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## Effectiveness of family bonding therapy supported by child clinical psychomotricity to increase self-regulation in children with attention deficit hyperactivity disorder: A pilot study



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### ARTICLE INFO

#### Article history:

Received 7 February 2022

Accepted 9 December 2022

Available online 20 December 2022

#### Keywords:

Children

Self-regulation

Attention deficit hyperactivity disorder (ADHD)

Family Bonding Therapy (FBT)

Clinical Psychomotor Therapy (CPT)

### ABSTRACT

Girls and boys diagnosed with attention deficit hyperactivity disorder (ADHD) need to reduce their symptoms through interventions. A crossover quasi-experimental design has been carried out aimed at both mothers and fathers and their girls and boys diagnosed with ADHD. Specifically, a Family Bonding Therapy (FBT) for mothers and fathers and a Clinical Psychomotor Therapy (CPT) for girls and boys with ADHD. The sample has been made up of three girls and thirteen boys between 5 years 11 months and 9 years old, in addition to their mothers and fathers. The girls and boys have been evaluated at the beginning, middle, and the end of the interventions. Their capacity of self-regulation has been measured through two questionnaires addressed to mothers and fathers (Behavioral Assessment of Executive Function/BRIEF-2 and Behavior Assessment System for children/BASC). The indicators of both questionnaires quantified the change in self-regulation as the response variable. Statistical methods associated with mixed linear models have measure the effect and the order of treatment as explanatory variables. Furthermore, different control variables were incorporated, the *initial level* of response and covariates such as the *anxiety* and the *adaptability*. This study has reported that *hyperactivity* has proven to be a central symptom to measure self-regulation capacity because it showed a significant association with PBT when applied after CPT, as measured by the BASC. In conclusion, the effect of clinical interventions based on their order favors the reduction of *hyperactivity* and influences the self-regulation capacity of girls and boys.

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## Efectividad de la terapia vincular familiar apoyada con psicomotricidad clínica infantil para el incremento de la autorregulación en niños y niñas con trastorno por déficit atencional e hiperactividad: un estudio piloto

### RESUMEN

Los niños diagnosticados con trastorno por déficit de atención con hiperactividad (TDAH) necesitan reducir sus síntomas mediante intervenciones. Se ha realizado un diseño cuasi-experimental cruzado dirigido tanto a madres y padres como a sus hijos diagnosticados con TDAH. Específicamente, una

#### Palabras clave:

Infantes

Autorregulación

DOI of original article: <https://doi.org/10.1016/j.psicod.2022.12.001>

**Abbreviations:** ADHD, Attention deficit hyperactivity disorder; FBT, Family Bonding Therapy; CPT, Clinical Psychomotor Therapy; BASC, Infant and Youth Behavioral Assessment System; BRIEF-2, Battery of behavioral evaluation of executive behavior.

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Trastorno por déficit de atención e hiperactividad (ADHD)  
Terapia Vincular Familiar (FBT)  
Terapia Psicomotora Clínica (CPT)

Terapia de Vinculación Familiar (FBT) para madres y padres y una Terapia Psicomotriz Clínica (CPT) para niños/as con TDAH. La muestra ha estado compuesta por tres niñas y trece niños de entre 5 años 11 meses y 9 años, además de sus padres y madres. Los niños han sido evaluados al inicio, mitad y final de las intervenciones. Su capacidad de autorregulación se ha medido a través de dos cuestionarios dirigidos a madres y padres (Behavioral Assessment of Executive Function/BRIEF-2 y Behavior Assessment System for children/BASC). Los indicadores de ambos cuestionarios han cuantificado cambios en la autorregulación como variable de respuesta. Los métodos estadísticos asociados a modelos lineales mixtos han medido el efecto y orden del tratamiento como variables explicativas. Además, se han incorporado variables de control, como el nivel inicial de respuesta y covariables como la ansiedad y la adaptabilidad. Este estudio ha reportado que la hiperactividad ha sido un síntoma central para medir la capacidad de autorregulación porque ha mostrado una asociación significativa en la FBT cuando se realiza después de la CPT, medida por el cuestionario BASC. En conclusión, el efecto de las intervenciones clínicas en función de su orden ha favorecido la reducción de la hiperactividad y ha influido en la capacidad de autorregulación de niños/as.

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## Introduction

Attention deficit disorder (ADHD) is one of the most diagnosed problems in childhood (Puddu et al., 2017). It has a prevalence between 5% and 15% worldwide, and 10% in Chile (Zamorano et al., 2017). This disorder is characterized by a persistent pattern of inattention, hyperactivity, and impulsivity, that interferes with behavioral functioning (Asociación Americana de Psiquiatría, 2014). Researchers report that up to 20% of infants receive treatment with psychostimulants (Iriart & Ríos, 2012; López, 2015). Alterations in the behavior of infants with ADHD are associated with the reward system, mediated by the fronto-medial regions (Zamorano et al., 2017). Cognitive processes that are associated with behavioral functioning (such as planning, reasoning, learning and creativity) favor strategic responses to conflictive situations (Koechlin, 2016).

A cognitive process that encompasses different behavioral functions is self-regulation. Neurobiological findings have pointed to the involvement of the prefrontal cortex in self-regulation processes, due to its role in conflict resolution (Johansson et al., 2015; Lackner et al., 2018; Posner & Rothbart, 2009). Self-regulation is defined as the ability of individuals to modify their behavior by virtue of the demands of specific situations (Baumeister & Heatherton, 1996; González, 2007; Larraín-Valenzuela et al., 2022). Different authors argue that self-regulation brings together processes in which people initiate, adjust, interrupt, stop or change other thoughts, feelings or actions in order to achieve the realization of personal goals or plans, or to maintain current standards (Baumeister & Heatherton, 1996; González, 2007; Larraín-Valenzuela et al., 2022). From a psychobiological perspective, self-regulation would be a component of temperament, because it integrates individual differences in reactivity that include structures influenced by heredity, maturation, and experience (Larraín-Valenzuela et al., 2022; Posner & Rothbart, 1998; Rothbart et al., 1994; Rueda et al., 2005).

Regarding self-regulation, it can be conceptualized as a more restrictive way to understand the capacity for self-control, which is associated with the attempt to nullify overbearing tendencies of an unwanted nature or impulses in a conscious and effortful way (Canet-Juric et al., 2016). Specifically, it is understood as the ability to cancel or modify internal responses, behavioral tendencies (impulses), and refrain from acting on them voluntarily. Therefore, to achieve better adjustments within the environment requires a successful regulation of impulses. Self-regulation is multifactorial (biological, hereditary and experiential) because it is configured over time by a confluence of contextual and epigenetic variables (Bridgett et al., 2013; Eisenberg et al., 2004; Fridman et al., 2020; Posner & Rothbart, 1998, 2009). It is a cognitive process, highly sensitive to changes in the environment, because it generates a response adjusted to the requirements of the con-

text (Nigg, 2017; Ruff & Rothbart, 2001). Therefore, it is possible that contextual interventions such as those focused on families (mothers and fathers, girls and boys) can promote mental health. Marusak et al. (2018) demonstrated that healthy parenting protects against the development of emotional psychopathology, especially in girls and boys exposed to stressful contexts, and that dysfunctional parenting strategies can affect self-regulation in girls and boys. In addition, they argue that it would be associated with brain alterations, and that behavioral responses to emotional conflict are faster but less precise, possibly reflecting an avoidance pattern. Behavioral responses linked to emotional conflict were associated with excessive parental control and anxiety in girls and boys.

