

Asperger Syndrome and Behavioral Inhibition: Gratification Delayed Through Affective Bond Stimulation

Síndrome de asperger e inhibición conductual: retraso en la gratificación a través de la estimulación del vínculo afectivo

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Abstract

In the present time, an important interest has now arisen about autism spectrum disorder (ASD), given the increased prevalence. Regarding the prevalence of ASD, it has been indicated that 1 in every 68 children has been diagnosed, as a worldwide statistics, according to DSM-V data (2013). However, in Chile the percentage of ASD is still unclear, although, the data base provided by the Ministry of Education (MINEDUC) has been important source of statistics of students with ASD, diagnosed under the modality of the Supreme Decree of law No. 170/2010. Therefore, the aim of the present investigation is to determine the hypothesis of the teacher/student affective bond in children with ASD contributes to improve executive function of inhibitory control. The actual research was conducted under a quantitative methodology, using an experimental method and a single case design. The results indicate that affective bond that is facilitated between teacher/student promotes a greater development and functioning of EF inhibitory control, in the performance of TENI test. That is an important element to consider in the therapies that are used in children with ASD, at the preschool level, specifically in kindergarten, based on the affective bonding that could be stimulated through consideration of his interests, abilities and needs that a child with this condition could manifest, i.e., to consider adapting interventions to the needs that a child with ASD can present, on based on work through affective bonding.

Keywords: autistic spectrum disorder, affective bond, inhibitory control.

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Resumen

En la actualidad ha surgido un importante interés acerca del trastorno del espectro autista (TEA), dado el aumento de la prevalencia de éste. Se ha indicado que 1 de cada 68 niños lo padece, ello a nivel mundial, según datos de DSM-V (2013). No obstante, en Chile el porcentaje aún no está claro, siendo las cifras proporcionados por el Ministerio de Educación (MINEDUC) lo más certero a nivel estadístico con lo que se cuenta en la actualidad, ello dada la atención de estudiantes con TEA bajo la modalidad del Decreto Supremo N°170/2010. La presente investigación, busca probar que el vínculo afectivo docente/estudiante, en niños con TEA, contribuye a la mejora del funcionamiento de la función ejecutiva (FE) de control inhibitorio. Para ello se realizó una investigación bajo una metodología cuantitativa, mediante un diseño experimental, de caso único. Los resultados indican que efectivamente el vínculo afectivo que se facilita entre docente/estudiante promueve un mayor desarrollo y funcionamiento de la FE de control inhibitorio, en el desempeño de la prueba TENI. Lo anterior representa un importante elemento a considerar en las terapias que se utilizan en niños y niñas con diagnóstico de TEA, a nivel preescolar, específicamente en kínder, tomando como base la vinculación afectiva que se podría facilitar a través de la consideración de los intereses, habilidades y necesidades que un niño podría manifestar, i.e., considerar la posibilidad de adaptar las intervenciones a las necesidades que un niño o niña con TEA podría presentar, tomando como base para ello el trabajo a través de la vinculación afectiva.

Palabras clave: trastorno del espectro autista, vínculo afectivo, control inhibitorio.

In spite of the fact that there is still no defined percentage of children and/or adults diagnosed with ASD, the Ministry of Education, herein referred to as MINEDUC, has provided interesting data on students who are served under the system of special educational needs (SEN), first through the approval of study plans and programs for people with autism, severe dysphasia, or psychosis (Decree N° 815/1990), and subsequently under attention for specific language disorders (Decree 1300 / 2002), and, at present, in the form of permanent-type SEN associated with autistic spectrum disorders (Decree N° 170/2010).

This is relevant because current research, as well as the first studies carried out –in the 1930s Hans Asperger (Silberman, 2015) was interested in developing methods and intervention strategies that addressed the adaptation of subjects with diagnoses of ASD– focus on the need to characterize this spectrum, emphasizing behavioral, genetic, and socio-emotional aspects, which has led to a lack of a clear intervention methodology. Regarding the adaptation of people with ASD, in terms of development of executive skills and the importance of facilitation of the affective bond, the studies center on their development and adaptive functioning. In this sense it should be noted that this article and its author do not assume that this is an arbitrary decision by those who have done research at the level of proposed interventions, instead being guided by the lack of clarity of the etiology of this disorder –and the obvious need to clarify and be aware of it– as well as the broad and diverse developmental trajectories observed in people with ASD, ergo, the wide repertoire and behavioral manifestations observed in this condition.

