links. Therefore, the processing system is affected as a whole, both to personal attribution level of concept as to interaction of that concept over context, related to three basic errors: 1) into analysis of the similar characteristics of concepts corresponding to same categories, 2) in the realization of global attribution of its meanings, and 3) in the relationships construction or neural nodes of the previous processed information.

This research line has been widely deepened. Hetzroni & Shalahevich [11] investigated the analogical reasoning or ability to establish relationships of similarity-differences about structure or map of objects and situations in children with ASD regarding to a neurotypical development group and found that children with ASD were able to establish basic analogical processes, but their development was reduced in relation to their peers owing to presence of a perceptive detractor, such that presence of regular stimuli interfere with perceptual level,which give the decrease of ability to stimuli selection and so cognitive system produces fewer similarities- structural differences, affecting to analogical thought. Howard, Liversedge & Benson [12] also suggest that students with ASD did not differ from their peers of neurotypical development throughout reading speed tasks, but they differed in semantic relationships development related to comprehension subjects worked, concluding there´re significant differences between the groups regarding to information processing level. Lee, Martin, Hogan, Hano, Gordon & Losh [13] found that people with ASD showed greater difficulties than normotypic peers in tasks of complex syntax to integrate narrative developments and activities related to problem situations about intentions or goal-directed actions, which is directly related to ability or competence of semantic comprehensive development, which affects to the quality of complex language skills. Robinson, Howlin & Russell [14] indicated how the experimental group formed by people with ASD showed in comparison with control group peers greater deficits for description of autobiographical memory in relation to recovery of semantic features of their personality, as well as, they needed a greater number of rules and helps to develop episodic memory tasks.

For this reason, it´s essential to establish a system of specific assistance for development of links between cognitive elements, which make up the learning process, in order to articulate the functioning of successive neural nodes that organize the new understanding incoming information and its relation to previous knowledge.

In this sense, the specific program “RELATEA”, of development of conceptual categories for students with ASD [15], organizes a successive steps series, which integrate the aid corresponding to following key phases of processing level: 1) comprehensive development of input concepts, 2) creation of meaningful relationships for new input concept, 3) the development of a concept analytical process, 4) integration of analytical features into overall understanding of input concept, 5) concepts classification within their categories of belonging, 6) recovery of the information analyzed according to previous associated relationships, 7) relation of new cognitive content with previously built contents, 8) development of significant nodes associated with these new relationships, 9) hierarchy of information through semantic criteria, and 10) information selective recovery from the associated relational nodes.

Agreed this theoretical basis, this research submit the following study aims.

Research aims

Therefore, the general aims of this study are following: 1) assess the program effectiveness for build of cognitive nodes throughout learning process of students with ASD, and 2) corroborate the efficacy of nodes or relationships between concepts in improving coding of learning process in students with ASD.

These general aims correspond to following specific aims: 1) compare the differential response according to experimental group type assigned to participants, 2) analyze the same data regarding to age of study participants, 3) measure the relationships acquisition incidence level in semantic codification of the concepts, and 4) establish those conclusions derived from this study to improve the functional learning of people with ASD.

Method

Study design

This study constitutes an experimental design, with 3 experimental groups (EG1,2,3) of 3 successive measures= $pretest_1$-$postest_2$- $postest_3$.

Participants

A total of 33 participants diagnosed with ASD have participated in this study, aged between 6 and 17 age years. Participants have been assigned to the three EG following the equity principles, so EG1 is formed by n= 10, EG2: n= 9 and EG3: n= 10, whose distribution can be seen in Table 1.

Table 1 Distribution of participants assigned by age and EG.

		age				Total
		6-8 years	9-11 years	12-14 years	15-17 years	6-8 years
group	experimental 1	4	4	3	3	14
	experimental 2	2	3	2	2	9
	experimental 3	3	2	3	2	10
	Total	9	9	8	7	33

Variables and measuring instruments

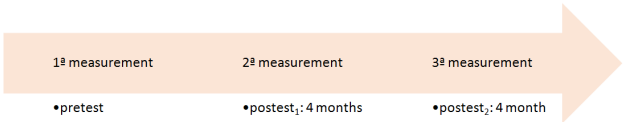
Variables used are the following: 1) the group variable ("group"), 2) the age variable ("age"), 3) the variable interconnected to relation development between the concepts ("relation") and the variable related to semantic comprehension of concepts ("category").