Chavez Arana et al. (2020) suggest that parental effectiveness associated with cognitive behavioral therapy reduces disruption problems and contributes to improving self-regulation capacity in girls and boys with neurodevelopmental difficulties, and reducing parental stress through good parenting practices. This study implemented a randomized controlled trial design with girls and boys with a diagnosis of acquired brain injury ( $n=71$ ), together with their mothers and fathers. They reported a reduction in girls' and boys' disruptive behavior within their homes and an improvement in emotional self-regulation associated with parenting practices. The intervention decreased dysfunctional parenting immediately after the end of the intervention. Likewise, the dysfunctionality of paternity decreased because a warm upbringing, behavior control and support in the autonomy of the girls and boys were promoted. They concluded that the combination of interventions improves parenting practices for girls and boys with acquired brain injuries, regardless of the girls' and boys' level of disruptive behavior.

Grolnick et al. (2021) maintain that when there is greater parental involvement there are positive changes, greater perception of competence, academic commitment and increased self-esteem. They measured the efficacy of a preventive parenting intervention which was framed in mothers and fathers who wanted to improve parenting but their girls and boys rejected all types of mental health support. They were 57 mothers and fathers of girls and boys aged 8 to 12 years through an experimental design based on a waiting list that promoted self-regulation associated with autonomy to mitigate behavior problems in their girls and boys. The main results show a decrease in externalizing symptoms such as aggressiveness, lack of attention, and disobedience, among others. Also, they showed greater effects in families with a lower educational level, and also in families that had girls and boys with symptoms measured at the beginning of the study with internalizing symptoms such as anxiety, depression and somatic complaints. This agrees with Sanders and Mazzucchelli (2013), who states that the ability of mothers and fathers to self-regulate their own performance is essential to maintain positive, enriching, and non-abusive parenting practices that promote good developmental outcomes. Specifically, they argue that self-regulation skills are the target of

many clinical and preventive psychological therapies because they allow to gain a greater sense of personal control and mastery over one's life. In addition, they provide that self-regulation can be intervened at the level of mothers and fathers and girls and boys. Sanders et al. (2019), through a conceptual review, argue that programs that promote self-regulatory capacity in both mothers and fathers and girls and boys from a multigenerational context.

Along the same lines, Fosco et al. (2018) investigated fifty-four participants (27 parent-child dyads diagnosed with ADHD) assessed before and after their mothers and fathers underwent a manual parenting behavior training program. Results showed that a greater child visuospatial and phonological working memory was associated with an increase in caution in parental response, and with a greater reduction in inattention. Better self-regulation capacity of the mothers and fathers (greater inhibitory control and greater caution in the response) leads to a decrease in behavior problems after treatment. Greater caution in parental response was associated with less post-treatment, as well as greater parental confidence. However, they suggest that interventions associated with parenting and changes in parental behavior can be successfully integrated into treatment outcomes that affect self-regulation capacity. Therefore, there is evidence (but still scarce) on how parental interventions associated with the capacity of self-regulation contribute to child development, promote habits and mitigate their mental health problems (Baker et al., 2019; Barros et al., 2015; Morawska et al., 2019).

Likewise, Barkley (1997a, 1997b) argues that self-control, inattention, and impulsivity difficulties are typical of girls and boys diagnosed with ADHD. It also refers to self-regulation, as a capacity that develops from childhood and involves both internal and external adaptation strategies, aimed at responding to the demands of the environment, showing a difficulty in exercising control over one's own behavior (Becker et al., 2014; Eisenberg et al., 2004; Slot et al., 2017). However, empirical studies are still needed to shed light on how an increase in self-regulation implies better problem solving, exercising control and monitoring the internal state to achieve a certain behavior based on a goal (Nigg, 2017). In this regard, Barkley (1997b) suggests, within the self-regulation model, that the ideal intervention for boys/girls with a diagnosis of ADHD would be one based on play within natural environments. Along the same lines, researchers maintain that play is important for the development of self-regulation, because it allows effective clinical intervention efforts from a multidimensional approach (Elias & Berk, 2002; Savina, 2014).

Now, in connection to ADHD clinical work, it is pertinent to mention that ADHD is the neurodevelopmental disorder most commonly treated in clinical psychomotor interventions (Mutel, 2017). Intervention guidelines for girls and boys with attention deficit disorder (ADHD) indicate that clinical psychomotor intervention reduces motor agitation, inattention and impulsivity (Herguedas Esteban et al., 2019; Marquet-Doleac & Soppelsa, 2009; Tae Suh & Heon Moon, 2016). However, problems in evaluating the effectiveness of the programs, generalizing their results, and determining their long-term effects still persist (Albaret, 1991; Tae Suh & Heon Moon, 2016). The psychomotor intervention raises the general objective of developing and/or reestablishing the potentialities and aptitudes of the subject through corporal expression in different areas—such as the motor, affective-social, communicative and cognitive domains—from motor expressiveness based on spontaneous play (Arnáiz & Bolarín, 2000; Berruezo, 2008; Bottini et al., 2012; De Quiros, 2012; Tae Suh & Heon Moon, 2016; Zwets et al., 2016). The most opportune period for psychomotor intervention is between four and seven years of age, because of the reported developmental difficulties in the symbolic function of thought (Aucouturier, 2004). In relation to psychomotor interventions in infants, it is proposed that psychomotricity offers a space and a time which encourages

their abilities to elaborate and solve obstacles, recovering the pleasure and power of movement through body play (Calmels, 2003; Emck & Bosscher, 2010; Heynen et al., 2017). One of the main tools is body play, because it encourages learning and other complex cognitive abilities, such as self-regulation (Becker et al., 2014; Sassano, 2011; Slot et al., 2017).

The effects of psychomotor intervention have been reported to be beneficial in psychomotor intervention projects within educational institutions (Elgarhy & Liu, 2016; Franc, 2002; Frazão et al., 2021; Moreira et al., 2016; Serrabona, 2006). There is extensive clinical literature describing a decrease in symptoms (Bergland et al., 2018; Boerhout et al., 2016; Breivte et al., 2010; Elgarhy & Liu, 2016; Zwets et al., 2016). However, this number is reduced when considering the literature that includes experimental studies with quantitative methodological analysis (Larraín, 2019). Therefore, psychomotor intervention appears relevant because it promotes psychological maturation and child learning, avoiding the fragmentation of the body, understanding a psycho-affective-motor unit (Chokler, 2005; Frazão et al., 2021; Heynen et al., 2017; Mila, 2008, 2018).