Background Information

ASD has been characterized as “qualitative alterations in reciprocal social interaction, alterations in verbal and nonverbal communication, presence of restrictive, repetitive, and stereotyped patterns of behavior” (DSM V, 2013; Wing, 1997). Diagnosis is commonly made in early childhood, from 12 - 24 months onwards (DSM V, 2013), basically due to the difficulty of observing early characteristics –prior to 12 months– associated with that spectrum. This is not a due to the absence of behavioral characteristics related to ASD in the first few months after birth, but is instead related to a condition associated with the research and the difficulty of categorizing indicators that allow this diagnosis to be made during the first 12 months of life.

In terms of its characterization, ASD has been categorized as a group of neurodevelopmental disorders, whose symptoms are mild to severe and are often chronic. These alterations include difficulties of

socialization –a common trait of all people with this diagnosis– communication, and emotional behavior (Cornish, Cole, Longhi, Karmiloff-Smith, & Scerif, 2013; Leonard, Annaz, Karmiloff-Smith, & Johnson, 2013. MINEDUC, 2010). A new categorization has now been established in the DSM V (2013) statistical manual, which removes Rett Syndrome and establishes that ASD is comprised by the following disorders: early childhood autism, childhood autism, Kanner’s autism, high-functioning autism, atypical autism, pervasive developmental disorder-not otherwise specified, childhood disintegrative disorder, and Asperger syndrome.

According to the latest data obtained regarding ASD diagnoses, it may affect 1% of the world population (DSM V, 2013). On the other hand, in Chile there is no exact percentage of people with a diagnosis of ASD. In this regard, MINEDUC stated in 2011 that there were 586 students attended under specialized care, regulated by Supreme Decree 1300/2002, in relation to the area of specific language disorders. At present, according to the regulations of Supreme Decree N° 170/2010, special attention is provided in regular schools to children diagnosed with ASD. However, there are no statistical data on the number of children under this type of care. Meanwhile, the Ministry of Health (MINSAL, 2011) has stated that there are 2,156 children diagnosed with ASD. Nevertheless, there is still no certainty as to the prevalence of children diagnosed with ASD in Chile.

Regarding the origin of this disorder, two authors separately and almost in parallel provided extensive information on the conditions most frequently diagnosed; childhood autism and Asperger syndrome, conceptualizations developed by Leo Kanner in 1943 and Hans Asperger in 1934 and 1938, respectively (Ramachadran, 2012; Silberman, 2015). Although Kanner considered that autism was a disorder exclusive to childhood and had an underlying significant factor of upbringing and alteration in family dynamics¹, he being one of the precursors of the Refrigerator Mother concept, Asperger believed that this condition was more closely associated with a genetic disorder, given the existence of families with previous generations who had shown the same behavior as the children he had studied. He highlighted that subjects who had this condition had a high intellectual level and atypical interests in subjects that were uncommon for their age range (e.g. philosophy or astronomy), as well as overly developed language and syntax skills for their age (Silberman, 2015). In spite of the research –observation of more than 200 children with similar characteristics: social awkwardness, grave and serious facial expressions, precocious skills, obsessive interests, and fascination with rules, regulations, and programs– as well as publications and congresses conducted by Hans Asperger², Asperger syndrome only entered the clinical field and the classifications of diseases of the World Health Organization and the American Psychiatric Association in 1994 (Baron-Cohen, 2014).

On another note regarding the comorbidities associated with ASD, along with the qualitative alterations in reciprocal social interaction; alterations of verbal and non-verbal communication; presence of restrictive, repetitive, and stereotyped patterns of behavior –also plotted by Wing (1997)– we also find attentional disorders, mood disorders, food disorders, and disorders of behavior and executive functions, specifically, difficulties in delaying gratification; that is, they have difficulties with the performance of executive ability of inhibitory control³ (Baron-Cohen, 2014; DSM-V, 2013; Oviedo, Manuel-Apolinar, De la Chesnaye, & Guerra-Araiza, 2015).

