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School interventions for ADHD: A literature review (2000-2018)

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Abstract

Attention-Deficit/Hyperactivity Disorder (ADHD) affects between 3% and 6% of the child population, with those affected children presenting high failure and school dropout rates. From this perspective, interventions implemented in the school context, especially in the classroom, are relevant to the educational process of students with ADHD. This study's objective was to retrieve studies addressing school interventions conducted with children and youth with ADHD through a literature review performed between 2000 and 2018. Empirical peer-reviewed studies, written in Portuguese or English were selected from the Capes Periodical database. Thirty-three papers met the inclusion criteria, only two of which were Brazilian studies. The results reveal positive effects of different intervention strategies on typical academic and ADHD repertoires, which encourages further research and applications.

Keywords: ADHD; school interventions; literature review; children; adolescents

INTERVENÇÕES ESCOLARES PARA O TDAH: UMA REVISÃO DA LITERATURA (2000-2018)

Resumo

O Transtorno de Déficit de Atenção/Hiperatividade (TDAH) acomete entre 3% e 6% da população infantil, a qual apresenta índices elevados de fracasso e evasão escolar. Nessa perspectiva, intervenções realizadas no contexto escolar e, principalmente, em sala de aula, são relevantes para o processo educacional dos estudantes com TDAH. O objetivo do presente estudo foi recuperar publicações relativas a intervenções escolares com crianças e jovens com TDAH por meio da revisão da literatura no período entre 2000 e 2018. Estudos em português ou inglês, empíricos e revisados por pares foram selecionados na base de dados Portal de Periódicos Capes. Trinta e três artigos atendiam aos critérios de inclusão, apenas dois brasileiros. Os resultados evidenciaram efeitos positivos de diferentes estratégias interventivas sobre repertórios acadêmicos e típicos do TDAH incentivando novas investigações e aplicações.

Palavras-chave: TDAH; intervenções escolares; revisão da literatura; crianças; adolescentes.

INTERVENCIONES ESCOLARES PARA TDAH: UNA REVISIÓN DE LA LITERATURA (2000-2018)

Resumen

El Trastorno de Déficit de Atención/Hiperactividad (TDAH) acomete entre el 3% y el 6% de la población infantil la cual presenta índices elevados de fracaso y evasión

escolar. En esta perspectiva, intervenciones realizadas en el contexto escolar y, principalmente, en el aula, son relevantes para el proceso educativo de los estudiantes com TDAH. El presente estudio tuvo como objetivo recuperar las publicaciones relativas a intervenciones escolares realizadas con niños y jóvenes con TDAH, por medio de la revisión de la literatura em el período compreendido entre 2000 y 2018. Fueron selecionados los estudios en portugués o inglés, empíricos y revisados por pares en la base de datos Portal de Periódicos Capes. Treinta y tres artículos atendían a los criterios de inclusión, apenas dos brasileños. Los resultados evidenciaron efectos positivos de diferentes estrategias interventivas sobre el repertorio típico del TDAH y académicos incentivando nuevas investigaciones y aplicaciones.
Palabras-clave: TDAH; intervenciones escolares; revisión de la literatura; niños; jóvenes.

1. Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by the persistence of a triad of symptoms (inattention, hyperactivity, and impulsiveness) that affects from 3% to 6% of the world's children population (American Psychiatric Association, 2014), and is considered one of the most common childhood disorders.

There is a consensus that ADHD is a multifactorial disorder that requires a multimodal intervention approach (Benczik, 2014; Costa, Moreira, & Seabra Júnior, 2015), involving different social agents and contexts (DuPaul & Stoner, 2015; Mattos, 2015). Studies (e.g., Murray, Arnold et al., 2008; So, Leung, & Hung, 2008) have shown that the results obtained by combining pharmacological and behavioral interventions are superior to those obtained when only one type of intervention is adopted.

Despite such evidence, the use of drug interventions predominates, as the number of medications available and their increased consumption shows. In the United States, for instance, the number of drugs intended for the treatment of ADHD increased by four times in ten years (Schachar et al., 2002). Among pharmacological interventions, clinical guidelines from different countries recommend psycho-stimulant drugs, such as methylphenidate and lisdexamfetamine dimesylate, as first-line drugs (e.g., Canadian ADHD Resource Alliance [CADDRA], 2018; National Institute for Health and Care Excellence [NICE], 2018). Non-stimulant drugs like Atomoxetine and guanfacin are considered second-line alternatives.

An increase in consumption rates accompanies this increased variety of medications. In Brazil, the sale of methylphenidate increased by 1.616% between 2000 and 2008 (Moyses & Collares, 2013). In England, the use of stimulants to treat ADHD jumped from 220,000 prescriptions to 418,300 between 1998 and 2004 (National Institute for Health and Care Excellence, 2013).

Despite evidence of the efficacy of pharmacological interventions, there are limitations, such as potential side effects or intolerance; low responsiveness; short-term effect; and impediments concerning age (Moreno-García, Meneres-Sancho, Camacho-Vara de Rey, & Severa, 2019; National Institute for Health and Care Excellence, 2013). According to the subcommittee on ADHD from the American Academy of Pediatrics (2011), preschoolers should be exclusively treated with non-pharmacological means; the use of medications is recommended only for children older than six years of age and adolescents.