In accordance with the above, there is evidence that multidimensional interventions favor self-regulatory capacity. Therefore, incorporating psychological techniques that contribute to parenting in addition to interventions aimed at acting through the mediation of the body on altered or diminished mental and behavioral functions, could provoke psychological processes that promote neuroplastic changes in brain regions, similar to a pharmacological treatment (Barsaglini et al., 2014; Heynen et al., 2017; Prasko et al., 2007). The hypothesis of this research holds that intervention in girls and boys with parental support would increase their self-regulation capacity. From this, the objective is to evaluate the effect of a parental support program of family bonding therapy, accompanied by a clinical psychomotor intervention, on the self-regulation capacity (in their cognitive and personality domain), through a report scale for parents of girls and boys diagnosed with ADHD, and to mitigate their main symptoms, such as hyperactivity.

## Method

### Participants

Participants—including adults and their ADHD diagnosed girls and boys—were invited to two free intervention programs, named “Child psychomotor workshop for children diagnosed with ADHD” and “Psychoeducation workshop aimed at mothers and fathers of infants with ADHD”. The age of the boys/girls ranged from 5 years to 9 years old ( $M = 6.99$ ,  $SD = 0.94$ ; 18.75% females. The ratio of women to men was 1:7). The schooling levels ranged from kindergarten to second grade. Seventeen families agreed to participate, and signed the approval letter according to the requirements of the Ethics Committee of the Universidad Diego Portales (UDP). Their acceptance was based on the needs of the participants, and the confirmation of the diagnostic with ADHD. The initial sample consisted of 17 girls and boys. After the evaluations, 16 girls and boys remained. A flow diagram was made (see Figure 1).

With respect to the mothers and fathers, they presented a low socioeconomic level, and the majority had completed high school. Only one of the participating mothers and fathers had completed higher education. The majority had low supporting networks, with the mothers in charge of raising the girls and boys and the fathers having a role as financial providers. Three fathers were the exception, and they presented a more active role in parenting, expressing concerns regarding their girls and boys. The mothers of the girls and boys generally attended the parenting interventions in the first session, but it was promoted that the fathers could be included in the

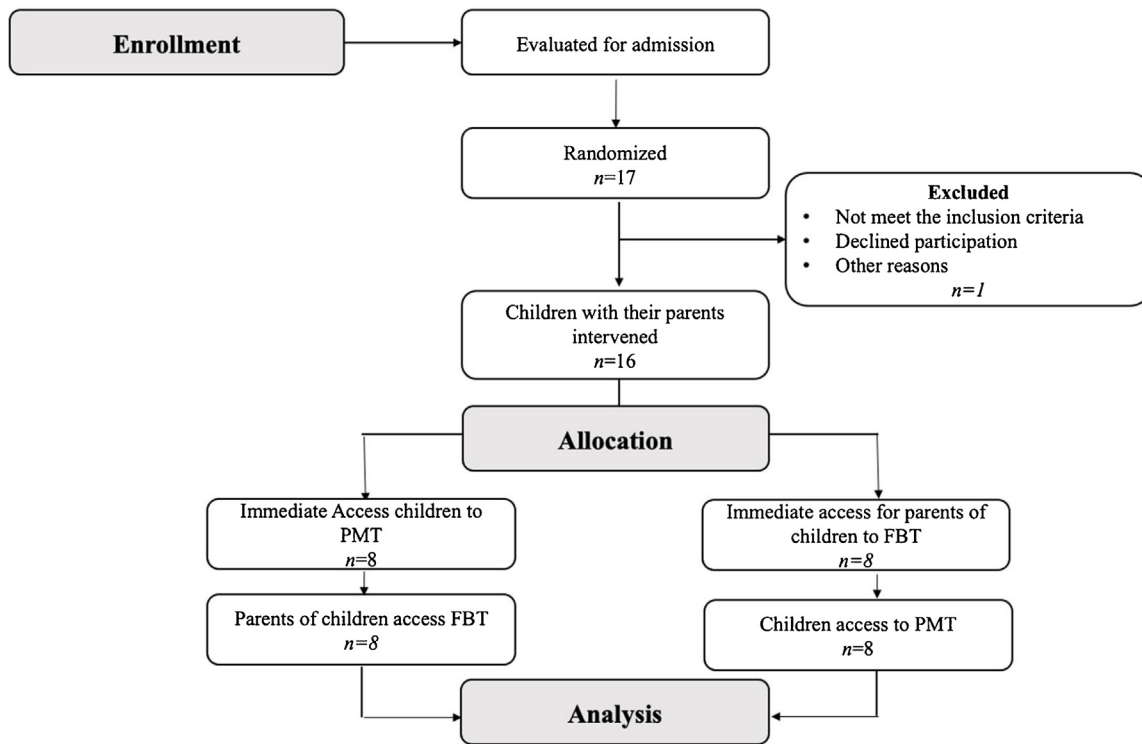


Figure 1. Flow diagram.

following interventions so that they could achieve better communication and create a more efficient parenting model. Most of the mothers and fathers had received medical assistance throughout their lives, but not support in relation to upbringing and improving the family environment. All the participants stated at the beginning the desire to improve as mothers and fathers and thus strengthen the development of their girls and boys.

**Instruments**

Regarding the measurement instruments, the BRIEF questionnaire assesses the different components of executive functions, while the BASC questionnaire assesses the clinical and adaptive aspects. Both questionnaires already had prior validation for the Spanish-speaking population. In this validation, the BRIEF-2 and BASC have a correlation pattern in the directions and expected magnitudes (Gioia et al., 2017). That is, the BRIEF-2 questionnaire had a high correlation with the BASC questionnaire, at least when both were directed at mothers and fathers (Gioia et al., 2017).

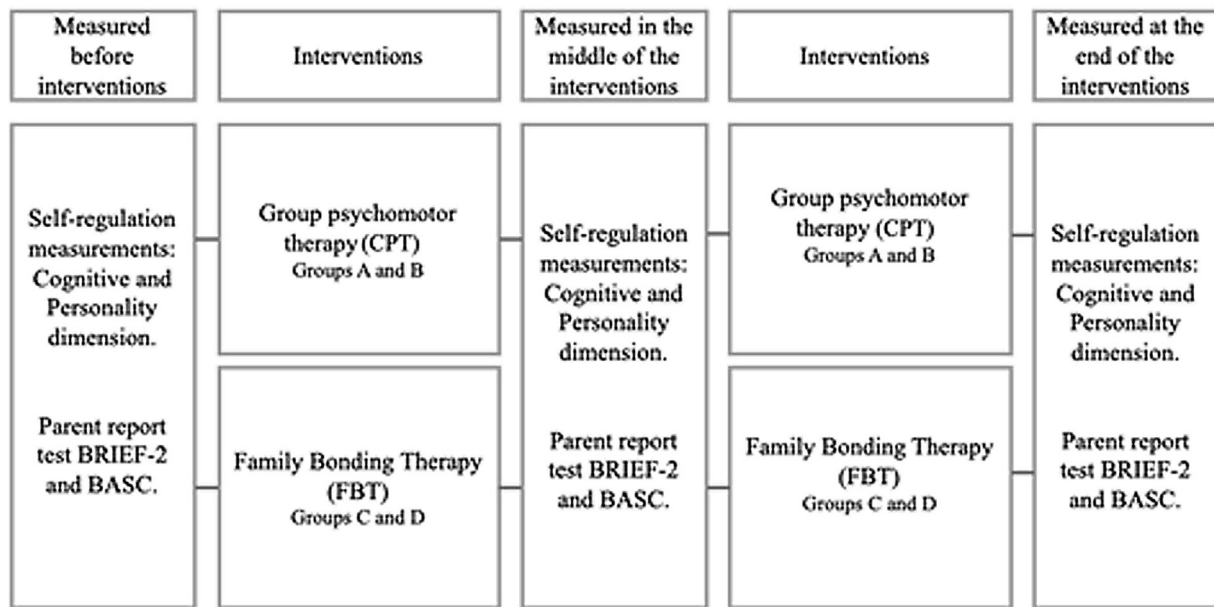
The measurement of self-regulation in its cognitive-behavioral component was based on the Behavioral Assessment of Executive Function (BRIEF-2), developed by Gioia et al. (2017). The instrument consists of different questionnaires answered by the mothers and fathers, caregivers and teachers of the person evaluated (Gioia et al., 2017). For this study, the parent version was applied. It consists of nine clinical scales (inhibition, self-control, flexibility, emotional control, initiative, working memory, planning-organization, task supervision, and organization of materials), three general indexes (behavioral regulation index, emotional regulation index, and of cognitive regulation) and a global index of executive function. In addition, it includes three validity scales related to infrequency, inconsistency, and negativity. The results are delivered through t-scores (mean 50 and standard deviation 10) in relation to the reference population, differentiated by sex and age. The higher the score, the more difficulties in executive functions: T scores less than 60 are considered normal; between 60 and 64, slightly ele-