¹ In 1948, Kanner published an article in the magazine *Time* entitled “*Frosted Children: Diaper-Age Schizoids*”, in which he described the parents of his patients as cold perfectionists who hardly had time to hug their children, adding that children with autism sought solitude after having remained “isolated in a refrigerator that didn’t defrost.” Later, Leo Eisenberg published a series of cases about the “refrigerator parents” of his patients (Silberman, 2015).

² According to research carried out by Uta Frith (1991) and an article published by Joseph Michaels (1935), Hans Asperger conducted his work starting in 1911, along with Erwin Lazar, at the Children’s Clinic of the University of Vienna Hospital under the concept of therapeutic pedagogy –*Heilpädagogik*– beginning with his first writing about it in the 1930s, which resulted in the first publication in 1934 in a seminar in Leipzig and Postdam. Similarly, the first public conference on *Autismus* was held on October 3, 1938, at the same hospital. In 1943, he presented his cases in a doctoral thesis in Hamburg –published in 1944 under the title *Die ‘Autistischen Psychopathen’ im Kindesalter* (Autistic Psychopathy in Children)– in which he described autism as “*an extreme variant of masculine intelligence,*” ahead of Baron-Cohen’s proposal on the masculinized brain.

³ In regard to the studies that have been done to understand the development and performance of executive functions in people with ASD and the development of mentalization skills, Simon Baron-Cohen and his study group proposed that the difficulties of inhibitory control were responsible for the deficiency in the development and functioning of mentalization capacity (Baron-Cohen, Lombardo, & Tager-Flusberg, 2013; Baron-Cohen, 2014).

Asperger Syndrome and Executive Functions

Among the studies that have been carried out of people with ASD, significant evidence has been found of disorders in the development and performance of executive functions (EF), thanks to the establishment of neurocognitive profiles. In this respect, one of the most commonly observed EFs has been the dysfunction of mentalization capacity or theory of mind [ToM] (Baron-Cohen, 2014), given the importance of this for the development of the empathy –interaction of the ability of cognitive ToM/emotional ToM. As a result of this, the study of the transit of ToM development from the first months after birth has aroused great investigative interest through observation of the expression/absence of earlier ability that precedes the said EF, that is, imitative ability. Associated with that, interest has also increased in the study of the neurobiological basis of these abilities, represented in the value of the circuit of mirror neurons, in order to discover their influence –essentially obvious– in the development and functioning of the ToM (Damasio & Meyer, 2008; Rizzolatti & Ferrari, 2014; Rizzolatti & Sinigaglia, 2013), because the ability to mentalize is one of the EFs that has a more atypical trajectory and pattern of operation in people with ASD, notwithstanding the consideration of EF disorders such as cognitive flexibility and inhibitory control or behavioral inhibition.

The study of EF is a relatively new field and has awoken interest in areas such as cognitive neuroscience, cognitive psychology, and, more recently, in subjects related to the understanding of intermodal evolution of human affective processing (Verdejo-García & Bechara, 2010). Historically, Luria (1980) was one of the first researchers to offer a description of the concept, proposing the existence of three functional units of the brain: (i) waking and motivation (limbic and reticular system); (ii) obtaining, processing, and storage of information (post-rolandic cortical areas); and (iii) programming, control, and verification of mental activity, the latter, according to the author, being dependent on the activity of the prefrontal cortex (PFC), the main cortex of cognitive association, the activity of which would unify the other EFs. Luria's ideas would later find an empirical basis in a series of studies, the main contribution of which was extensive evidence of the role of the PFC in the functioning and development of EF in adulthood (Ardila, Ostrosky-Solís, 2008; Damasio, 2010; Diamond, 2013). There is also experimental and functional imaging evidence that demonstrates the important role fulfilled by the cerebellum, together with the prefrontal cortex, in the expression of the various executive functions (Andreasen & Pierson, 2008; Baillieux, De Smeta, Paquier, De Deyn, & Marien, 2008; Lagarde, Hantkie, Hajjioui, & Yelnik, 2009), given the cortico-striatal⁴ communication that occurs in these structures. In addition to this, there is evidence regarding the role of structures such as the anterior cingulate cortex and the caudate nucleus in the expression of executive functions from the early stages of human development (Sastre-Riba, Fonseca-Pedrero, & Poch-Olivé, 2015).