In addition to the limitations above, there is a criticism of explanations that ADHD is a condition of essentially organic nature. These explanations, coherent with the context of health, have been accepted by other fields, such as education. The consequence of this phenomenon, known as school medicalization, is the pathologization of educational problems. As such, pathologies considered to be inherent to children tend to be used to justify school difficulties and failures (Signor, Berberian, & Santana, 2017). In this process, the school is often not held liable for the difficulties children present or fails to acknowledge its essential role as providing a context where interventions to treat ADHD can be implemented.

Interventions implemented in the school context are considered particularly important from a multimodal perspective because this is a context where typical ADHD behaviors are the most dysfunctional and contribute to alarming rates of school failure and dropout, reaching up to 35% in high school (Dorneles, Corso, Costa, Pisacco, & Sperafico, 2014). Considering that the field in which educational agents work goes beyond biological concerns, behavioral interventions have been appointed as an alternative or a complement to pharmacological treatment within the school context (DuPaul & Stoner, 2015).

Considering the importance of intervening in ADHD cases within the school context to promoting a repertoire of more adaptive behaviors and preventing school failure and dropout, this exploratory/descriptive study's objective is to identify, through a literature review, papers published from 2000 to 2018 addressing

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non-pharmacological interventions implemented among children and youth with ADHD in the school context.

2. Method

Papers were searched from the Periodicals Portal of the Coordination for the Improvement of Higher Education Personnel (Capes), which gathers and makes available 127 databases (e.g., Eric, Ebsco, Lilacs, MEDLINE/PubMed, PsycINFO, SciELO, Web Of Science). The search for papers published between 2000 and 2015 was conducted from March to April 2016 and papers published between 2016 and 2018 were searched from February to March 2018.

Nine different descriptors were used in the initial search, four of which referred to disorders (Hyperactiveness, Hyperactivity, Attention Deficit and ADHD) and the remaining referred to interventions (Psychopedagogy, Psychopedagogical, School Intervention, Classroom Intervention, and Classroom Strategies). The describers were combined in pairs (one disorder and one intervention), forming 20 pairs of words. An analysis of the keywords of the papers identified resulted in the search being restricted to the ADHD and school intervention descriptors. School Intervention was the most effective descriptor in identifying papers that addressed this study's objective. The initial search using the psychopedagogy and psycho-pedagogical descriptors resulted in many papers addressing clinical interventions implemented outside of school, while the classroom descriptor restricted the search, leading to papers addressing school interventions that were not implemented within a classroom being disregarded.

The papers were selected after reading the abstracts and applying the inclusion criteria: (1) published in a scientific journal; (2) reporting empirical research; (3) published between 2000 and 2018; (4) written in English or Portuguese; and (5) peer-reviewed. Exclusion criteria were: (1) addressing a population other than children and/or adolescents within the school context; (2) addressing children and/or adolescents with comorbidities; and (3) not reporting empirically investigated interventions. Papers that appeared more than once (n = 9) or the full texts of which were not available in the database (n = 4) were also excluded. The full texts of the papers that met the inclusion criteria were read in detail.

A total of 762 papers were initially identified using the final descriptors ADHD and School Intervention (Figure 2.1). After reading the titles and abstracts,

102 studies were selected following the inclusion/exclusion criteria. Of these, nine were excluded because they appeared more than once so that 93 papers remained. After carefully reading the full texts of these 93 papers, 33 papers composed the study's sample.

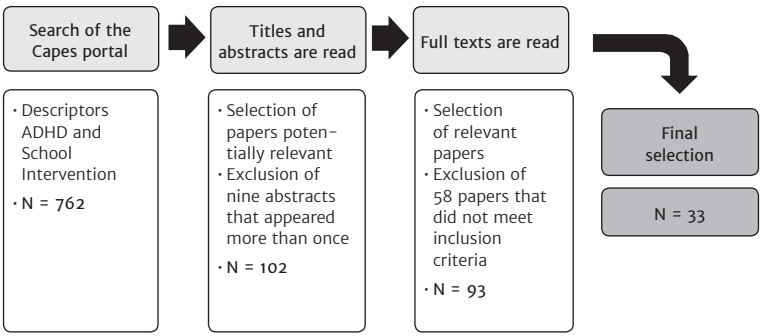

Figure 2.1. Flowchart of the identification and selection of papers.

3. Results

A total of 33 papers addressing non-pharmacological interventions implemented in the school context with children and/or adolescents with ADHD were identified (Tables 3.1 and 3.2). Thirty-one papers were written in English and two in Portuguese and the papers were published in 27 different journals. No publications were found between 2000 and 2004. Of the total, 18 papers describe research conducted in classrooms and 15 in the school context.

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Table 3.1. Summary of studies addressing ADHD interventions in the school context (2000–2008).