vated; between 65 and 69, potentially clinical; and greater than 70, clinically elevated.

The Spanish adaptation of the BRIEF-2 presents, for the general population, a Cronbach's alpha ( $\alpha$ ) of .66 for the initiative subscale, and  $\alpha = .87$  for emotional control. The test-retest reliability measured after the course of three weeks presented an average value of stability coefficients of .91. Accordingly with these reports, the internal consistency for the BRIEF-2 scales, using the standardized results obtained in the present study, was  $\alpha = .91$ ;  $\omega = .97$  for the first evaluation;  $\alpha = .97$ ;  $\omega = .99$  for the second evaluation; and  $\alpha = .97$ ;  $\omega = .99$  for the third evaluation.

The Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 2004) is a system made up of several methods of evaluation through a variety of symptoms that are (or not) part of the boys/girls and adolescents' behavior, including their perception. From them, the parent questionnaire was the only instrument used here, due to the age range of the sample. It collects information associated with the girls' and boys' observable behavior both at home and in other contexts. A "TEA editions online correction service" was used for scoring and obtaining the scores, delivering a profile of each scale evaluated. The parent questionnaire features a clinical scale that evaluates maladaptive behavioral (aggressiveness, hyperactivity, behavior problems, attention problems, learning problems, atypicality, depression, anxiety, withdrawal and somatization); an adaptive scale that evaluates positive behavioral (adaptability, social skills, leadership); and a scale of global dimension (externalize problems, internalize problems and adaptive skills). The scales offer t scores with a mean of 50, a deviation of 10 points, and percentiles: equal or more than 70 points mean clinically significance; between 60 to 69 points, at risk; 50-41 points, medium level; 40 to 31 points low, and less than 30 points is considered very low. The Spanish adaptation of the BASC presents, for the general population, to Cronbach's alpha ( $\alpha$ ) of .80, considering it acceptable (Reynolds & Kamphaus, 2004). Accordingly with these reports, the internal consistency for the BASC scales, using the standardized results obtained in the present study, was  $\alpha = .83$ ;  $\omega = .95$  for the first evaluation;





**Figure 2.** The experimental design crossed with two intervention programs and their respective evaluations in three moments of the self-regulatory behavior is shown. Group A: 4. Group B: 4. Group C: 4. Group D: 4. Total participants: 16.

$\alpha = .82$ ;  $\omega = .92$  for the second evaluation; and  $\alpha = .85$ ;  $\omega = .93$  for the third evaluation.

**Research design**

A non-randomized quasi-experimental controlled trial, using a crossover paradigm, was used to assess the effect of the intervention. The boys and girls were assigned to the type of intervention after meeting the inclusion criteria. The inclusion criteria were: girls and boys between 5 and 9 years old, diagnosed with ADHD and who participated in both interventions. Half of the girls and boys received group psychomotor therapy (CPT; 16 sessions of CPT three times a week, for one chronological hour), meanwhile the other half of girls and boys were used as active controls, in which their mothers and fathers received a psychoeducation workshop with a focus on Family Bonding Therapy (FBT; four group sessions, lasting 2 hours 30 minutes each) (Messing, 2000, 2007, 2011, 2017, 2020). Once the CPT was over, the group of waiting infants received the CPT treatment, and the mothers and fathers of the girls and boys previously intervened with CPT started the FBT workshop. Both groups were evaluated three times: (1) Before any of both treatments, (2) Concluding the first interventions for all groups, and (3) At the end of both interventions. In addition, there was a measurement through the “psychomotor guideline” (before and after the CPT), because this instrument is applied only within the psychomotor intervention. Figure 2 depicts the experimental design.

**Procedure**

The present study was carried out at the Faculty of Psychology of the Diego Portales University (UDP), Santiago, Metropolitan Region (MR), Chile. During a period of four months, a dissemination was carried out through the Psychological Clinic of the same University. Also, the neurology service of a hospital in the same MR was contacted. In the same way, different educational establishments that presented school integration programs were contacted as a way to gather participants who already had a clinical diagnosis of ADHD, among others.

**Diagnostic confirmation**

A psychologist belonging to the group of researchers contacted both health and education professionals who referred each of the families. A workshop was held with all those summoned to explain the procedures and interventions, as well as informed consent and sentiment. Subsequently, an interview was conducted with the mothers and fathers of the girls and boys, which gathered answers for different questionnaires aimed at confirming the symptoms and the diagnosis previously established by a doctor. The interview involved the developmental-history self-report *questionnaire Behavior Assessment System for Children* (Reynolds & Kamphaus, 2004), the *Conners Test* (Conners, 1989) as a screening method for the diagnosis of ADHD (Carrasco et al., 2012), and the *EDAH questionnaire* (Ferré & Narbona, 2001).

Regarding the clinical characterization, eight girls and boys who received medication before the intervention were asked to continue with their pharmacological treatment. Twelve participants had attended the child neurology service for attention problems, while the others were referred from the school integration program. This alternative diagnosis was reached by qualified professionals to strengthen learning. This is due to difficulties in accessing the public health system. The groups are organized according to the clinical problems associated with neurodevelopment, with the principle of clinical help and therapeutic intervention prevailing over the design of the study.