The variable "group" is divided into three groups: 1) EG1, formed by the group of participants with ASD to which the program of nodes specific creation or relations development between concepts of RELATEA program, 2) EG2, constituted by the participants group with ASD who have followed a curricular process with a specific attention to training of relationships between the learning contents, in agreement with the principles of meaningful learning, and 3) EG3, formed by participants group with ASD who followed an regular ordinary educational process,without specific attention to relationships development.

"Age" Variable is structured in 4 intervals: 1) 9 participants of 6-8 age years, 2) 9 participants between 9 and 11 age years, 3) 8 participants among 12 - 14 years, and 4) 7 students between 15-17 years. Then, students were assigned to three EG according to the proportionality level. "Relation" variable has studied under the levels of coding and retrieval of information found through of memory´ MY test [16]. "Category" variable has been measured throughout a strategy of learning conceptual and categorical groups built *ad hoc*, according to biological and non-biological categories structured by Omar [17].

Procedure

Once the authorizations and corresponding ethical considerations were obtained, we proceeded to analysis of study variables. The first measurement of the variables "relation1,2,3" and "category1,2,3" was found. The application of three intervention processes began, after 4 months the second measurement was made and, finally, after another 4 months the third measurement was found (see Figure 1).



Time: 8 months.

Figure 1 Measures of "relation" and "categor" variables.

Programmatic Processes

Participants of EG1 followed the application of RELATEA program, which includes five successive phases to promote the specific development of relationships between concepts: 1)introduction of stimulus or content, 2) decoding of stimulus, 3) association of links with this content, 4) cognitive reconstruction of decoded stimulus, 5) recovery of information learned, and 6) functional application of landed concept.

Participants of EG2 carried out a learning, based on meaningful learning model, regarding to regular curriculum, in which the learning concepts are related to elements attributed significantly to facilitate the relationship inter-conceptual.

Participants of EG3 continued the regular learnings without any specific indication.

Data analysis

Comparative data analysis has been found throughout nonparametric statistical tests, which are adjusted to statistical requirements to small research study groups. In this sense, following measures have been carried out: 1) *Chi Square* analysis to the sample distribution analysis, 2) *Kruskal-Wallis Test* for multiple comparative analysis to the variables: "group" and "age". Finally, relation between variables "relation" and "category" was found through *Friedman Test*.

RESULTS

Sample distribution analysis

Chi-square test was carried out to distribution analysis (see Table 2). Data indicate the mean of answers found is significantly related to previous statistically expected responses in all variables of this study, which shows a normal distribution ("relation1,2,3": Sig= .00; "categor1,2,3": Sig= .00).

Table 2 Sampledistribution.

	relation1	relation2	relation3	categor1	categor2	categor3
Chi-Square(a,b,c)	25.27	15.27	21.90	6.81	11.63	13.42
df	2	2	3	1	2	3
Asymp. Sig.	.00	.00	.00	.00	.00	.00

a)0 cells (,0%) have expected frequencies less than 5. The minimum expected cell frequency is 11,0.
b)0 cells (,0%) have expected frequencies less than 5. The minimum expected cell frequency is 8,3.
c) 0 cells (,0%) have expected frequencies less than 5. The minimum expected cell frequency is 16,5.

Comparative analysis to "group" variable

Table 3 shows comparative analysis between the variables: "relation1,2,3" and "categor1,2,3" regarding to experimental group assigned: "group1,2,3", found through the *Kruskal Wallis test*.

Table 3 Kruskal Wallis Test for "group" type.

	relation1			relation2			relation3			categor1			categor2			categor3		
Chi-Square	5.33			7.73			25.67			5.46			14.34			22.49		
df	2			2			2			2			2			2		
Asymp. Sig.	.06			.02			.00			.06			.00			.00		
	EG1	EG2	EG3	EG1	EG2	EG3	EG1	EG2	EG3	EG1	EG2	EG3	EG1	EG2	EG3	EG1	EG2	EG3
Men Rank	13.5	19.2	19.9	21.5	15.0	12.5	25.8	10.0	10.0	1 9.5	1 8.0	1 2.5	2 2.2	1 7.6	9.0	2 5.3	1 3.6	8.4

Grouping Variable: EG= "group1,2,3".

Results are conclusive. Before starting the application of the programmatic process, first measures of variables "relation 1" and "category 1" aren´t differentially significant for the threeEG: Sig = .06 and .06 respectively. From beginning of programmatic process application, second e third measures of variables: "relation" and "categor" indicate significant critical levels for EG type, so "relation 2": Sig= .02; "relation 3": Sig= .00, as well as"categor2": Sig= .01 and "categor3": Sig= .00.These data show there´re differences in these variables according the group type assigned to participants.