Interest has recently shifted towards studies conducted among children, the objective of which is to observe the progress of executive functions in early childhood and thus construct a longitudinal and evolutionary understanding of the concept (Bauselas, 2014; Pnevmatikos & Trikkaliotis, 2013). These studies have emphasized analysis of the atypical development of executive functions, given their functional association with early developmental behaviors and their structural execution (Monette, Bigras, & Lafrenière, 2015; Sastre-Riba et al., 2015); for the purposes of this study, in its expression in children diagnosed with ASD.

As regards the components of the EF, three main elements have been operationalized to explain how they work: (i) *Flexibility*, which represents the ability to switch between multiple possibilities, tasks, or mental operations. This element would be specifically expressed in the capacity of cognitive flexibility; (ii) *Updating*, which is understood as the ability to update and monitor representations or information thanks to the functions of the working memory; and (iii) *Inhibition*, which is seen as the ability to inhibit –automatically and whenever necessary– automatic and/or dominant responses in relation to behavior, cognition, and selective attention. These elements give EF the characteristics of being intermodal and intertemporal (Letho, Juujärvi, Kooistra, Pulkkinen, 2003; Miyake, Friedman, Emerson, Witzki, Howeter, & Wager, 2000; Sastre-Riba et al., 2015; Verdejo-García & Bechara, 2010). In specific terms, taking into account studies of subjects with difficulties in executive functioning, it is proposed that the three integrating factors identified depend on specific areas of the PFC: the working memory function (WM) has been located in the dorsolateral prefrontal cortex DL-PFC); the flexibility function has been

⁴ This refers to a heteromodal cortical pathway of superior cognitive processing formed by thalamic, cerebellar, and neocortical structures.

sited in the medial prefrontal cortex (MPFC); and the inhibition skill has been related to activity in the orbitofrontal cortex (OFC), which is considered to be an extension of the limbic system (Bauselas, 2014; Damasio, 2010; Jurado & Roselli, 2007). In this sense, the activation and interaction of the limbic structures and the OFC is fundamental through the activation of the nucleus accumbens, a dopamine-releasing center that has been described as the fundamental axis of conditioned learning and motivation skills, which has also been called the center of the reward circuit and is also considered to be the center of the affective bond (Ardila & Roselli, 2007; Bustos, 2008; Junqué & Barroso, 2009). Specifically, the affective bond is described as a process that is not only essential in affective interaction with the father/mother or early caregivers, but also for establishment of later affective bonds, specifically those established in the educational process, the facilitation of which is of fundamental importance for the adherence and stimulation of the teaching-learning process (Bustos, Díaz, Castro, Zapata, & Rodríguez, 2014), which is why the affective link –and its neurobiological basis– is the central focus of this study.

The affective bond has been defined as the attraction that one individual feels for another, the effect of which is of transcendental importance for a subject, since it determines the social behavior of each individual (Bowlby, Guera, & López, 2006). In the social sense, the importance of the affective bond not only considers the father/mother and son/daughter affective relationship, but also the affective interaction established between peers, as well as the bonding relationship established between a teacher and a student and, in turn, how that affective bond facilitates the learning process (Bustos et al., 2014). In this case, this assumption takes on immeasurable prominence, given the importance of the figure of teachers in the first few academic years, which is no different in children with ASD, as even more so in children with this condition, in the words of Asperger (1953), the teacher “must at all costs be calm and collected and must remain in control ... the teacher has to become a little autistic” (cited in Silberman, 2015, p. 137).

As for the EF for inhibitory control, this has been defined as “the ability to control, modulate, or inhibit automatic behaviors, responses, or thoughts” (Gligorovic & Buha Durovic, 2014; Moraine, 2014). According to Roselli, Jurado, and Matute (2008), the inhibitory control skill is not only central to inhibiting behaviors, responses, and/or thoughts, but is essential for achieving better selective and sustained attention, WM capacity, and planning, since it facilitates the delay of gratification towards achievement of an objective (Gligorovic et al., 2014). This notion evokes an interesting question: Is there indeed comorbidity with attentional difficulties per se? Or does actual comorbidity correspond to the difficulty of delaying gratification, that is, poor control and/or behavioral inhibition? Even though these questions are not the subject of this study, both are have an interesting bent.