Regarding the psychometric profile associated with ADHD symptomatology, the Conners Test was used for mothers and fathers, who reported their girls’ and boys’ behavior. This scale consisted of 10 items, graded from 0 to 3, ordered from the lowest to the highest level of severity. Specifically, 0 is the absence of the feature (“nothing”); 1, the feature outlined (“small”); 2, a remarkable feature (“quite”); and 3, a very marked feature (“a lot”). The test has a maximum of 30 points, with a cutoff limit of 15 points that suggests a possible diagnosis of ADHD (Conners, 1989). This was complemented with the EDAA, because it measures the main characteristics of possible ADHD and its comorbidities, such as behavioral disorders. It was applied to all mothers and fathers, due to the difficulty of access to teachers. This scale consisted of 20 items, graded from 0 to 3, ordered from lowest to highest according to the level of severity. Specifically, there were four response

categories: As in the previous test, a score of 0 was recorded as absence of the characteristic (“nothing”); 1 was a behavior schema (“small”); 2 was a notable feature (“quite a bit”); and 3 a very marked trait (“a lot”). The test has a maximum of 60 points. Then, a category suggestive of ADHD type was assigned to each response (e.g., *hyperactivity, attention deficit, hyperactivity and inattention, conduct disorder, and global score*). Each response category presented a cutoff score associated with a percentile, which suggests the presence or absence of the disorder (Ferré & Narbona, 2001).

After the information collected from the mothers and fathers, all the girls and boys were given the *TONI-2 non-verbal intelligence test* to rule out cognitive deficits, since it could change the intervention objectives associated with ADHD (Brown et al., 2000). The evaluation included four subtests that make up the *Wechsler battery* of processing speed and working memory indices in its Chilean version (Wechsler, 2014).

### Interventions

*Psychoeducation workshop aimed at parents focused on family bonding therapy (FBT)*: This workshop considers the theoretical and practical alignments of Claudia Messing’s family bonding therapy (Messing, 2000, 2007, 2011, 2017, 2020). This intervention directs the therapeutic process towards subjectivation with emotional reconnection, and the construction of new models of authority in the face of the failure of traditional models of authority (for example, linked to fear). The intervention was performed by a clinical psychologist with family bonding therapy training, who supervised the group clinical intervention. The themes linked to the origin story, interfered with the painful experiences of the mothers and fathers with their own mothers and fathers, and how they are transferred in other scenarios. The conflicts that emerged while bonding with their own girls and boys, for example, were part of the activities performed in the groups (Messing, 2000, 2007, 2011, 2017, 2020).

The work was intended on highlighting the most important aspects proposed by Messing (Messing, 2000, 2007, 2011, 2017, 2020), such as fostering awareness of mothers and fathers’ bonds with their girls and boys and their own mothers and fathers. Additionally, the excessive overload of family roles and their effects, the massive mimicry of their own mothers and fathers, the reproduction of experiences, and the difficulty in setting appropriate limits for their girls and boys.

The increase in self-regulation of the mothers and fathers was through the verbalization of different lived experiences of discomfort and/or pain with the bonds with their own mothers and fathers and also with their siblings. The main stories were associated with traumatic situations of domestic violence and substance abuse such as alcohol consumption. Also, extreme poverty, repeated situations of child abandonment, which meant experiences of childhood trauma that interfere with current dynamics, where they are mothers and fathers and need to feel content to repair their own history. Moreover, they need to be accompanied to understand that what they experience with their girls and boys is a possibility to heal and offer a life chance, which is different from the one they lived.

These topics were addressed during the four sessions that presented a common general structure: (1) The time and place were previously defined; (2) The participants were allocated in a circle to favors their gaze of other participants; (3) The need to respect the group and avoid sanctioning judgment between them was pointed out; (4) Each member of the group was invited to intervene about a specific problem voluntarily. This strategy sought a change of perspective of the situation and the possibility of solving the problem collectively; (5) The problem of each one served as an example to improve the whole group’s personal aspects; (6) Goals and resolution strategies were proposed to be implemented at home to review them during the next meeting, and (7) The closing of the session

ended with the evocation of “a word” that referred to the emotional state for the end of the session.

*Intervention program in clinical psychomotor therapy (CPT)*: The objective of the psychomotor clinical intervention program was to trigger questions about the body, increasing the transfer with the therapy and the objects (González, 2009). Girls and boys were encouraged to develop their subjective construction based on the therapist’s mirror to promote the expression of their corporality and symbolization (Levin, 1991). In addition, it encouraged motor development, because they transform modes of perception and allow a greater adjustment in the relationship with their environment (Da Fonseca, 1996). All sessions were carried out by a psychomotor expert, who performed active listening to the boys and girls through tonic empathy, and acted to convey a feeling of safety, and a partner that allowed the passage to the symbolic (Aucouturier, 2004). His function was to contain and organize the actions of the girls and boys, to delimit the times for each activity, and to provide with spaces for the development of the session.

The physical space called the psychomotor room was key to the intervention of the program. It met the requirements of brightness, space, warmth, and low level of exposure to danger of girls and boys (Cerrutti, 1996). The material provided was that proposed by the theory and practice of Aucouturier (2004). This space considered the interests and needs of the participants, as it was the non-figurative polymorphic material necessary to promote the imagination (e.g., ladder, mattresses, mirror, fabrics, ropes, woods, sheets, pencils, etc.). The general structure for the 16 girls’ and boys’ clinical psychomotor sessions incorporated the Bernard Aucouturier psychomotor practice principle (2004). All sessions presented a general structure based on the psychomotor practice of Aucouturier (2004): a beginning called entrance ritual, which the psychomotor therapist agreed with the participants, the rules of the place associated with the care of one’s own body, the body of the companions and materials. Then, the moment of free play, where sensorimotor games prevailed. Afterwards, the infants were invited to the moment of representation associated with free-choice graph-plastic expressive activities. Finally, it ended with the exit ritual that marked the passage “from the game” to “reality” (Aucouturier, 2004).

### Data analysis

The questionnaires of the BRIEF-2 scales aimed to the family members, and of the BASC scales aimed for mothers and fathers, were selected because they presented a concurrent validation, which allows extracting the latent variable of self-regulation. Regarding the BRIEF-2, an exploratory factor analysis (EFA) of oblique rotations performed by Gioia et al. (2017), to analyze the latent factors, revealed four factors. For this study, and after conceptual evidence, the capacity for self-regulation was delimited to the first of these factors, composed by *hyperactivity, aggression, inhibition, behavioral problems, emotional control, self-supervision and problems of attention* (Factor 1). The remaining items obtained by Gioia et al. (2017) (Factor 2: *planning and organization, initiative, working memory, organization of materials and supervision of the task*; Factor 3: *emotional control, anxiety, depression and somatization*; and Factor 4: *withdrawal, atypicality and flexibility*), for the purposes of this study, were added as secondary variables and analyzed through composite scores.