Likewise, measure ranges show this improvement increases progressively in GE1 regarding the other study groups: "relation3": EG1= 25.89, EG2= 10.39, EG3= 10.50 and "categor3": EG1= 25. 32, EG2= 13.61 y EG3= 8.40 (see Table 4), therefore, improvement level is greater in EG1 than EG2 and on EG2 greater than EG3 It´s concluded the application of different learning programmatic process regarding to the three EG has influenced differently about improvement of the conceptual contents assimilation according the three participants groups. Data graphic expression is seen in Figure 2, being the "factor 1" variable result of statistical sum of six measures corresponding to variables:" relation" and "categor".

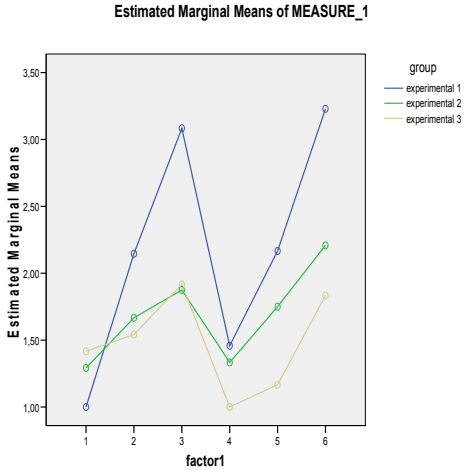


Figure 2 Comparative analysis.

Comparative analysis to "age" variable

Comparative analysis performed for four age ranges "age" of this study lets conclude that significant changes found in variables development "relation" and "category" are independent of participants age ranges, since no significant differences were observed in critical levels (see Table 4).)

Table 4 Kruskal Wallis Test for "age" variable

	relation1	relation2	relation3	categor1	categor2	categor3
Chi-Square	6.84	6.29	.67	4.67	2.32	2.12
df	3	3	3	3	3	3
Asymp. Sig.	.07	.09	.87	.19	.50	.54

Grouping Variable: "age".

Indeed, Figure 3 show that behavior of variables follows a regular process for the different age groups ("factor 1" is statistical sum of the six measures corresponding to variables: "relation1,2,3" and "categor1,2,3")

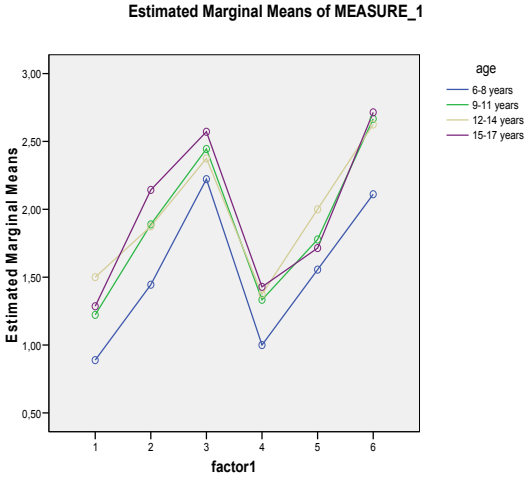


Figure 3 Datadistribution for "relation1,2,3" and "categor1,2,3" regarding "age".

Relational study at "relation" and "categor" variables

Therefore, differences between the learning processes have produced different results in concepts learning, which lets inducing positive relationships between both variables: "relation" and "categor". In fact, upon Table 5 is observed that of ranges averages found through *Friedman test* present clearly differentiated critical levels (sig= .00). Data allows conclude that process of relations building to the concepts is related to semantic comprehension of this same concepts.

Table5.*Relations between "relation" and "categor" variables*

	Mean Rank
relation1	2.26
relation2	3.47
relation3	4.80
categor1	2.15
categor2	3.29
categor3	5.03

N	33
Chi-Square	97.71
df	5
Asymp. Sig.	.00

Friedman Test

DISCUSSION

RELATEA´ specific program used to facilitate the structural development of relational links and nodes at input informationimproved the ability to establish relationships between this new concept and previously obtained knowledge and hence significantly improved the ability of semantic coding and the posterior recovery.Hence, EG1 participantsincreased the creation level of relationships between the concepts and improved semantic comprehension processes regarding EG2,3. The improvement cause explained because the creation of structured relationships between concepts has been developed together with the comprehensive semantic development of conceptual unit and the parallel sequential process of this concept at the category level. EG1 participants also checked different processes of categorization, hierarchy and generalization of learning conceptual units and their belonging conceptual categories, while for EG2 participants, this process of creating links and the hierarchization and categorization processes of information were within learning continuum, which is more difficult for students with ASD, who need a high degree of its curricular programmatic process. Both groups, EG1 and the EG2 obtained significantly higher ranges than EG3, especially in variable "categor3", whose participants didn´t develop any specific indication regarding the creation of links or relationships, limiting its learning process to regular curricular method used.
These data also allow conclude that results found regardless of participants age interval: "age", which´s an important element because it highlights the need to perform a specific work in this research line to establishment of relational codes from earliest age to adulthood.