Study	Intervention	Context	N	Target Behavior(s)	Mediation
Clarfield and Stoner (2005)	*Headsprout Reading Basic* Computer-based program	Computer room	3	Oral reading fluency and task engagement	Computer
Peck et al. (2005)	Yoga	Gymnasium; Classroom	10	Attention	Physical Education teacher
Plumer and Stoner (2005)	*Classwide Peer Tutoring - CWPT and Peer Coaching – PC* (Peer tutoring and peer training)	Classroom	3	Social behaviors	Peers
Mautone et al. (2005)	*Math Blasteré - Computer Assisted Instruction – CAI*	Resources room	3	Mathematics performance	Computer
Stahr et al. (2006)	Self-monitoring	Classroom	1	Task engagement, social behaviors.	Therapist
Gumpel (2007)	Self-monitoring with non-contingent and contingent reinforcement	Recess	3	Social skills	Therapist
Murray et al. (2008)	Daily Behavior Report Card – DBR	Classroom	24	Academic skills	Teacher

Table 3.2. Synthesis of studies addressing ADHD interventions in the school context (2009-2018).

Study	Intervention	Context	N	Target Behavior(s)	Mediation
Fabiano et al. (2009)	Daily Behavior Report Card - DBR	Classroom	63	ADHD typical behaviors	Teacher
Schottelkorb and Ray (2009)	Child-centered therapy and person-centered consultation for teachers	Games room	4	ADHD typical behaviors	Therapist/ Counselor
Volpe et al. (2009)	Traditional Data--Base Academic Intervention –TDAI e Intensive Data--Base Academic Intervention – IDAI (Teaching models based on intensive or traditional consultations for teachers)	Classroom	175	Academic engagement	Teacher
Cihak et al. (2009)	Tootling (peer communication)	Classroom	19	Disruptive behavior in classroom and peer communication	Peers
Fabiano et al. (2010)	Daily Behavior Report Card – DBR	Classroom	63	Academic performance	Teacher
Brady and Kubina Jr. (2010)	Endurance of Multiplication Fact Fluency	Experiment room	3	Mathematics skills	Computer
Pina et al. (2010)	Ludomotricity and cortical stimulation	Resources room	10	Reading/ writing	Resources Room Teacher

(*continues*)

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Table 3.2. Synthesis of studies addressing ADHD interventions in the school context (2009-2018).

Study	Intervention	Context	N	Target Behavior(s)	Mediation
Rabiner et al. (2010)	Computerized Attention Training -CAT and Computer Assisted Instruction – CAI	Computers room	77	Attention in classroom and school performance	Computer
Leflot et al. (2010)	Good Behavior Game-GBG (Teacher classroom management strategies)	Classroom	570	Disruptive behavior	Therapist / Counselor
Erbey et al. (2011)	Flashcards with reading racetrack	Resources room	3	Reading and Mathematics skills	Teacher
Ozdemir (2011)	First Step to Success Program on Academic – FSS [I think "in Academics"?]	Support room; Classroom	4	Academic engagement	Therapist / Counselor
Smith et al. (2011)	Rocket Math	Classroom	1	Mathematics performance	Computer
Young (2012)	Cognitive-behavioral group therapy	Not reported	48	Intervention adherence	Therapist / Counselor
Kercood et al. (2012)	Highlighted words	Experiment room	10	Mathematics performance	Teacher
Cole et al. (2012)	Anger regulation cognitive behavioral program	Support room	70	Understanding and self-perception of anger	Therapist / Counselor
Nolan and Filter (2012)	Non-contingent reinforcement (NCR) and response cost (RC)	Classroom	1	Problem behaviors	Therapist / Counselor

(*continues*)

Table 3.2. Synthesis of studies addressing ADHD interventions in the school context (2009-2018).

Study	Intervention	Context	N	Target Behavior(s)	Mediation
Vujnovic et al. (2013)	Daily Behavior Report Card – DBR	Classroom; Casa	33	Parents' and teachers' adherence	Teacher
Wells e Sheehey (2013)	Positive Behavior Support (incorporation of students' interests in the curriculum)	Resources room; Classroom	3	"Positive" behaviors - school tasks engagement	Computer
Costa et al. (2015)	Ludomotor and strategy games	Gymnasium; Classroom	4	Memory, attention, and concentration	Physical Education teacher
Muratori et.al. (2015)	Coping Power Program	Classroom	184	Problem behaviors and prosocial behavior	Teacher
Cirelli et al. (2016)	Activity schedule	Classroom	2	Academic performance	Teacher
Dawson et al. (2016)	Family-school collaborative, psychosocial, multimodal intervention	Resources room	139	Attention deficit; hyperactivity; impulsivity	Therapist / Counselor
Feil et al. (2016)	Preschool First Step – PFS (family-school joint intervention with feedback to students' behaviors in classroom and guidance provided by parents at home)	Classroom; Casa	45	Attention deficit; hyperactivity; impulsivity	Coach/Teacher

(*continues*)

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Table 3.2. Synthesis of studies addressing ADHD interventions in the school context (2009-2018).

Study	Intervention	Context	N	Target Behavior(s)	Mediation
Langberg et al. (2016)	The Challenging Horizons After School Program (Psychosocial intervention for adolescents)	Classroom; Casa	112	Attention; Executive functions	Coach
Leckey et al. (2016)	The Incredible Years Teacher Programme	Classroom	217	Disruptive behavior	Teacher
Chou and Huang (2017)	Yoga	Gymnasium	49	Attention; Executive Functions	Physical Education teacher

The number of participants (one to 570), as well as the behaviors of interest, varies as much as the number of interventions. Some papers focused on academic performance, while others focused on reducing characteristic ADHD behaviors.