Thus, a EFA was performed to evaluate the number of independent composite scores that can be obtained from the item’s *anxiety, withdrawal, adaptability, social skills, externalization of problems, adaptive skills, working memory, planning and organization, supervision of tasks and organization of materials* (i.e., Factors 2, 3 and 4 from Gioia, 2017), in order to define which of these secondary variables influenced treatment, and thus incorporate them into the

**Table 1**  
Participants characteristics (boys and girls)

Descriptors	n (%)	M	SD	Descriptors	n (%)
Sample size	16 (100%)	–	–	Clinical diagnosis by institutions	
Gender				With diagnosis	16 (100%)
Female	3 (18.75%)	–	–	Without diagnosis	0 (0%)
Male	13 (81.25%)	–	–	Referrals to therapeutic intervention	
Age of boys and girls		6.99	.94	With therapeutic support	16 (100%)
Scholarship				No therapeutic support	0 (0%)
Kindergarten	3 (18.75%)	–	–	Medication	
First basic	5 (31.25%)	–	–	Without pharmacological support	8 (50%)
Second basic	8 (50%)	–	–	With pharmacological support	8 (50%)
Average of the session in psychomotor skills	–	15	3.18	Clinical problems according to DSM-V	
Measurements and questionnaires applied				Anxiety problem	1 (6.25%)
General I.Q. TONI-2	–	122	12.58	Attention problem and hyperactivity	7 (43.75%)
I.Q. Processing Speed WISC-V	–	109	14.71	Behavior problem	2 (12.50%)
I.Q. Working Memory WISC-V	–	91	8.50	Language problem	2 (12.50%)
Conner's Test score for mothers and fathers	–	15	8.84	Emotional dysregulation	2 (12.50%)
EDAH Test Score Items for Conduct Disorder	–	14	6.63	Autism spectrum problem	2 (12.50%)
EDAH Test Score Items for Attention Disorder	–	8	2.56	–	–
EDAH Test Score Items for Hyperactivity Disorder	–	9	3.22	–	–

Note. Characteristics of the participating boys/girls. Demographic, symptomatological and diagnostic descriptors of the sample. SD = statistical deviation. I.Q. = intelligence quotient. TONI-2 = Non-verbal intelligence test. WISC-V = Children' Weschler Battery. EDAH Test = Test for Attention Deficit Hyperactivity Disorder.

treatments' effects model. The factors were extracted using a principal axis factorization and a varimax rotation. Then the variables that loaded less than 0.3 in each factor (subloaders) or that loaded in two or more factors with loads > 0.3 (crossloaders) were eliminated. The procedure was repeated iteratively until no subloaders or crossloaders appeared, obtaining a total of 2 factors. The variables within each factor were transformed to z-scores to obtain composite scores. The internal consistency for each of the factors was  $\alpha = .85$ ,  $\omega = .92$ ; and  $\alpha = .83$ ,  $\omega = .96$ , respectively.

This procedure left only two relevant factors. *Factor 1 (the cognitive factor)* included the *anxiety scales, externalizing problems, working memory, planning and organization, supervision of tasks and organization of materials*. This *cognitive factor* is possibly associated with the *cognitive dimension* of self-regulation (Malanchini et al., 2019); thus, here is referred as “*cognitive factor*”. *Factor 2 (the personality factor)* included the scales of *withdrawal, adaptability, social skills, and adaptation skills*. The *personality factor* possibly presents statistically significant changes in self-regulation in its *emotional control* outcomes when related to the *personality dimension* (Malanchini et al., 2019). Thus, for later it is referred as “*personality factor*”. These factors were then included as control variables in the regression analysis, to analyze if they influenced the effect of the interventions before and after treatments, for both FBT and CPT.

For the purposes of this study, were considered as predictors of self-regulation the main variables associated with the *cognitive factor* of Gioia et al. (2017). These were *hyperactivity, aggressiveness, inhibition, behavioral problems, emotional control, self-supervision and attentional problems*. For the analysis of the data we adjusted, for each of this outcome's variables, a linear mixed-effect model using the R library *nlme* (Pinheiro et al., 2018). As the dependent variable, we used the difference in each of the selected BRIEF and BASC scores before and after intervention ( $\Delta$ Outcomes). This was calculated, for the CPT and FBT interventions, as the score obtained by the participant after the intervention minus the score the same participant obtained before the intervention. In the complete model we included, as independent variables: *treatment*, a dummy variable that takes the value 0 for FBT and 1 for CPT; *Order* (i.e., the order in which treatments were delivered), specified as a dummy variable that takes the value 0 when CPT is the first treatment and FBT the second one, and the value 1 *vice-versa*; *the cognitive factor* and *the personality factor*, which are the composite scores obtained from factor analysis, and *initial score*, the score of the subjects in the response variable at the beginning of the process, before any

intervention. Repeated measures were controlled by assigning a random intercept and slope (Jonas et al., 2018).

Then, using a backward method, we specified a partial model that includes, for each regression, only the variables that presented a *p-value* < .05. These partial models were contrasted against a null model using dependent variable average as regressor, using the  $\chi^2$  test and Bayesian parsimony diagnostics (AIC, BIC). In addition, we obtained the conditional and marginal *r2* value (which computes the fixed and fixed plus random effects, respectively) for each model, using the R function *r.squaredGLMM* (Bartoń, 2022).

## Results

### Sample description

A total of 16 participants entered the study, three girls and thirteen boys. The participants did not present sociodemographic differences. The distribution of schooling was *second grade* = 50%; *first grade* = 31.25%; and *kindergarten* = 18.75%. All of them were without therapeutic support. Half of the sample was found to be medicalized. All participants presented the *clinical diagnosis* of ADHD. The diagnosis of ADHD in the participants presented a different level of severity associated with neurodevelopment. Specifically, seven (43.75%) presented ADHD characteristics. Only one presented (6.25%) comorbidity with anxiety disorder. Two of them (12.50%) had ADHD associated with a predominantly defiant conduct disorder. Two of them (12.50%) had ADHD with emotional dysregulation. Two (12.50%) had ADHD with communication difficulties. And finally, two (12.50%) participants had ADHD with possible autism spectrum comorbidities.

*General cognitive performance* was performed assessed with IQ TONI-2 ( $M = 122$ ,  $SD = 12.58$ ). The IQ processing speed WISC-V ( $M = 109$ ,  $SD = 14.71$ ) and the IQ *working memory* WISC-V ( $M = 91$ ,  $SD = 8.50$ ). With respect to the diagnostic confirmation for ADHD, the test score Conner's test for mothers and fathers reported ( $M = 15$ ,  $SD = 8.84$ ), *EDAH test score items for conduct disorder* ( $M = 14$ ,  $SD = 6.63$ ), *EDAH test score items for attention disorder*  $M = 8$ ,  $SD = 2.56$ ) and *EDAH test score items for hyperactivity disorder* ( $M = 9$ ,  $SD = 3.22$ ) (Table 1).

### Outcomes of interventions: CPT followed by FBT improved hyperactivity scores

We found that for all the dependent variables of the BRIEF scale, the initial level of each one the initial level of each one predicts

**Table 2**  
Mixed-linear regression for the BRIEF subscales

BRIEF	Inhibition				Emotional control				Self-monitoring			
	Complete		Partial		Complete		Partial		Complete		Partial	
	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>
(Intercept)	29.46	.02*	17.63	.05*	43.57	.02*	29.76	.03*	26.24	.17	–	–
CPT	4.88	.18	–	–	6.04	.17	–	–	9.79	.07	–	–
Second moment	–1.99	.64	–	–	.34	.93	–	–	8.65	.14	–	–
Initial level	–.5	.01*	–.31	.03*	–.71	.01*	–0.48	.02*	–.51	.08	–	–
Cognitive factor	4.34	.07	–	–	4.89	.10	–	–	2.96	.36	–	–
Personality factor	–0.37	.87	–	–	5.79	.03*	5.65	.04*	–.81	.79	–	–
CPT * Second moment	–4.31	.39	–	–	–6.24	.30	–	–	–14.59	.07	–	–
<i>r</i> <sup>2</sup> marginal	.34		–		.43		–		.33		–	
<i>r</i> <sup>2</sup> conditional	.37		–		.47		–		.33		–	
Anova	.14		.12		.03*		.03*		.14		–	

\**p* < .05.

