



Effectiveness of an Integrated Global Systemic Program to Improve Behavioural Development in People with Autism Spectrum Disorder

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ABSTRACT

From the behavioural perspective, the specific diagnosis of people with Autism Spectrum Disorder (ASD), was categorized by the Diagnostic and Statistical Manual of Mental Disorders 5th of the DSM-V-TR of American Psychiatric Association (2013) and also the International Classification of Diseases, 11th. from World Health Organization (2018). Both classifications have indicated it specific behavioural construct associated with its diagnosis, defined by a whole of socio- behavioural deficits; however, it is need to have added that cognitive-perceptive symptomatic groups are the direct cause and consequence of the behavioural particularity in people with ASD.

For this reason, in this study has raised like general aim to analyse the effectiveness of the application of an integrated cognitive-behavioural systemic program to improve behaviours in people with ASD. The research study has been designed a quasi-experimental analysis of three groups with two pre-test and posttest measures. The groups are made up by: 1) an experimental group of 4 students with ASD (n= 4), which the integrated global systemic program was applied, 2) a control group-1, composed of 4 students with ASD, who have followed an A-B behavioural program (Stimulus-Response), and 3) a third control group-2, also made up of 4 students with ASD, who have followed several usual behaviours of modification programs (N= 12). Results found from means of non-parametric Kruskal Wallis Test (K-W), have showed the effectiveness of global integrated program implemented to experimental group, which has founded highly significant critical differential indices, regarding other two control 1-2 groups. Likewise, the bivariate correlations between behavioural dimension and cognitive-perceptive factors of processing are calculated and shown.

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INTRODUCTION

People with Autism Spectrum Disorder (ASD) present specific particularities regarding social skills, especially relating to understanding the emotional state of other people over intrinsic social context, which maladaptive behaviours with greater or less degree can be developed (Volkmar *et al.*, 2014). These specificities have had direct consequences and were also the cause to special needs found in attention skills of people with ASD, as well as deficits along the processes of flexibility, planning, organization and prioritization of social activities were found, which have developed a lineal link between emotional-social processes and the neural cognitive processing of information, among which perception, coding, the creation of neural relational links and the recovery of

perceived and coded information adapted to the context are featured (BlijdHoogewys *et al.*, 2014; Rosenthal *et al.*, 2013). These related social disarrangements can have increased the comorbidity of the symptomatic groups associated with ASD, such as anxiety, depression and/or severe anguish, owing to the people with ASD have received a negative reaction from contextual environment to their way of reaction social behaviour (Pugliese *et al.*, 2016; Strang *et al.*, 2012). Thereby, behavioural maladaptive, executive dysfunction and associated comorbid considerations make up a heterogeneous neurocognitive symptomatic group that, as appointed by Duncan, Tamm, Birnschein & Becker (2019), specifically characterized to behaviours of people with ASD, which, moreover, could have impaired their psychosocial evolutive development.

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From this behavioural perspective, ASD diagnosis has been categorized by the Diagnostic and Statistical Manual of Mental Disorders 5th of DSM-V-TR (American Psychiatric Association, 2013) and the International Classification of Diseases, 11th of World Organization of Health (2018), has been defined as specific behavioural construct, defined by a set of psycho- socio-behavioural symptoms, but the cognitive factors that affect its behavioural particularity haven't clearly indicated (Becker & Barkley, 2018; Brewe, Simmons, Capriola-Hall & White, 2020).

Whence, many currently studies have been based on mutual predictive relationships analysis between perceptual-cognitive and psychosocial development, giving the social-cognition categorical concept to describe the specific needs of people with ASD. Hence, a recently study, carried out by Koenig et al. (2009), have said that cognitive factors are empirically shown to be general basic predictors of observable behaviours in the social context of people with ASD. However, this relationship is not a linear issue, but it has been observed a highly multicollinearity, in which multiple implicit and explicit variables are influenced, although, indeed, both variables are highly theoretically correlated (Lerner et al., 2015; Pathak, Bennett & Shui, 2019). Just, it is essential to adopt a multifactorial practical model, both to specific understanding of symptoms groups associated with the ASD, and also to design of specific psycho- social and educational intervention programs (Keifer, Mikami, Morris, Libsack & Lerner, 2020).