Respecto del desarrollo de la FE de control inhibitorio, es fundamental el desarrollo de lenguaje, como muy bien lo planteo Vygotski (1962, citado en Carlson, 2003, p., 140), dada la mediación conductual que se establece a través de la interacción en el habla, y la posterior internalización de éste, lo que a futuro, no solo permitirá mediar y monitorear el propio comportamiento, sino que a la base de ello, se encontrará la internalización de reglas, a través del diálogo interno *-self speech-* i.e., en palabras de Vygotski: se habrá conseguido el proceso de internalización semiótica de la herramienta, internalización que depende de la interacción con esa herramienta, la que no solo puede ser un objeto, sino que también otro.

With regard to the development of the inhibitory control EF, development of language is fundamental, as stated by Vygotski (1962, cited in Carlson, 2003, p. 140), given the behavioral mediation established through interaction in speech and its subsequent internalization, which, in the future, not only allows the specific behavior to be mediated and monitored, but is the basis of internalization of rules through internal dialogue –self speech. That is, in Vygotsky’s words, the process of semiotic internalization of the tool will have been achieved, which depends on interaction with that tool, which can be both one object and another.

One of the most important manifestations of problems in the performance of the executive function of inhibitory control among people with ASD, according to Mosconi, Kay, D’Cruz, Seidenfeld, Guter, Stanford, & Sweeney (2009), is the repeated appearance of atypical interests in those with this diagnosis. Indeed, these interests impede children with ASD from carrying out pedagogical activities in educational settings, or they are interrupted in the face of the slightest irruption of elements that are related to these unusual behaviors or *strange* interests. Some claims have gone even further regarding dysfunction in the EF of inhibitory control, stating that the difficulties in performance of this EF are responsible for problems in developing ToM capacity (Baron-Cohen, 2014, Baron-Cohen, Lombardo, Tager-Flusberg,

& Cohen, 2013), since this inability to inhibit interference would be responsible for the inability to inhibit one's own interests in favor of those of another person, to the direct detriment of the possibility of considering the interests of the other person (Carlson & Moses, 2001).

For all of the above, this research will seek to determine whether the teacher/student affective bond in children with ASD contributes to improving performance of the inhibitory control EF.

Method

For this research, a single-case study was carried out under a quantitative methodology with an experimental design. The selected n was non-probabilistic and intentional, male, with a level 1 ASD diagnosis, and Attention Deficit Disorder with Hyperactivity, Mixed Receptive-Expressive Language Disorder (these latter disorders as associated comorbidity), with nonspecific and intermittent ocular contact, and behavioral and emotional impulsivity. The n was enrolled in Kindergarten and was 5 years and 8 months old at the time of the experiment. Data analysis was performed using SPSS software, using the student's t test technique for dependent samples, given the single-case design and the comparison of the pre-test and post-test means, as well as the presence and absence of the bonding program.

To carry out the experimentation process, a pre- and post-test evaluation (A-B design) was done and a program was prepared that was divided into three periods: the first aimed at raising awareness of the nursery teacher regarding the program and the ASD diagnosis, as well as the acceptance and validation of the figure of the nursery teacher by the child. The second period was aimed at implementation of the bonding program, carried out by the nursery teacher, in which weekly meetings were held and there was constant support for day-to-day activities from May to September, five hours a week (one hour per day and certain behavioral cues whenever necessary). The third period was oriented to maintaining the activities in the second period and observation of the inhibitory behavior of the student. To do this, an experiment was conducted focusing on the development and stimulation of the affective bond (based on 10 behaviors executed each day, as already specified) between the student diagnosed with level 1 ASD and their nursery teacher. This program was based on the behaviors and strategies developed by Bustos et al. (2014), which consisted of:

- Request for visual contact, on a constant basis and as many times as necessary, in the presence of any communicative guideline that the nursery teacher and student produced.
- Always calling the student by his name.
- When talking to the student, or referring to him, the teacher assumed a position that allowed her to be at the same level as the child (squatting).
- Asking him questions and establishing initial communication on a daily basis through aspects of interest to the child (i.e. games, cartoons, pets, playful elements, stories).
- Faced with difficulties, the teacher guided establishment of possible solutions in the child, consulting him about strategies and suggesting new types of encounters depending on the proposals made by the student, e.g. what should we do if ...? What do you think will happen if ...? How would you feel if ...?
- Anticipation of all activities that the child would carry out during the day. The teacher would not only ask the student what activities would be carried out during the day, but would repeat this a couple of minutes beforehand and during the morning or previously. If the child forgot, the teacher would repeat the information.
- A position was chosen and granted giving him easy access to the teacher, which was also where children with greater socio-affective affinity would be found.
- Monitoring of pedagogical and play activities carried out by the child, with the aim of praising everything that he did, depending on what was requested of him, or correcting or guiding these activities. All of this would be done calling him by his name and with clear and specific language, a firm tone of voice, and accompanied by nonverbal behaviors.
- In a second stage, the teacher would begin to use body cues, such as small touches of the head when giving an instruction or praise, a small hug when greeting or saying goodbye, and touching his shoulder or elbow when monitoring his work.
- Exaggeration of facial expressions when establishing visual contact, accompanied by marked vocal prosody, depending on the emotion that the teacher wished to communicate.

In terms of ethical aspects, we used informed consent and identity protection of *n*. Similarly, once the process was finished, the results were returned.

Instrument

The instrument chosen to collect the data was the “*Bzzz!*” subtest of behavioral inhibition, in the Neuropsychological Test for Children (TENI by the Spanish acronym), for children from 3 years and 0 months to 9 years and 11 months of age, developed, standardized and edited for Chile by the Centro de Desarrollo de Tecnologías de Inclusión (CEDETI, 2012) of the Pontificia Universidad Católica de Chile.

Results

In order to assess the stimulation program and the hypothesis proposed regarding the increase in the performance of the inhibitory control EF, a pre- and post-test evaluation was performed using the TENI Neuropsychological Test (2012), specifically using the behavioral inhibition subtest “*Bzzz!*” The following graphs show the main differences in both applications, in terms of the score compared to the statistical mean of the test, which is a score of 10 points with a deviation of 3 points.

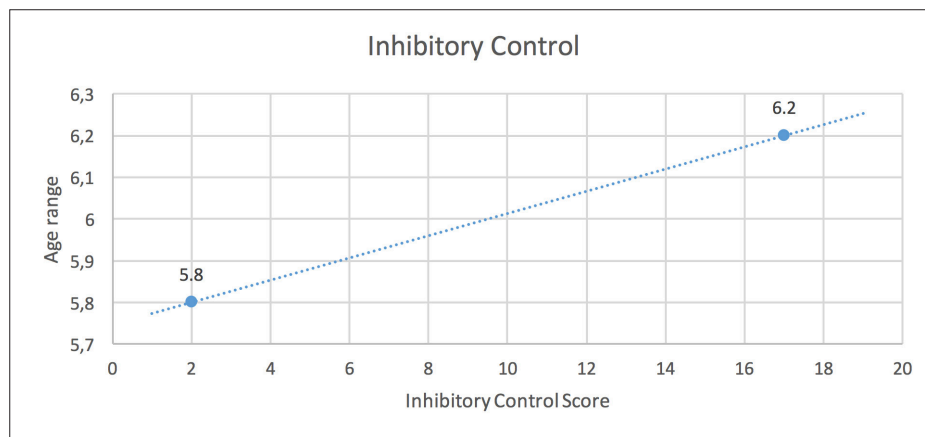


Figure 1. The trajectory of the functioning and behavior of the inhibitory control ability can be observed before and after the application of the stimulation program, with respect to the subject's age ranges.