Given the variability of interventions, we decided to group the studies based on the intervention mediators – teacher, peers, computer, or other professionals. Additionally, a set of studies, the focus of which was functional analysis-based interventions and the use of conditioning principles, was identified. The studies are presented according to these five categories.

3.1 Teacher-mediated interventions

Thirteen studies fell under this category, four of which refer to interventions of a physical/psychomotor nature. Increased attention and discrimination was observed with the use of yoga (Chou & Huang, 2017; Peck, Kehle, Bray, & Theodore, 2005). Improved learning of writing and reading was reported with the use of ludomotor tasks and educational games (Pina et al., 2010). A psychomotor-based program that stimulates memory, attention, and concentration using playful and strategy games, adapted from teaching resources employed in Physical Education classes, was proposed (Costa et al., 2015).

The nine studies that remained address five different teacher-mediated interventions: Daily Behavior Report – DBR or Daily Registration Card – DRC; Traditional Database Academic Intervention - TDAI; Intensive Database Academic Intervention – IDAI; Activity Schedule, Room Management Training Program, and Flashcards with Reading Racetrack.

The DBR/DRC (Fabiano, Vujnovic, Naylor, Pariseau, & Robins, 2009; Fabiano et al., 2010; Murray, Rabiner, Schulte, & Newitt, 2008; Vujnovic, Fabiano, Pariseau, & Naylor, 2013) involves the use of a record protocol with a list of students' target behaviors. This protocol needs to be completed daily, and feedback is required when specific behaviors are presented. In general, studies using DBR/DRC report positive effects of the intervention in terms of academic skills (Murray, Rabiner et al., 2008), antisocial behavior, hyperactivity/impulsiveness (Fabiano et al., 2009; Fabiano et al., 2010), and adherence to the intervention on the part of parents and teachers (Murray, Rabiner et al., 2008; Vujnovic et al., 2013).

The TDAI and IDAI differ regarding the degree to which students are monitored and receive feedback, which is more intense and systematic in the IDAI. Both interventions promoted improved academic engagement (Volpe, DuPaul, Jitendra, & Tresco, 2009).

Kercood, Zentall, Vinh, and Tom-Wright (2012) investigated the effects from manipulating didactic material and verified that a greater number of correct answers to mathematical problems was obtained when key words were highlighted. Erbey, McLaughlin, Derby, and Everson (2011) used a racing track game and flashcards with words or objects that interested children as a means to teach phonetics, words and added facts to a student with ADHD and the combined use of two instruments improved the student's mathematical and reading skills.

Strategies focusing on the behavior of teachers (Leckey et al., 2016) or students (Cirelli, Sidener, Reeve & Reeve, 2016) aimed at organizing classroom teaching work, were investigated. In order to strengthen the competencies of teachers in handling a classroom, Leckey et al.'s (2016) training (The Incredible Years Teacher Programme - IYTP) focused on the establishment of positive relationships with students to prevent problem behaviors and motivate students, among other things, was provided; the results show that teachers acquired an improved ability to manage a classroom. Cirelli et al. (2016) used an activity schedule to monitor the time two boys with ADHD independently dedicated to classroom tasks.

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3.2 Peer-mediated interventions

Three studies described interventions in which two students worked together, each one helping and providing feedback to the other. Plumer and Stoner (2005) assessed the effect of ClassWide Peer Tutoring – CWPT, in which students give instructions to their peers to solve exercises and provide feedback when they got them right. Active and positive involvement was observed among peers during the performance of tasks. Cihak, Kirk, and Boon (2009) found that disruptive behaviors decreased among all the participants when observation and recording of prosocial behavior were implemented among peers. Muratori et al. (2015) utilized peer mediation by implementing a negotiation and cooperation program to prevent aggressive behavior among children with ADHD. The results show an increase in the rate of prosocial behavior, decreased levels of stress, and hyperactivity/attention deficit.

3.3 Computer-mediated interventions

Computers are recommended as a tool to improve students' academic performance. Authors argue that the characteristics of computer-based exercises and the possibility of it being used continuously favor attention to and concentration on academic stimuli (DuPaul & Stoner, 2015).

Six studies addressed computer-based interventions, four of which were intended to improve performance in mathematics (Brady & Kubina, 2010; Mautone, DuPaul, & Jitendra, 2005; Rabiner, Murray & Skinner, 2010; Smith, March-and-Martella, & Martella, 2011).

Smith et al. (2011) used a computer-based game (Rocket Math) composed of math sheets, with a student diagnosed with ADHD; fewer errors were found after six months using the program. Mautone et al. (2005) assessed the effect of Computer Assisted Instruction - CAI, which presented tasks and then their results, with three students with ADHD. The students rated CAI positively. Brady and Kubina (2010) also reported that positive results were obtained on computer-mediated multiplication tasks performed by three students with ADHD. Rabiner et al. (2010) adopted two computer-based interventions (CAT and CAI) that focused on promoting a focus on mathematics and reading tasks. The Computerized Attention Training - CAT included a list of exercises focused on cognitive skills, hearing, and eyesight. The Computer Assisted Instruction – CAI focused on mathematics and

reading fluency using cognitive skills that were already trained into individuals. Both interventions reduced attention problems.