Although the psychiatric comorbidity associated with ASD has been caused to a genetic etiologic group of multi- gene, which affect the ASD diagnosis, owing to incidence of hyperglutamatergic and hypo-GABAergic hypotheses (Cellot & Cherubini, 2014; Deidda, Bozarth, & Cancelada, 2014; Rojas, 2014a); but, also the environmental variables development have been deepen over these comorbidities or have facilitated the appearance of others symptoms associated to the ASD diagnosis (Foss-Feig et al., 2017; Ford, Crewther & Abu-Akel, 2020). Besides, this contextual environmental influence has been evidenced when contraindicated programs has been developed against the particular cognitive- perceptive processing of people with ASD, above all, into adolescence evolutive time and also adulthood, which an evident environmental etiological incidence has been involved (De Bruin et al., 2007; Joshi et al., 2010; Leyfer et al., 2006). Successively, this correlation association could have increased cognitive- perceptive encoding rigidity and both variables, social interaction and cognitive- perceptive processing have shown a highly mutual relationship (Brookman-Frazer, Stadnick, Chlebowski, Baker-Ericzén & Ganger, 2018).

Therefore, basic conclusive data have made up the need to develop specific treatments and intervention programs, that should be characterized by systemic and globality concepts.

These programs will have to involve the whole participation of the behavioural system and neuronal cognitive processing with goal of generate evident improvements along behaviour modification programs designed to.

In synthesis, in this study, the following hypotheses and general aims have been proposed.

RESEARCH HYPOTHESIS AND GENERAL GOALS

Basic hypothesis of this study has been related to the scientific knowledge regarding to behavioural systems in people with ASD, which are substantially related to the perceptual-cognitive processing of neuronal information. Accordingly, the integrated psycho- social and educational intervention has been given like an effective instrument to promote adapted behavioural framework on people with ASD; however, a linear behaviour modification intervention of type A-B (Stimulus/ Behaviour- Response-Reinforcement), which has not integrated human perceptual-cognitive factors, has not performed the expected effects on the main aims proposed.

Therefore, the main goals of this research study have been raised:

- Analyse the application of an integrated behavioural-cognitive- perceptive global systemic program to an experimental group of participants with ASD.
- Analyse the application of a linear A-B behavioural program to modification of maladaptive behaviours in a control- 1 group of participants with ASD.
- Analyse the application of several programs to behaviour modification in a third control- 2 group of participants with ASD also.
- Observe and compare if there're differences in the behaviour improvement regarding participants group shape that could have been due to the differential programs applied.

METHOD

Research design

This design is made up by a quasi-experimental study to three groups, with two statistical measures: pretest and posttest. A total of 12 participants have collaborated along the three groups, an experimental group made up of 4 students with ASD (n= 4), a control group-1 made up of 4 students with ASD, and other control- 2 group also made up of 4 students with ASD.

The experimental group has deepened on the application of Integrated Behavioural Intervention Program (IBIP) (Ojea, 2020). IBIP program is formed by functional application based on particular specific needs of participants, with aim of integrate the behavioural goals with the perceptual-cognitive levels of information processing, from basic hypothesis regarding to basic concept that behaviour is a consequence of systemic process highly integrated by different variables that

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have been composed human behaviour and, thus, self-influence each other continuously about.

Control group-1 has followed a linear process of behavioural modification A-B, which has been based essentially regarding to use of positive reinforcement to promote adaptive behaviours.

Thirdly, the control group-2, whose participants belong to

different educational schools, has not followed a concrete specific program of behavioural modification.

Participants

A total of 12 participants that correspond to following distribution it can be observed in Table 1.