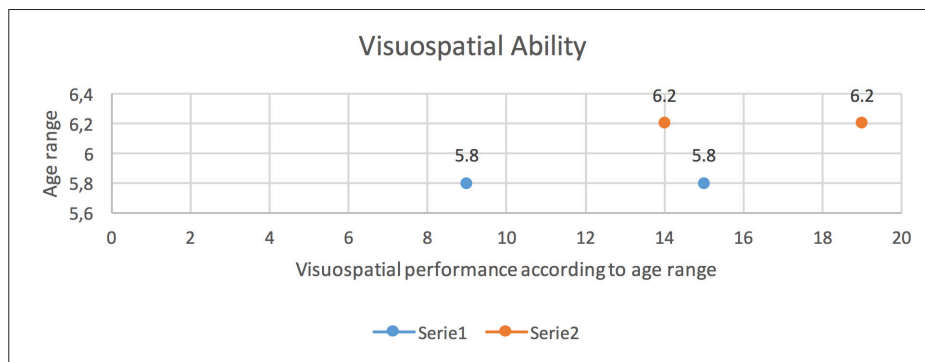


Figure 2. The trajectory of the functioning and behavior of the visuospatial ability can be observed before and after the application of the stimulation program, with respect to the subject's age ranges.

The results of the student's t test for dependent samples indicate that the difference between pre-test and post-test measurements is statistically significant $p=0.0377$ ($p=.05$), so the working hypothesis is accepted. The pre-test x - the post-test $x = (-15.00)$, with a difference interval of -27.91 to -2.09 ; the value $t = 5.0000$, with an error difference interval = 3.000 .

As regards the information in Figure 1, two performances can be seen: first, the pre-test assessment (5 years and 8 months), the statistical performance of which shows a deviation of 8 points, below the statistical mean expected; the second datum corresponds to the post-test assessment (6 years and 2 months), the statistical performance of which is at a deviation of 7 points above the statistical mean expected and 15 percentage deviations regarding the pre-test assessment. The pre-test and post-test means are 2 and 17, respectively.

The information shown in Figure 2 indicates the visuospatial ability, which although not part of the assessment process, should be considered, given the information obtained with the same test used to measure the capacity of inhibitory control, and which represents a method of contrast, becoming significant evidence in terms of acquiring the result of the performance of the EF of inhibitory control; that is, it provides evidence that the functional increase of this EF is due to the application of the stimulation program and not due to the maturational development of the subject. In statistical terms, this ability shows an increase in relation to the mean of the test by 4 and 5 deviations.

Discussion and Conclusions

The objective of this research was to find out whether the affective bond between the teacher and a student diagnosed with level 1 autistic spectrum disorder contributes to the improvement of the EF of inhibitory control. In this regard, the experimentation process produced positive results in terms of increasing the performance of the inhibitory control EF, so the subject of experimentation not only showed an increase in the performance of the test at the visuoconstructional level—it should be underlined that although this element is not part of this study, and its increase is not statistically significant, it is an element to be considered in future research—but also a statistically significant increase in the inhibitory control EF, confirming the proposed hypothesis.

The post-test results show an exponential increase, in comparative terms, in the normative mean expected for children of his age range in the performance of the "Bzz!" behavioral inhibition test, which could be a significant indicator of the effects that can be generated in a subject with level 1 ASD by the facilitation of the teacher/student affective bond, from the perspective of establishing clear and routine guidelines, and even more so through the validation of their own interests. This is not only explained by the establishment of daily routines, but also by the behavioral affective quality, expressed in the use of repetitive behavioral guidelines (as referred to by points 1, 2, 3, 4, and 8 of the intervention program, specified in the method section), which the teacher establishes when conducting the experiment. This is consistent with one of the results of the research carried out by Mosconi et al. (2009), where this factor—repetitive behaviors—is key in the interaction with subjects diagnosed with ASD. This was also a central element of this study, as the work plan was not solely focused on the normative aspects, but rather on the recognition and validation of the child, as well as their interests and motivations (points 1, 4, 5, 8, 9, and 10 of the program of behaviors used) in the relationship established with the nursery teacher. This is supported by authors such as Bustos (2008) and Bowlby et al., (2006), regarding the argument that the interaction between subjects would not only stimulate the affective relationship between the two subjects—for the purposes of this research, the teacher and the student diagnosed with ASD—but at the level of the central nervous system (CNS). This would be expressed by the stimulation and activation of the ventral tegmental area (VTA) and then of the nucleus accumbens, both dopamine-releasing centers and responsible for social contact, motivation, positive reinforcement, the affective bond; and also areas responsible for the activation and functioning of the PFC, the main cognitive integrative center, in addition to being accountable for associative learning and performance of EF. This proposal is the central focus of the study conducted.