Clarfield and Stoner (2005) used CAI with three students with ADHD. Improved oral reading fluency was found in addition to greater engagement in academic tasks. Wells and Sheehey (2013) investigated the effect of computer use on the engagement of academic tasks and obtained positive results.

3.4 Interventions mediated by other professionals

Seven studies addressed interventions implemented by other professionals, such as therapists, counselors, and coaches. These interventions involved the school context, the monitoring of students at school, and demanded the participation of teachers, family, and/or a team.

Two studies focused on expression (Schottelkorb & Ray, 2009) and feelings management (Cole, Treadwell, Dosani, & Frederickson, 2012) by adopting Person-Centered and Cognitive-Behavioral interventions, respectively, reporting fewer typical ADHD behaviors and improved anger management.

The prevention of antisocial behaviors using interventions implemented by parents, teachers, or a specific team trained by a therapist was the objective of two studies. Ozdemir (2011) assessed the efficacy of a program intended to prevent the first signs of antisocial behaviors. The school and families of four children with ADHD in the initial school phase implemented the program; increased levels of academic engagement are reported. Leflot, Lier, Onghena, and Colpin (2010) designated a team to support the teacher in the classroom using tools to reinforce prosocial behaviors and academic performance, as well as to decrease antisocial behavior among students. The results reveal a decrease in students' disruptive behaviors.

Two other studies investigated the effect of family-school joint interventions (Dawson, Wymbs, Marshall, Mautone, & Power, 2016; Feil et al., 2016). Dawson et al. (2016) compared intervention and control conditions addressing children with ADHD, whose parents also presented ADHD. A total of 11 psycho-education sessions addressing ADHD were separately implemented among children and parents in the control group. The intervention condition consisted of an integrative, psychosocial treatment regimen provided in 12 sessions: two consisted of a family-school joint consultation; six sessions addressed the group of parents concur-

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rently with a group of children, and four sessions consisted of family therapy. The effect of the two conditions on disruptive behaviors was similar.

Feil et al. (2016) implemented a training program (Preschool First Step – PFS) to decrease and prevent the occurrence of disruptive behaviors among preschool children with ADHD. The training was provided in the classroom and at home. The teacher and instructor provided feedback for appropriate and inappropriate child behaviors. At home, parents and caregivers read about and demonstrated skills, such as communication and cooperation. Improved social skills and fewer disruptive behaviors are reported.

Langberg et al. (2016) assessed the effect of a psychosocial intervention program directed to adolescents with ADHD (The Challenging Horizons After School Program – CHP-AS). Meetings that lasted approximately two hours and focused on academic skills were held twice a week. Only 28% of the participants presented a significant improvement in academic skills.

The last study in this group assessed a group cognitive-behavioral therapy program implemented among children with ADHD at school (Young, 2012). The program included a direct intervention with children and indirect intervention with parents, who were instructed to act as coaches of their children. Parents and teachers reported improvement in the children's attention and their management of feelings.

3.5 Functional analysis-based interventions and interventions using conditioning principles

Identifying environmental events that reinforce ADHD-typical disruptive behavior is the starting point for planning interventions based on functional analyses. Three of the studies reported this type of intervention involving the use of principles of strengthening and weakening of behaviors.

Stahr, Cushing, and Lane (2006) verified that the behaviors of a girl with ADHD, such as not doing schoolwork and continually moving around, were maintained because of the attention she received from her teacher and classmates and the fact she was allowed to bypass her assignments. Interventions based on this analysis, involving communication system, self-monitoring, and an extinction improved target behaviors.

Two other studies used contingent reinforcement (CR) or non-contingent reinforcement (NCR) among children with ADHD. Nolan and Filter (2012) adopted a combination of NCR associated with response cost (RC) in a case study addressing a student with ADHD. The NCR consisted of the student having free access to music; RC involved the contingent removal of music when a problem behavior occurred. The duration of problem behaviors decreased considerably. Gumpel (2007) used a combination of self-control associated with CR. Self-control involved monitoring of social behaviors during recess. CR consisted of the use of positive reinforcement (compliments, smile, others) when prosocial behaviors occurred. The two procedures influenced target behaviors, but the results from CR were more systematic than those from self-monitoring.

4. Discussion

This study revealed that diversity of non-pharmacological interventions is implemented among children and youth with ADHD in the school context. In qualitative terms, an inexpressive amount of studies (seven studies) address this study's topic in the first half (2000 to 2008) of the 19-year period. In the second half, from 2009 to 2018, a substantial increase is observed in the number of studies addressing ADHD interventions in the school context. This increase in the number of publications follows a 66% increase in the number of ADHD diagnoses that occurred in the United States from 2000 to 2010 (Garfield et al., 2012), suggesting a growing interest in the topic, especially in the United States, where the largest number of studies is identified.

Despite the increased number of studies addressing school interventions, this number is still low if we compare it to the number of studies addressing pharmacological interventions. A total of 29 different denominations of interventions were identified in the 33 papers selected. One of these denominations (DBR) was investigated in more than one study, revealing the low number of replications that are essential to improving the external validity and generalization of results. On the other hand, starting in 2009, a methodological change is observed in the studies' designs in comparison to the studies developed up to 2008. The set of studies conducted up to 2008 involved a small number of participants and consisted of case studies; only two of the seven (28.6%) studies conducted in this period included ten or more participants. Among the studies conducted between 2009 and

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2018, those with a large number of participants (65.4%) predominate, suggesting that there was a greater concern for the generalization of results in the most recent studies.