Table 1: Distribution of study participants (N = 12).

| sex | age | group | level | | | Total |
|----------|-----------|--------------|-------|-------|-------|-------|
| | | | ASD-1 | ASD-2 | ASD-3 | |
| guy | 4-6 yo | control-1 | 1 | 1 | | 2 |
| | | experimental | 1 | 0 | 1 | 2 |
| | 7-9 yo | control-1 | 0 | 1 | 0 | 1 |
| | | control-2 | 0 | 1 | 0 | 1 |
| | | experimental | | 1 | 0 | 1 |
| | | control-1 | | 0 | 1 | 1 |
| girl | >16 yo | control-2 | | | 1 | 1 |
| | | control-2 | 1 | | | 1 |
| | 7-9 yo | control-2 | | 1 | | 1 |
| | | experimental | | 1 | | 1 |
| 13-15 yo | control-2 | | 1 | | 1 | |

Measuring instruments

Instruments measure have been used to analyse the behavioural and cognitive- perceptual dimensions:

- 1) The pretest- posttest behavioural analysis has been analysed with the following scales:
 - The behavioural analysis from the Scale GARS- 2S of Gilliam (2006).
 - The Questionnaire for the Evaluation of Schizotypy (E-S) (Fonseca- Pedro, Muñiz, Lemos- Giráldez, Paino & Villazón- García, 2010).
 - The Anxiety and Depression Clinical Educational Questionnaire (ADCEQ) (Lozano, García & Lozano, 2013).
- 2) The pretest- posttest cognitive- perceptual processing study has been analysed throughout the Semantic Integration Scale (SIS) (Ojea & Tellado, 2018).

Variables

Variables were used of two types: 1) fixed variables, and 2) explicative factors.

- 1) The fixed variables have been the following:
 - “group” (group type they have belonged the participants: 1) experimental group, 2) control-1 group, and 3) control-2 group.).
 - “level” (ASD level), that’s corresponded to the International Classification DSM-5-TR (American Psychiatric Association, 2013): ASD- 1 (slight need), ASD- 2 (half need), and ASD- 3 (severe need).
 - “sex” (participants sex), formed by two values: 1) guy, and 2: girl.
 - “age” (participants age), that was grouped on 5 values: 1: age group 4- 6.9 years old, 2) 7- 9.9 years old, 3) 10- 12.9

years old, 4) 13- 15.9 years old, and 5) >16 years old.

- 2) The factors are related to levels of behaviour and the perceptual-cognitive processing of information, which have been analysed throughout the two successive measures: pretest- posttest (1- 2), carried out along an interval of 9 months.

The measures present 5 continuous values (1-5), from 1 value, corresponding to mildest deficit, to 5, corresponding to most severe deficit.

The factors were formed by two dimensions: 1) the behavioural dimension, and 2) the cognitive- perceptual processual dimension.

2.1. The behavioural dimension has made up of 4 variables:

- “disr 1- 2”: disruptive behaviours to social level.
- “self 1- 2”: self- harmful behaviours.
- “anx 1- 2”: anxiety levels.
- “schiz 1- 2”: comorbid schizoid ranks associated with ASD diagnosis.

2.2. Processual dimension was made up of 2 variables:

- “percep 1-2” (perceptive-cognitive level).
- “proces 1-2”: information processing level, which has been related to coding and semantic retrieval level.

Data analysis

A comparative analysis of the pretest- posttest measures has been issued, regarding to the “group” variable, thoroughly to non- parametric statistical data of several independent samples owing to small number of this participants sample. Likewise, the comparative differential analysis was observed for variables: “level”, “sex” and “age”.

The correlations between both dimensions: behavioural and cognitive have also been analysed.

RESULTS

Results have been organized into three general categories: 1) comparative pretest-posttest levels for group type, regarding ASD level, age and sex of study participants, 2) evolution of means regarding to pretest- posttest statistical ranges in accordance with group way, and 3) calculated grouping of behavioural and processual-cognitive dimensions and their corresponding correlational analysis.

1) Comparative levels analysis.

Comparative levels to pretest- posttest analysis for the analysis factors in relation to the group way have been analysed through the Non-Parametric Kruskal Wallis Test. (K-W) (see Table 2).