**Table 3**  
Mixed-linear regression for the BASC subscales (not including hyperactivity)

BASC	Aggressiveness				Behavioral problems				Attentional problems			
	Complete		Partial		Complete		Partial		Complete		Partial	
	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>
(Intercept)	22.41	.04*	20.50	.00**	34.21	.05	18.92	.05	42.46	.00**	26.24	.00*
CPT	11.65	.03*	5.37	.14	7.47	.29	–	–	.57	.88	–	–
Second moment	1.25	.83	–	–	–6.22	.50	–	–	–5.63	.24	–	–
Initial level	–.44	.00**	–.40	.00**	–.56	.03*	–.35	.04*	–.66	.00**	–.46	.00**
Cognitive factor	1.19	.69	–	–	3.49	.49	–	–	4.97	.10	–	–
Personality factor	2.43	.44	–	–	6.55	.18	–	–	1.57	.49	–	–
CPT * Second moment	–12.85	.08	–	–	–6.81	.44	–	–	–4.12	.44	–	–
<i>r</i> <sup>2</sup> marginal	.52		–		.43		–		.51		–	
<i>r</i> <sup>2</sup> conditional	.52		–		.73		–		.51		–	
Anova	.00**		**		.42		.11		.00**		–	

\**p* < .05. \*\* *p* < .01.

**Table 4**  
Mixed-linear regression for the BASC's hyperactivity subscale

BASC	Hyperactivity			
	Complete		Partial	
	$\beta$	<i>p</i>	$\beta$	<i>p</i>
(Intercept)	–1.9	.80	–6.25	.02*
CPT	11.51	.00**	11.88	.00***
Second moment	5.37	.21	6.75	.04*
Initial level	–0.06	.55	–	–
Cognitive factor	–.39	.87	–	–
Personality factor	3.09	.19	–	–
CPT * Second moment	–16.22	.00**	–16.88	.00***
<i>r</i> <sup>2</sup> marginal	.45		.39	
<i>r</i> <sup>2</sup> conditional	.59		.52	
Anova	.00**		.00**	

\**p* < .05. \*\* *p* < .01. \*\*\* *p* < .001.

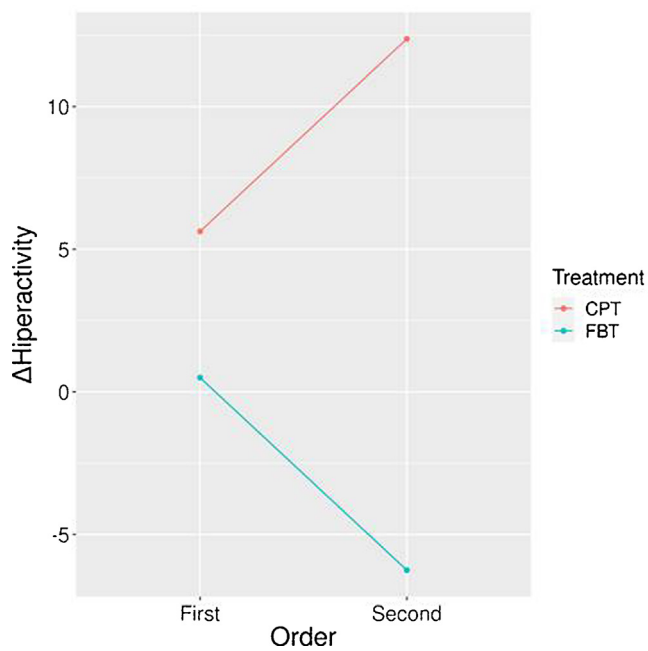
the response to the treatment (*inhibition*:  $\beta_{Initial} = .31, p = .03$ ; *emotional control*:  $\beta_{Initial} = -.48, p = .02$ ; *Table 2*). The only exception is *self-monitoring* ( $\beta_{Initial} = -.51, p = .08$ ; *Table 2*). This means that the initial state of the participants was relevant to their result. The factor analysis, using two factors obtained from the parallel analysis (function *R* fa.parallel), explained .59 of the variance. In the BASC scale, the initial level of *aggressiveness*, *attentional problems* and *behavioural problems* predicts the *aggressiveness*, *attention problems* and *behavioural problems* responses to treatment ( $\beta_{Initial} = -.40, p < .00$ ;  $\beta_{Initial} = -.46, p < .00$ ;  $\beta_{Initial} = -.35, p = .04$ , respectively; *Table 3*), but not the *hyperactivity* ( $\beta_{Initial} = -.06, p = .55$ ; *Table 4*) responses. All the regression coefficients associated with  $\beta_{Initial}$  are < 0, of the variables analyzed, except for *hyperactivity*. This suggests that subjects with the worst initial state respond better.

*Hyperactivity, self-monitoring and behavioural problems* are the only regression where the intercept is not statistically significant (for the others scales, the values are; *inhibition*:  $\beta_{Intercept} = 17.63, p = .05$ ; *emotional control*:  $\beta_{Intercept} = 29.76, p = .03$ ; *aggressiveness*:  $\beta_{Intercept} = 20.5, p < .00$ ; *behavioral problems*:  $\beta_{Intercept} = 18.92, p = .05$ ; *attention problems*:  $\beta_{Intercept} = 26.24, p < .00$ ; *Tables 2 and 3*), suggesting that they are the only scales where there was no effect of the FBT treatment.

More importantly, we found a significant association between changes in the *hyperactivity* scales, the interventions applied, and their order of occurrence. Specifically,  $\Delta$  *hyperactivity* shows significant association with CPT, CPT applied in the second moment, and the interaction between both variables ( $\beta_{CPT} = 11.88, p < .00$ ;  $\beta_{Second} = 6.75, p = .04$ ;  $\beta_{CPT*Second} = -16.88, p < .00$ , respectively; *Table 4*). That is, when the FBT intervention was applied after the CPT, the effect of the FBT is significant (*Figure 3*). *Figure 3* shows the *hyperactivity* component, which decreases the lower the score on the BASC scale. The blue line indicates psychomotor therapy (CPT) and the red line corresponds to intervention with parents (FBT). In the CPT an elevation is observed in the second moment, and the FBT presents a significant decrease in the second. In other words, girls and boys must first go to psychomotor therapy so that later, the FBT intervention is carried out and generates significant changes in the self-regulatory behavior associated with the *hyperactivity* scale.

Regarding the composite score scales, there was only a statistically significant effect in personality factor related to emotional control outcomes for the full model ( $\beta_{Personalityfactor} = 5.79, p = .03$ ) and partial model ( $\beta_{Personalityfactor} = 5.65, p = .04$ ) (*Table 2*). Likewise, interaction is crucial to understanding the effect of interventions. The main variable is the treatment and it would be moderated by the order variable. This means that when CPT is 11.86 it is because FBT was at the beginning of both interventions. That is,





**Figure 3.** Hyperactivity shows significant association with CPT and FBT in the second moment.

the treatment effect is 11.86 points for girls and boys who had FBT first. And, the treatment effect when CPT is first and FBT is second, is -5 points. This indicates that the score is reduced by -5 points, therefore, the symptoms of hyperactivity decreased (Figure 3). In conclusion, when analyzing the interactions associated with the order of treatment, the first order CPT and the second order FBT, the participants improved in their symptoms, unlike the combination, in which the CPT was second order and the first order FBT.