This would not only influence the aforementioned social contact and affective bond—and its neurobiological basis—but also performance of the capacity for inhibitory control through language—and, indeed, the socio-affective importance that this provides to it. This would facilitate not only interaction in the subject, but the introjection of the semiotic relationship established with the teacher through external

language, as well as internal or self speech, as explained by Vygotski (1962, cited in Carlson, 2003, p, 141), as we have already stated, based on the validation of the subject and the consideration of their interests in every field. In association with this, it would provide and stimulate the capacity for associative learning and, therefore, self-regulation through behavioral control, through the delimitation –point 8 of the program– that supplies the teacher with elements such as anticipation (indication and repetition of tasks to be performed or daily activities whenever necessary), as well as the instructions that are given to the child and subsequent consultation about them, the request for constant visual contact, and the individualization of the subject whenever interaction is sought with them, which would agree with the argument of Carlson (2003) and the results obtained by Bustos et al. (2014).

Furthermore, the assertions of Baron-Cohen (2014), Baron-Cohen et al. (2013), and Carlson and Moses, (2001) are interesting regarding the suggestion that the difficulty in inhibiting interference and personal interests would be to the direct detriment of the possibility of considering the interests of another person in the interaction. Therefore, if this assertion is correct, development of the mentalization ability, the success of the study, in an n greater than 30 subjects would represent an important advance in the intervention applied to subjects diagnosed with level 1 ASD. This would be based on the intervention of the executive ability of inhibitory control and not just on its activation, but also –and as indicated by the theory– of the ToM ability (Baron-Cohen, 2014; Baron-Cohen et al., 2013). This possibility could be an important future proposal for the understanding of these EFs in people diagnosed with ASD at an early age.

Finally and importantly, if this thesis were to be tested in a significant population, it would also contribute to proving Hans Asperger's approach in the early 1930s, when he said that "little teachers" had peculiar interests and a high cognitive performance, and that this only had to be discovered and stimulated. This statement is an important precedent of what this study has sought to address, considering the importance of stimulation of the affective bond in children with level 1 ASD, highlighting not only the pedagogical-academic elements, but also, and specifically, the interests of children diagnosed with ASD and the importance of this when establishing patterns of interaction with others and by stimulating and reinforcing such abilities in each of them; these behaviors reflecting the validation of the interests and abilities of the subject. This considers not only the socio-affective interaction to be valid, but also –and even more so– the neurobiological basis of the affective bond; that is, activation of the nucleus accumbens and, through that, the abilities for which the latter is responsible: motivation, reinforcement behaviors, activation of the PFC –the neural base of associative learning– and EF. And in relation to that, at the center of this study, the cognitive analysis of emotions and the EF of inhibitory control.

With respect to the Chilean educational field, this would be an important advance and a fundamental element to continue projecting the research, regarding the current intervention and attention for children diagnosed with level 1 ASD, addressed under Decree N° 170/2010. It would thus be essential to replicate this research under the same parameters and in a similar population, increasing the sample to $n > 30$ in order to observe the influence of the affective bond in behavioral control, as well as to establish possible gender differences regarding this ability. In the same area, research of this kind can be supported by the neurobiological evidence of stimulation of the affective bond. Linked to this, considering the potentiality of the nervous system in early childhood, that is, cerebral plasticity, the results that could be obtained from interventions of this type are incommensurable –and this is no exaggeration– taking into account the current evidence of understanding of the subject and their developmental trajectory, as well as taking into account the importance of early stimulation in this trajectory.

It is important to remember that this study was carried out using a single-case study method, which is the main limitation of the results obtained, since they are not likely to be generalized among the whole population diagnosed with level 1 ASD. Nevertheless, the results represent an important opportunity to carry out experimental research with a sample size of $n > 30$ and in a more diverse population, considering socioeconomic level, age range, and gender, which is the main future projection for the continuation of studies in the development of interventions aimed at the adaptation of people with ASD. It would also be interesting to reproduce this study in a older population, not solely of children, and also including females in the study, with the aim of observing not only the effects of the stimulation, but also the performance in both genders regarding facilitation of affective bonds in people with ASD.

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