Table 2: Comparative pretest- posttest analysis of dynamic variables to "group" variable.

| K-W | disr1 | disr2 | self1 | self2 | anx1 | anx2 |
|-------------|-------|-------|-------|-------|------|------|
| Chi-Square | 3.66 | 5.28 | 1.64 | 6.74 | 1.97 | 7.95 |
| df | 2 | 2 | 2 | 2 | 2 | 2 |
| Asymp. Sig. | .16 | .07 | .44 | .03 | .37 | .01 |

| | schiz1 | schiz2 | percep1 | percep2 | proces1 | proces2 |
|-------------|--------|--------|---------|---------|---------|---------|
| Chi-Square | .82 | 5.97 | 4.55 | 9.60 | 5.01 | 9.41 |
| df | 2 | 2 | 2 | 2 | 2 | 2 |
| Asymp. Sig. | .66 | .05 | .10 | .00 | .08 | .00 |

Kruskal- Wallis Test.

As can be seen on previous Table, data found are brightly differential. In all variables analysis groups analysed the equality of means could have been rejected, although statistical equality was not always equivalent to significant critical level found.

Thus, in disruptive social behaviours (disr 1-2), a significant reduction in Chi² value of pretest- posttest regarding to Kruskal- Wallis Test: 3.66- 5.28 has been indicated; however, the associated critical value is not significant on posttest data (sig: .07).

In self-harmful behaviours variable (self 1- 2), the Chi² values have found a significant differential change agreeable to group way (1.64- 6.74), transforming to highly significant differential 2- tailed critical level (pretest sig.: .44 to posttest level: .03).

In anxiety variable (anx 1- 2), Chi² value has increased from 1.97- 7.95, that has involved a significant differential level change of this variable regarding to group type, with highly significant posttest critical values (pretest: .37- posttest: .01). The levels of schizotypal traits variable (schiz 1- 2) have shown an evolutive Chi² value (.82- 5.97), being posttest critical level highly significant (sig: .05).

Previous data have been related to data found in cognitive-perceptive processing variables, in which differentially significant results have been found between pretest and posttest data analysis.

Perception variable (percep), critical level has been evolved from sig: .10 to sig: .00; while, in processing variable (proces), critical level has obtained significant level on posttest (pretest: .08 to posttest: .00), which concludes to positive evolution along highly differential pretest- posttest differential levels of variables according group type analysis. However, in relation to pretest- posttest analysis for ASD level, age groups or sex type, no significant differences throughout the study to any variables about were found.

2) Ranges analysis for group type.

Data analysis of the implicit ranks in K-W Test regarding to pretest- posttest analysis has shown a clarification about, since all posttest variables have indicated significant differences regarding group way, with a hard reduction in the statistical mean of ranges for all variables- factors, both to behavioural variables and to information processing cognitive- perceptive variables (see Table 3).

Table 3: average ranges regarding group type.