Likewise, a second line of conclusions allows to corroborate that perceptive-cognitive variable: "relation" is related significantly with cognitive semantic coding capacity variable(*Friedman Test*: sig= .00) to "relation and "categor" (1,2,3) variables.

Indeed, another studies present related conclusions. Lucas, Thomas & Courtenay [18]show that children with ASD are able to get integrated semantic knowledge when the elements of learning are presented with information relations to infer the context, learned through exhaustive relationship between this concept or situation and its real functionality, so the teaching method is underlying to ensure an educational development adapted to people with ASD. Coderre, Chernenok, Gordon & Ledoux [19]and Nagy &Townsend [20]indicate that educational methods influence into creation of visual-spatial alternatives since people with ASD experience difficulties with semantic language. Authors affirm the semantic processing of people with ASD before non-linguistic stimuli isn´t such affected, which suggests there´s a specific deficit of structural linguistic semantic processing, which ca be improved, throughout use of visual-spatial complements of concepts-goal.
Anyway, learning method is always a fundamental element of teaching- learning adaptation process to students with ASD, for which it´s necessary adjust the learning contents, but also theteaching-learning strategies based in data. In this programmatic process must participate all elements of system upon learning development: family, school and social-health services [21,22].

CONCLUSIONS

Data found in this research are essential to conclude that application in the teaching-learning processes of people with special educational needs, specifically in relation to students with ASD need a right adapted educational process. Indeed, students of EG1 have improved significantly in the creation of concepts (curricular contents) and in the development of conceptual categories, regard to EG2 and EG3, however, above all, participants of EG1, who have applied the RELATEA program, have improved in the construction of intrinsic relationships between the concepts and categories of learning, compared the other study groups.

These data are basic because allow us set up the following general conclusions: 1) meaningful learning, which relates a previous concept with a new aim learning is an essential element of learning process adapted to students with ASD, thus, participants of EG1 and EG2 improved significantly regard to EG3, and 2) the meaningful learning used by EG1 allows get significantly better results than EG2 group, who have also used meaningful learning. It´s because students of EG1 have developed the creation of keep relationships between the learned concepts, which has allowed ease the mnesic recovery of previously learned concepts and, therefore, go on in the development of new more complex concepts- categories.

For this reason, it´s possible conclude that learning adapted to particular needs of students with ASD requires, not only the use of a meaningful methodology developed during the didactic process, but also it´s necessary the creation of own relationships between learning, since people with ASD characterize precisely by autonomy lack about creation of relationships inter-concepts, which shape a specific share of peculiar perceptual-cognitive information processing of people with ASD

Study limitations

This study presents the limitations of research with groups of people with specific educational support needs, which are usually small groups, although more studies are needed, however the reliability and validity of this data has been has been checked with the use of non-parametric tests

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References

1. American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders (DSM- 5) ®.* Arlington:American Psychiatric Association. In https://www.psychiatry.org/psychiatrists/practice/dsm
2. Ingersoll, B., & Wainer, A. (2013). Initial efficacy of Project ImPACT: A parent-mediated social communication intervention for young children with

ASD. *Journal of Autism and Developmental Disorders, 43*, 2943- 2952. DOI:10.1007/s10803-013-1840-9