## Discussion

This study contributes to the evaluation of the effect of two clinical interventions, specifically family bond therapy in conjunction with clinical psychomotor therapy, on the capacity for self-regulation in girls and boys diagnosed with ADHD. The effect of the interventions was evaluated through the change in self-regulatory capacity measured with two questionnaires addressed to mothers and fathers, applied to the child's parents before and after each intervention. As stated by Gioia et al. (2017), self-regulatory capacity is a general domain, which is why key indicators were used for this study to assess changes in behavior. Between both BRIEF and BASC questionnaires, the main variables of self-regulation were evidenced, such as *hyperactivity*, *inhibition*, *attention problems*, *emotional control*, *aggressiveness*, and *self-monitoring*, and how they changed in the girls and boys after receiving the interventions.

The main result of the therapeutic effect on self-regulatory capacity was evidenced in the *hyperactivity* scale of the BASC questionnaire because it decreased in the FBT after CPT. That is, significant changes appear in the FBT when it is performed after the CPT associated with the intervention in girls and boys. It may be that when girls and boys reduce disruptive symptoms within the family environment, mothers and fathers are better able to address their troublesome parenting issues. Grolnick et al. (2021) reported changes in self-regulatory behavior associated with externalizing symptoms such as *hyperactivity* after a parental intervention focused on parenting. Leijten et al. (2019) argued that nonviolent discipline techniques, which increase self-control, achieve stronger effects in the treatment of disruptive behaviors.

Regarding the influence of socioeconomic status on interventions, Chen and Chang (2016) reported that parenting programs produced positive effects in reducing child abuse in low-, middle-, and high-income countries. Other authors maintain that the intervention was more effective with parents with a lower educational level (Grolnick et al., 2021). This evidence agrees with the characteristics of the study sample, since they show a decrease in externalizing behaviors, although the symptom of *hyperactivity* was not measured as it was in our study. However, this sample characteristic could affect the generalization of our results.

The decrease in *hyperactivity* is central because it is one of the main symptoms of the self-regulation difficulties (Barkley, 1997a, 2001). Also, this component is key to executive functions and affected girls and boys with ADHD (Henríquez-Henríquez et al., 2015; Zamorano et al., 2020). These relationships with executive functions and interventions aimed at mothers and fathers and girls and boys in psychomotor therapy have already been reported (Chavez Arana et al., 2020; Cipollone & Carta, 2015; Fosco et al., 2018). In this way, the decrease in *hyperactivity* is consistent with the expected results of the psychomotor intervention that sought to reduce excessive movement, facilitate operational thinking and promote the acquisition of cognitive and instrumental strategies to improve adaptation to the environment (Aucouturier, 2004; Calmels, 2003; Chokler, 2005; Mila, 2008). In addition, *hyperactivity* is a highly disruptive symptom that was evidenced within the family environment. This was approached in parental interventions as a clear example of creating models of authority different from their own experiences as girls and boys. Thus, generating coping strategies that would calm the reactivity of mothers and fathers and girls and boys, giving meaning to this behavior. In other words, becoming aware of hyperactivity as a symptom of the problem was a way of repairing the mothers and fathers' own history. One solution was, together with the child, expressions of discharge such as those experienced in the CPT intervention.

No changes were reported after FBT or CPT in the *aggressiveness scale* of the patients, as it was the case in the study by Zwets et al. (2016) after the intervention of a pilot program. There were no significant improvements in the internalization of anger, depression, and no significant changes in quality of life unlike other studies (Boerhout et al., 2016; Breivte et al., 2010; Canuto et al., 2008). Although if the initial level of the response variable is a significant predictor for the *inhibition*, *emotional control*, *aggressiveness scale* for the BRIEF questionnaire and, for the BASC questionnaire, the *initial state* of the *attention problems scales* and *aggressiveness* were predictors in the effect of the treatment. Sandell (1985) affirms that the greater the ability to integrate the patient's self at the beginning of the treatment, the better the results of the therapeutic intervention would be. This is because basic conflict resolution would be associated with greater symptoms, in which a decrease in self-regulation capacity implies more intervention time and therapeutic changes are more gradual. Therefore, baseline status must be considered to determine the effects of interventions. A meta-analysis on parenting programs and the components of disruptive behavior in girls and boys argued that the effect of the interventions involved an improvement in the behavior of the participants (Leijten et al., 2019).

In conclusion, this research carried out a pilot study that analyzed the effect of a psychomotor therapeutic program for children with parental support as a possibility to contribute to the clinical and educational field. Specifically, it made visible two types of interventions and their methods to be evaluated. The FBT intervention promotes the emotional reconnection of the parents with their own parents to re-establish the role of son or daughter, and thus, from this subjective position, build a new model of authority with clear, safe and container limits. The CPT intervention, on the other hand, promotes spontaneous play through psychomotor

skills, encouraging the psychomotor expression of each one of the members of the group within an ecological context. The result of the interaction of both interventions showed a decrease in hyperactivity symptoms, specifically the self-regulatory capacity.

In relation to the limitations of this study, it should be noted that the intervention program presented a non-random distribution of participants due to the prevailing clinical environment and experimental design. The participants included in the study were assigned to the intervention programs according to their therapeutic needs. Although this could generate methodological concerns, it was resolved by analyzing the data with the generation of a GML model that includes regression variables that indicate the initial state of each of the participants.

Subsequent studies should expand the sample group to improve the robustness of this research. However, the costs involved in therapeutic interventions should be emphasized. This increases the difficulties and in the execution of clinical studies, and even more when it comes to girls and boys, because they depend on the relatives for their participation. These findings invite us to carry out comprehensive intervention programs for both mothers and fathers and girls and boys with a population that presents other problems. Other limitations of this study were that the measurement did not incorporate external evaluators other than the mothers and fathers. And part of the applied reports, such as BASC, did not contemplate the latest standardized version due to accessibility problems and high associated costs. Furthermore, it only assessed the effect with a limited number of intervention sessions, therefore, it cannot be determined to generalize the findings if they were longer interventions.

In general, our study contributes to the line on the need to carry out comprehensive interventions that address the family both in its dimensions as mothers and fathers and girls and boys. Larraín-Valenzuela and Nieto-Basaure (2020) describe the need to integrate support in family bond therapy in psychomotor skills with the aim of improving interventions in the clinical setting. Furthermore, the integration of the interventions perhaps favored therapeutic adherence, since it was only one that existed in less than half of the psychomotor intervention sessions for reasons unrelated to the program. Finally, this study may open up a field of clinical research that integrates parental interventions aimed at both mothers and fathers and children to strengthen mental health.

## Financing Funds

This research was financed by the PhD grant, Agencia Nacional de Research and Development, State of Chile. grant number 21181127 from JL-V <https://www.anid.cl/conoce-anid/> and National Center for Artificial Intelligence CENIA, FB210017, BASAL, ANID from RV.

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