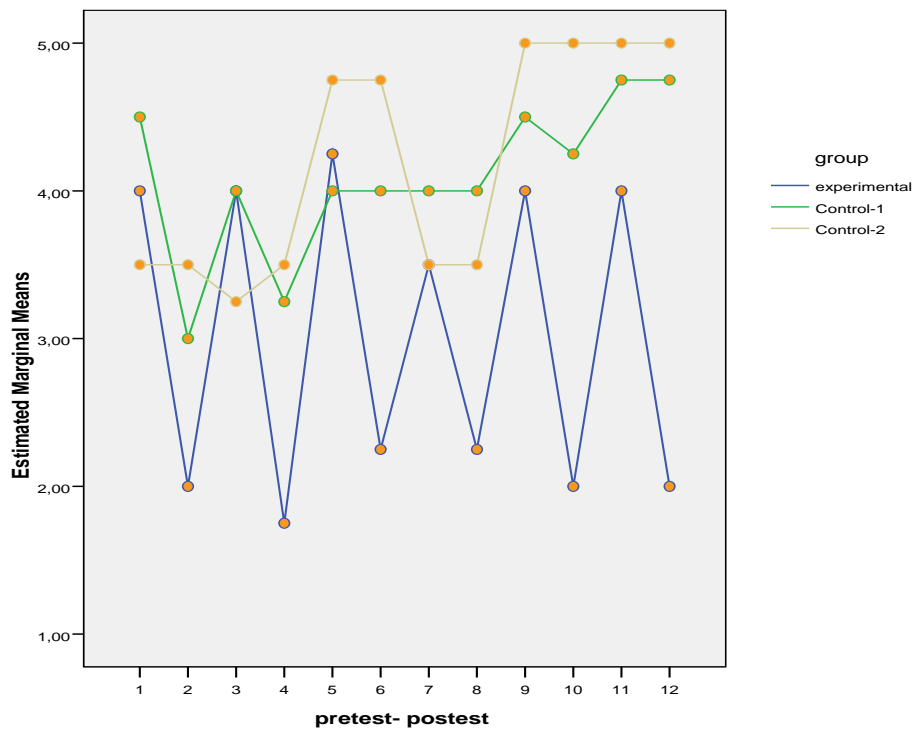
| Group | disr1 | disr2 | self1 | self2 | anx1 | anx2 |
|--------------|-------|-------|-------|-------|------|------|
| experimental | 6.50 | 3.50 | 7.38 | 2.88 | 6.25 | 2.75 |
| control-1 | 8.75 | 7.00 | 7.38 | 7.88 | 5.00 | 7.13 |
| control-2 | 4.25 | 9.00 | 4.75 | 8.75 | 8.25 | 9.63 |

| Group | schiz1 | schiz2 | percep1 | percep2 | proces1 | proces2 |
|--------------|--------|--------|---------|---------|---------|---------|
| experimental | 6.00 | 3.25 | 4.25 | 2.50 | 3.88 | 2.50 |
| control-1 | 7.75 | 9.00 | 6.25 | 7.00 | 7.13 | 8.00 |
| control-2 | 5.75 | 7.25 | 9.00 | 1.00 | 8.50 | 9.00 |

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Indeed, following Graph has expressly stated that changes found in the experimental group, regarding to pretest- posttest measures, have been found highly differential in comparison with control-1 and control-2 groups, which has proved the

high efficacy of global systemic programmatic treatment it has been applied on experimental group to improve behaviour of the people with ASD (see Graph 1).



Graph 1: Pretest- posttest data regarding group type.

Even if the results found between the control-1 and control-2 groups are compared, it can be concluded that, despite having found differences between the two groups, the differential

significant critical levels found in any of the analysis variables were not found (see Table 4), which corroborates the highly effectiveness of the IBIP experimental program.

Table 4: Comparative level to control 1-2 groups.

| K-W | disr1 | disr2 | self1 | self2 | anx1 | anx2 |
|-------------|-------|-------|-------|-------|------|------|
| Chi-Square | 3.50 | .90 | 1.17 | .62 | 2.02 | 2.02 |
| df | 1 | 1 | 1 | 1 | 1 | 1 |
| Asymp. Sig. | .06 | .34 | .27 | .42 | .15 | .15 |

| | schiz1 | schiz2 | percep1 | percep2 | proces1 | proces2 |
|-------------|--------|--------|---------|---------|---------|---------|
| Chi-Square | .90 | .90 | 2.33 | 4.20 | 1.00 | 1.00 |
| df | 1 | 1 | 1 | 1 | 1 | 1 |
| Asymp. Sig. | .34 | .34 | .12 | .04 | .31 | .31 |

3) Bivariate correlations.

Calculated transformation of behavioural variables and cognitive- perceptive variables in two multivariate differential dimensions has been statistically performed: I) BEHAVIOUR (disr, self, anx and schiz), and II)

PROCESSING (percep and proces). Results have indicated the correlations between both dimensions have found highly differential correlative relationships (.755), whose critical level is significant (2- tailed sig: .00) (see Table 5).