In general, all the interventions promoted an increase in the repertoire of students with ADHD; that is, the frequency of behaviors characteristic of this disorder diminished, while attention and concentration behaviors increased, as did understanding and the number of correct answers obtained during academic tasks, among other improvements. These results are important concerning at least four aspects. First, the interventions addressed here are either an alternative or a complement to pharmacological treatment. Additionally, these interventions contribute to removing from the students' shoulders the full responsibility for their difficulties, as small adaptations to the school context and in academic tasks implemented by different mediators are efficacious in promoting more appropriate behaviors. The interventions have the potential to prevent school failure. Finally, the information collected here can be useful to guide people working with children and youth with ADHD to make better decisions on how to manage these individuals (Langberg et al., 2016).

These results, however, should be considered with caution. In addition to the low number of replications, the search for papers exclusively written in English or Portuguese resulted in papers that mostly originated in the United States. Thus, cultural differences that impact the school context should be taken into account. Additionally, inclusion and exclusion criteria established that the only indirect criteria indicating the papers' quality were being peer-reviewed and being indexed in a scientific portal. Other indirect measures of quality (number of citations and the journals' impact factor) applied to the final sample are not very reliable, given the large variability of these measures and the lack of correlation lack of correlation between the different measures (e.g., papers with many citations published in low impact journals).

Another positive aspect to be highlighted in the set of interventions identified here is their low cost; that is, they can be implemented concomitantly with other activities, not requiring exclusive time or dedication and requiring few specific material resources. In this sense, they present an advantage over pharmacological interventions, which are not only expensive but also present side effects (Moreno-García et al., 2019; NICE, 2013; Romano-Silva et al., 2015).

The conclusion is that the set of data presented in this paper is promising, though further studies are needed to investigate new modalities of school interventions, while the interventions already investigated need to be replicated.

References

American Academy of Pediatrics, Subcommittee on Attention-Deficit/Hyperactivity Disorder, & Steering Committee on Quality Improvement and Management. (2011). ADHD: Clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents. *Pediatrics*, *128*(5), 1007–1022. doi:10.1542/peds.2011-2654

American Psychiatric Association – APA (2014). *Manual diagnóstico e estatístico de transtornos mentais (DSM-5)*. (5. ed.). Porto Alegre: Artmed.

Benczik, E. B. P. (2014). *Transtorno de déficit de atenção/hiperatividade: Atualização diagnóstica e terapêutica*. (5. ed.) São Paulo: Casa do Psicólogo.

Brady, K. K., & Kubina Jr., R. M. (2010). Endurance of multiplication fact fluency for students with Attention Deficit Hyperactivity Disorder. *Behavior Modification*, *38*, 79–93. doi:10.1177/0145445510361331

Canadian ADHD Resource Alliance (CADDRA) (2018). *Canadian ADHD Practice Guidelines* (4th ed). Toronto: CADDRA.

Chou, C., & Huang, C. (2017). Effects of an 8-week yoga program on sustained attention and discrimination function in children with attention deficit hyperactivity disorder. *PeerJ*, *5*, e2883. doi:10.7717/peerj.2883

Cihak, D. F., Kirk, E. R., & Boon, R. T. (2009). Effects of classwide positive peer "tootling" to reduce the disruptive classroom behaviors of elementary students with and without disabilities. *Journal of Behavioral Education*, *18*, 267–278. doi:10.1007/s10864-009-9091-8

Cirelli, C. A., Sidener, T. M., Reeve, K. F., & Reeve, S. A. (2016). Using activity schedules to increase on-task behavior in children at risk for attention-deficit/hyperactivity disorder. *Education & Treatment of Children*, *39*(3), 283–318. doi:10.1353/etc.2016.0013

Clarfield, J., & Stoner, G. (2005). The effects of computerized reading instruction on the academic performance of students identified with ADHD. *School Psychology Review*, *34*, 246–254.

Cole, R. L., Treadwell, S., Dosani, S., & Frederickson, N. (2012). Evaluation of a short-term, cognitive-behavioral intervention for primary age children with anger-re-

lated difficulties. *School Psychology International*, *34*(01), 82–100. doi:10.1177/0143034312451062

Costa, C. R., Moreira, J. C. C., & Seabra Júnior, M. O. (2015). Estratégias de ensino e recursos pedagógicos para o ensino de alunos com TDAH em aulas de educação física. Revista Brasileira de Educação Especial, 21(1), 126–126. doi:10.1590/S1413-65382115000100008

Dawson, A. E., Wymbs, B. T., Marshall, S. A., Mautone, J. A., & Power, T. J. (2016). The Role of Parental ADHD in Sustaining the Effects of a Family-School Interventionfor ADHD. *Journal of Clinical Child and Adolescent Psychology*, *45*(3), 305–319. doi:10.1080/15374416.2014.963858

Dorneles, B. V., Corso, L. V., Costa, A. C., Pisacco, N. M. T., Sperafico, Y. L. S., & Rohde, L. A. P. (2014). The impact of DSM-5 on the diagnosis of learning disorder in ADHD children and adolescents: a prevalence study. *Psicologia: Reflexão e Crítica*, *27*(4), 759–767. doi:10.1590/1678-7153.2014274167

DuPaul, G. J., & Stoner, G. (2015). *ADHD in the schools: Assessment and intervention strategies*. New York: Guilford Press.