3. Wilson, K. P., Dykstra, J. R., Watson, L. R., Boyd, B. A., & Crais, E. R. (2012). Coaching in early education classrooms serving children with autism: A pilot study. *Early Childhood Education Journal, 40*(2), 97- 105. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.835.304&rep=rep1&type=pdf
4. Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioural and Brain Sciences 22*, 577- 660. https://www.ncbi.nlm.nih.gov/pubmed/11301525
5. Barsalou, L. W. (2008). Cognitive and neural contributions to understanding the conceptual system. *Current Directions in Psychological Science, 17*(2), 91-95. https://doi.org/10.1111/j.1467-8721.2008.00555.x
6. Barsalou, L. W. (2009). Simulation, situated conceptualization and prediction. *Philosophical Transactions of the Royal Society B, 364*, 1281- 1289. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2666716/
7. Simmons, W. K., & Barsalou, L. W. (2003). The similarity in topography principle: reconciling theories of conceptual deficits. *Cognitive Neuropsychology, 20*, 451-486. http://dx.doi.org/10.1080/02643290342000032
8. Collins, A. M., & Loftus, E. F. (1975). A spreading-activation theory of semantic processing. *Psychological Review, 82*, 407- 428. http://dx.doi.org/10.1037/0033-295X.82.6.407
9. Rogers, T. T., & McClelland, J. L. (2004). *Semantic cognition: a parallel distributed processing approach.* Cambridge, MA: MIT Press. https://mitpress.mit.edu/books/semantic-cognition
10. Plaisted, K. (2001). Reduced generalization in autism: an alternative to weak central coherence. In J. Burack, T. Charman, N. Yirmina & P. Zelazo (Eds.), *The development of autism: perspectives from theory and research* (pp. 149- 169). Mahwah, N. J.: Erlbaum.https://www.repository.cam.ac.uk/handle/1810/248652
11. Hetzroni, O. E., & Shalahevich, K. (2018). Structure mapping in Autism Spectrum Disorder: Levels of information processing and relations to executive functions. *Journal of Autism and Developmental Disorders, 48*(3), 824-833. http://dx.doi.org/10.1007/s10803-017-3376-x
12. Howard, P. L. (ORCID 0000-0002-7974-5253), Liversedge, S. P., & Benson, V. (2017). Investigating the use of world knowledge during on-line comprehension in adults with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders, 47*(7), 2039-2053. http://dx.doi.org/10.1007/s10803-017-3129-x
13. Lee, M., Martin, G. E., Hogan, A., Hano, D., Gordon, P. C., & Losh, M. (2018). What's the story? A computational analysis of narrative competence in Autism. *Autism: The International Journal of Research and Practice, 22*(3), 335-344. http://dx.doi.org/10.1177/1362361316677957
14. Robinson, S., Howlin, P., & Russell, A. (2017). Personality traits, autobiographical memory and knowledge of self and others: A comparative study in young people with Autism Spectrum Disorder. *Autism: The International Journal of Research and Practice, 21*(3), 357-367. http://dx.doi.org/10.1177/1362361316645429
15. Ojea, M. (2018). Programa RELATEA. *Desarrollo de categorías conceptuales en estudiantes con trastornos del espectro autista*. Madrid: Pirámide. https://www.edicionespiramide.es/libro.php?id=5425555
16. [16] Yuste, C. (2005). MY. *Test de Memoria*. Madrid: TEA Ediciones. http://web.teaediciones.com/my-tests-de-memoria.aspx
17. Omar, E. (2015). Test de emparejamiento semántico de imágenes: instrucciones y pautas para el análisis de su ejecución. *Revista Cubana de Neurología y Neurocirugía*, 5(1), S30- S37. https://www.researchgate.net/publication/332351721_Test_de_emparejamiento_semantico_de_imagenes_instrucciones_y_pautas_para_el_analisis_de_su_ejecucion
18. Lucas, R. (ORCID 0000-0003-4320-310X), Thomas, L., &Norbury, C. F. (2017). Can children with Autism Spectrum Disorders learn new vocabulary from linguistic context? *Journal of Autism and Developmental Disorders, 47*(7), 2205-2216. http://dx.doi.org/10.1007/s10803-017-3151-z
19. Coderre, E. L., Chernenok, M., Gordon, B., & Ledoux, K. (2017). Linguistic and non-linguistic semantic processing in individuals with Autism Spectrum Disorders: An ERP study. *Journal of Autism and Developmental Disorders, 47*(3), 795-812. http://dx.doi.org/10.1007/s10803-016-2985-0
20. Nagy, W., & Townsend, D. (2012). Words as tools: Learning academic vocabulary as language acquisition. *Reading Research Quarterly, 47*(1), 91–108. doi:10.1002/RRQ.011.
21. Stahmer, A. C., Suhrheinrich, J., Schetter, P. L., &Hassrick, E. (2018). Training and implementation of Evidence-Based Practices (EBP): A study protocol. *Implementation Science, 13*(3). http://dx.doi.org/10.1186/s13012-017-0698-1
22. Ciaramelli, E., Spoglianti, S., Bertossi, E., Generali, N., Telarucci, F., Tancredi, R., … Igliozzi, R. (2018). Construction of past and future events in children and adolescents with ASD: Role of self-relatedness and relevance to decision-making. *Journal of Autism and Developmental Disorders, 48*(9), 2995-3009. http://dx.doi.org/10.1007/s10803-018-3577-y

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