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Table 5. Bivariate correlations to behaviour and processing dimensions.

| | BEHAVIOUR | PROCESSING |
|---------------------|-----------|------------|
| Pearson Correlation | 1 | .755(**) |
| Sig. (2-tailed) | | .00 |
| Pearson Correlation | | |
| Sig. (2-tailed) | | |
| N | | 12 |

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

CONCLUSION

This study has evidenced the previous hypotheses regarding the improvements found in the experimental group throughout a global, systemic and integrated program applied, that has interrelated two dimensions: behavioural and perceptual-cognitive processing dimensions offshore the creation of behavioural interrelated contexts. Thus, whole intervening factors in a global way to improve behaviour have actively participated, especially, regarding to specific and family intervention, but also, has involved the collaboration of educational schools and other associated therapies.

Indeed, the implementation of a simple linear system A-B program (Stimulus-Response-Reinforcement), needs to be supplemented with systemic intervention related to parallel development of contextual comprehensive cognitive processing with the behaviour goals designed to improve people behaviour with ASD.

The efficacy of IBIP program has been shown, which has related like whole the observable behavioural learning to cognitive- perceptive processes development.

DISCUSSION

IBIP program (Ojea, *ob. cit.* pp. 85- 86) has precisely sought to point out a globalized systemic design, in which cognitive and behavioural factors mutually influence each other through the development of behaviour modification plans, since it has allowed their application over contextual environments designed about, being the participation of ASD students highly active in order to ease behavioural aims understanding that had been proposed.

In this sense, this program has integrated a global structure it is formed by behavioural processes modification through the reconstruction of contextual situation properly adjusted to needs of each participant with ASD regarding to duly pre-established sequence: 1) reconstruction of the most adapted contextual behavioural processes, 2) comprehension of contextual behavioural situation created, 3) progressive interchange of roles along contextual behavioural execution, in order to facilitate the understanding of contextual situation of other individuals, 4) emotional- cognitive developmental related with contextual behavioural situation, 5) cognitive and synthesis analysis over experimental practice tested, 6) slight

contextual- situational changes related to previous practices tried, and 7) verification of understanding of main aim tasks on people with ASD.

Hence, IBIP program application has been adjusted to structured sequence it is made up of 6 clearly differentiated phases: 1) previous assessment of behavioural needs and the specific cognitive particularities of students with ASD, 2) education and training level of the professionals and families who will participate on program, 3) joint application of all factors: teachers, families and therapists, over the contexts designed, 4) generalization of the environments applied to other contexts through the individual informative agenda, 5) continuous evaluation of behavioural and cognitive improvements throughout behavioural modification process, 6) modification and flexibility to change the initial plans in accordance with the continuous evaluation processes.

Other programs have also been applied currently to facilitate a systemic global intervention on the psychosocial integrated treatment of maladjusted behaviours in people with ASD, which were not limited to A-B system of Stimulus-Response-Reinforcement. Thereby, McDaniel *et al.* (2020), Gengoux *et al.* (2019) have evaluated the effectiveness of combining family training to perform global systemic programs applied to facilitate the development of daily life behavioural tasks. Conclusive data of their integrated applications have shown a higher frequency of functional improvements of the behaviour of people with ASD regarding to other comparative groups that have followed other linear programs.

Consequently, advances in educational research for autism improvement should be based on integrated hypothetical proposes, which involved the joint participation of all intervening factors as active mediation services for allow the social- cognitive- perceptive and behavioural that’s based on two basic premises: 1) adjust the programs applied to cognitive area of proximal development and to previous competence level of understanding level of participants with ASD, and 2) adapt learning processes to particular specific characteristics of students with ASD through of creating related contexts, which, beside, it able to anticipate positive intrinsic achievement that are perceived as positive reinforcement, in order to strengthen the task motivation associated.

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It is absolutely necessary to continue this research line, regarding understanding of psychological and neural processing way, from which, the behaviours of people with ASD are better understood (Ketcheson, Hauck & Ulrich, 2017; Nelson, Paul, Johnston & Kidder, 2017; Pan *et al.*, 2017).

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