Erbey, R., McLaughlin, T. F., Derby, K. M., & Everson, M. (2011). The effects of using flashcards with reading racetrack to teach letter sounds, sight words, and math facts to elementary students with learning disabilities. *International Electronic Journal of Elementary Education*, *3*(3), 213–226.

Fabiano, G. A., Vujnovic, R., Naylor, J., Pariseau, M., & Robins, M. (2009). An investigation of the technical adequacy of a daily behavior report card (DBRC) for monitoring progress of students with attention-deficit/hyperactivity disorder in special education placement. *Assessment for Effective Intervention*, *34*(4), 231–241. doi:10.1177/1534508409333344

Fabiano, G. A., Vujnovic, R. K., Pelham, W. E., Waschbusch, D. A., Massetti, G. M., Pariseau, M. E., Naylor, J., Yu, J., Robins, M., Carnefix, T., Greiner, A. R., & Volker, M. (2010). Enhancing the effectiveness of special education programming for children with attention deficit hyperactivity disorder using a daily report card. *School Psychology Review*, *39*(2), 219–239.

Feil, E. G., Small, J. M., Seeley, J. R., Walker, H. M., Frey, A., & Forness, S. R. (2016). Early intervention for preschoolers at risk for attention-deficit/hyperactiviy disorder: Preschool first step to success. Behavioral Disorders, 41(2), 95–106. doi:10.17988/0198-7429-41.2.95

Garfield, G. F., Dorsey, E. R., Zhu, S., Huskamp, H. A., Conti, R., Dusetzina, S. B., Higashi, A., Perrin, J. M., Kornfield, R., & Alexander, G. C. (2012). Trends in attention deficit hyperactivity disorder (ADHD) ambulatory diagnosis and medical treatment in the united states, 2000-2010. *Academic Pediatrics*, *12*(2), 110–116. doi:10.1016/j.acap.2012.01.003

Gumpel, T.P. (2007). Are social competence difficulties caused by performance or acquisition deficits? The importance of self-regulatory mechanisms. *Psychology in the Schools*, *44*(4), 351-372. doi:10.1002/pits.20229

Kercood, S., Zentall, S., Vinh, M., & Tom-Wright, K. (2012). Attentional cuing in math word problems for girls at-risk for ADHD and their peers in general education settings. *Contemporary Educational Psychology*, *37*(2), 106–112. doi:10.1016/j.cedpsych.2012.02.001

Langberg, J. M., Evans, S.W., Schultz, B. K., Becker, S. P., Altaye, M., & Girio-Herrera. (2016). Trajectories and Predictors of Response to the Challenging Horizons Program for Adolescents With ADHD. *Behavior Therapy*, *47*(3), 339-354. doi:10.1016/j.beth.2016.01.001

Leckey, Y., Hyland, L., Hickey, G., Lodge, A., Kelly, P., Bywater, T., Comiskey, C., Donnelly, M., Mcgilloway, S. (2016). A mixed-methods evaluation of the longer-term implementation and utility of a teacher classroom management training programme in Irish primary schools. *Irish Educational Studies*, *35*(1), 35-55. doi:10.1080/03323315.2016.1147974

Leflot, G., Lier, P.A. C., Onghena, P., & Colpin, H. (2010). The role of teacher behavior management in the development of disruptive behaviors: An intervention study with the good behavior game. *Journal of Abnormal Child Psychology*, *38*, 869-880. doi:10.1007/s10802-010-9411-4

Mattos, P. (2015). *No mundo da lua: Perguntas e respostas sobre transtorno do déficit de atenção com hiperatividade em crianças, adolescentes e adultos* (16. Ed.). Rio de Janeiro: ABDA.

Mautone, J. A., DuPaul, G.J., & Jitendra, A. K. (2005). The effects of computer-assisted instruction on the mathematics performance and classroom behavior of children with ADHD. *Journal of Attention Disorders*, *9*, 301-312. doi:10.1177/1087054705278832

Moreno-García, I., Meneres-Sancho, S., Camacho-Vara de Rey, C., & Servera, M. (2019). A randomized controlled trial to examine the posttreatment efficacy of neurofeed-

back, behavior therapy, and pharmacology on ADHD measures. *Journal of attention disorders*, *23*(4), 374-383. doi:10.1177/1087054717693371

Moyses, M. A. A. & Collares, C. A. L. (2013). O lado escuro da dislexia e do TDAH. In: M. G. D, Facci, M. E. E. M., Meira (Org.), *A exclusão dos incluídos*. Maringá: EDUEM.

Muratori, P., Bertacchi, I., Giuli, C., Lombardi, L., Bonetti, S., Nocentini, A., Manfredi, A., Polidori, L., Ruglioni, L., Milone, A., & Lochman, J.E. (2015). First adaptation of coping power program as a classroom-based prevention intervention on aggressive behaviors among elementary school children. *Prevention Science*, *16*, 432-439. doi:10.1007/s11121-014-0501-3

Murray, D. W., Arnold, J., Swanson, J., Wells, K., Burns, K., Jensen, P., ... Strauss, T. (2008). A clinical review of outcomes of the multimodal treatment study of children with attention-deficit/hyperactivity disorder. *Current Psychiatry Report*, *10*, 424-431. doi:10.1007/s12618-009-0007-2

Murray, D.W., Rabiner, D., Schulte, A., & Newitt, K. (2008). Feasibility and integrity of a parent–teacher consultation intervention for ADHD students. *Child Youth Care Forum*, *37*, 111-126. doi:10.1007/s10566-008-9054-6

National Institute for Health and Care Excellence. (2013). Attention deficit hyperactivity disorder (NICE Quality Standard No. 39). Retrieved from https://www.nice.org.uk/guidance/qs39

Nolan, J. D. & Filter, K. J. (2012). A function-based classroom behavior intervention using-non-contingent reinforcement plus response cost. *Education and Treatment of Children*, *35*, p. 419-430. doi:10.1353/etc.2012.0017

Ozdemir, S. (2011). The effects of the first step to success program on academic engagement behaviors of turkish students with attention-deficit/hyperactivity disorder. *Journal of Positive Behavior Interventions*, *13*(3), 168-177. doi:10.1177/1098300710373503

Peck, H. L., Kehle, T. J., Bray, M. A., & Theodore, L. A. (2005). Yoga as intervention for children with attention problems. *School Psychology Review*, *34*(3), 415-424.

Pina, I. L., Macedo, L. S., Sequeira, M. E. A., Silva, I. L., Cardoso, F., Pinto, F. C., & Beresford, H. (2010). Avaliação de uma intervenção pedagógica na aprendizagem de crianças com transtorno de déficit de atenção e hiperatividade TDAH - no âmbito das políticas públicas do estado do Pará. *Ensaio: Avaliação e Políticas Públicas em Educação*, *18*(66), 65-84. doi:10.1590/s0104-40362010000100005

Plumer, P.J. & Stoner, G. (2005). The relative effects of classwide peer tutoring and peer coaching on the positive social behaviors of children with ADHD. *Journal of Attention Disorders*, *9*, 290-300. doi:10.1177/1087054705280796

Rabiner, D.L., Murray, D. W., & Skinner, A. T. (2010). A randomized trial of two promising computer-based interventions for students with attention difficulties. *Journal of Abnormal Child Psychology*, *38*, 131-142. doi:10.1007/s10802-009-9353-x

Schachar, R. J., Chin, S., Logan, G. D., Ornstein, T. J., Crosbie, J., Ickowicz, A., & Pakulak, A. (2004). Evidence for an error monitoring deficit in attention deficit hyperactivity disorder. *Journal of Abnormal Child Psychology*, *32*(3), 285–293. doi:10.1023/B:JACP.0000026142.11217.f2

Schottelkorb A. A., & Ray, D.C. (2009). ADHD symptom reduction in elementary students: A single-case effectiveness design. *Professional School Counseling*, *13*(1), 11. doi:10.5330/PSC.n.2010-13.11

Signor, R. C. F., Berverian, A. P., & Santana, A. P. (2017). A medicalização da educação: Implicações para a constituição do sujeito/aprendiz. *Educação e Pesquisa*, *43*(3), 743-763. doi:10.1590/S1517-9702201610146773

Smith, C. R., Marchand-Martella, N.E., & Martella, R. C. (2011). Assessing the effects of the rocket math program with a primary elementary school student at risk for school failure: A case study. *Education and Treatment of Children*, *34*(2), p. 247-258. doi:10.1353/etc.2011.0011

So, C. Y., Leung, P. W., & Hung, S. F. (2008). Treatment effective- ness of combined medication/behavioural treatment with chi- nese ADHD children in routine practice. *Behaviour Research and Therapy*, *46*, 983-992. doi:10.1016/j.brat.2008.06.007

Stahr, B., Cushing, K., & Lane, K. (2006). Efficacy of a function-based intervention in decreasing off-task behavior exhibited by a student with ADHD. *Journal of Positive Behavior Interventions*, *8*(4), 201-211. doi:10.1177/10983007060080040301

Volpe, R. J., DuPaul, G. J., Jitendra, A. K., & Tresco, K. E. (2009). Consultation-based academic interventions for children with attetion deficit hyperactivity disorder: Effects on reading and mathematics outcomes at 1-year follow-up. *School Psychology Review*, *38*, 5-13.

Vujnovic, R., Fabiano, G. A., Pariseau, M. E., & Naylor, J. (2013). Parameters of adherence to a yearlong daily report card intervention for students with attention-deficit/hyperactivity disorder. *Journal of Educational and Psychological Consultation*, *23*, 140-163. doi:10.1080/10474412.2013.785182

Wells, J. & Sheehey, M. (2013). Harnessing the power of technology: increasing academic engagement of elementary students' with learning disabilities and ADHD. *Insights on Learning Disabilities*, *10*(1), 73-86.

Young, S. (2012). The "RAPID" cognitive-behavioral therapy program for inattentive children: Preliminary finding. *Journal of Attention Disorders*, *17*(6), 519 –526. doi:10.1177/1087054711428074

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