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Peer-Mediated Intervention: Concept and Implications for Research and Pedagogical Practice of Teachers of Students with Autism[1]

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Abstract: Inclusion of students with autism has been a challenge for educators who indicate gaps in professional training, especially regarding interventions in the school context. The international literature shows evidence of the effectiveness of a type of intervention not found in the national literature, called peer-mediated intervention (PMI). This study aims to review the PMI in the education of students with autism and its implications for research and pedagogical practice. The

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theoretical principles of child development behind this intervention are examined to describe the evolution of different procedures and methodologies historically used. Research shows effectiveness of this intervention for improving social skills of special education students and, more recently, for academic learning of children with autism. The broad use from naturalistic to controlled environments, the low cost, and complexity favor its use as a pedagogical practice by kindergarten teachers in inclusive settings. However, the need of future studies addressing this topic in the Brazilian educational context is identified.
Keywords: Intervention; peer mediation; special education; school inclusion; autism

Intervenção mediada por pares: Conceito e implicações para a pesquisa e para as práticas pedagógicas de professores de alunos com autismo
Resumo: A inclusão de alunos com autismo tem sido um desafio para os educadores que apontam carências em sua formação, especialmente quanto a alternativas de intervenção no contexto escolar. A literatura internacional destaca evidências de efetividade de uma modalidade de intervenção ainda ausente na literatura nacional, conhecida como Intervenção Mediada por Pares (IMP). Este estudo tem por objetivo revisar a IMP na educação de alunos com autismo e suas implicações para a pesquisa e para a prática pedagógica. Os pressupostos teóricos do desenvolvimento infantil que fundamentam esta intervenção foram examinados para descrevera evolução dos diferentes procedimentos e metodologias historicamente utilizados. As pesquisas evidenciam a efetividade desta intervenção para as habilidades sociais de alunos da Educação Especial, mais recentemente, para a aprendizagem acadêmica de crianças com autismo. A abrangência de implementação em ambientes naturalísticos a controlados, o baixo custo e a complexidade favorecem sua utilização como prática pedagógica por professores de escolas da Educação Infantil no contexto inclusivo. No entanto, identifica-se a necessidade de pesquisas que investiguem a eficácia da IMP no cenário educacional brasileiro.
Palavras-chave: Intervenção; mediação de pares; educação especial; inclusão escolar; autismo

Intervención de mediación entre pares: Implicaciones para la investigación y las prácticas pedagógicas de profesores de alumnos con autismo
Resumen: La inclusión de alumnos con autismo ha sido un desafío para los educadores que apuntan carencias en su formación, especialmente con alternativas de intervención en el contexto escolar. La literatura internacional destaca evidencias de efectividad de una modalidad de intervención aún ausente en la literatura nacional, conocida como Intervención de Mediación entre Pares (IMP). Este estudio tiene por objetivo revisar la IMP en la educación de alumnos con autismo y sus implicaciones para la investigación y para la práctica pedagógica. Los supuestos teóricos del desarrollo infantil que fundamentan esta intervención se examinaron para describir la evolución de los diferentes procedimientos y metodologías históricamente utilizados. Las investigaciones evidencian la efectividad de esta intervención para las habilidades sociales de alumnos de la Educación Especial, más recientemente, para el aprendizaje académico de niños con autismo. El alcance de la implementación en ambientes naturales a controlados, el bajo costo y la complejidad favorecen su utilización como práctica pedagógica por profesores de escuelas de Educación Infantil en el contexto inclusivo. Sin embargo, se identifica la necesidad de investigaciones que investiguen la eficacia de la IMP en el escenario educativo brasileño.
Palabras clave: Intervención; mediación entre pares; educación especial; inclusión escolar; autismo

Introduction: Definitions of and Assumptions about PMI

School inclusion[2] has been proving itself a challenge to the Brazilian reality. Despite the increasing advances in legal frameworks (Brazil, 2008, 2015), one of the main difficulties reported by teachers is the development and implementation of interventions (Martins, 2007; Miranda, 2015; Silva, 2011), which must meet the educational objectives and meet the specificities of the target audience of Special Education[3]. Research shows a lack of knowledge by teachers about autism and pedagogical practices to meet the specific educational demands of these students in the classroom (Lima & Laplane, 2016; Nunes, Azevedo & Schmidt, 2013; Schmidt et al., 2016). This lack of knowledge is explained in part by the lack of support offered in terms of continuing training on pedagogical practices to engender the organization and consolidation of the inclusive process (Nascimento, Cruz & Braun, 2016; Terra & Gomes, 2013). Since autism is a disability that affects essentially the social area, one of the most relevant justifications for the inclusion of these students is the possibility of interaction with peers for the development of social skills (Brazil, 2012; Camargo & Bosa, 2009). Thus, the promotion of social interaction has gained space between pedagogical practices.

It is not recent the prominence that several authors in the area of Education confer to the role of social interactions in promoting cognitive, affective and child social skills development (Bruner, 1978; Gibson, 1973; Piaget & Cook, 1952; Vygotsky, 1962). In the case of PMI, the underlying theoretical assumptions postulate that child development depends fundamentally on social interactions with socially more competent classmates. A person is considered socially competent as he/she can solve social demands taking into account his/her social environment, and it is only from this competence that harmonious and successful social interactions can be developed (Nijs & Maes, 2014). Social competence, in turn, develops through the combination of adult-child (vertical) and child-child (horizontal) interactions (Hartup, 1989).

Every child, regardless of his/her condition, benefits from these two types of interactions. Vertical interactions, by involving a partner with more knowledge and social skills, forge basic skills such as safety and protection throughout the first year of life so that the child can be more evolved and independent. For example, safe attachment between the mother and her child is developed through vertical interactions, and forms the basis for the exploratory behavior of the environment, which will allow the emergence of more complex skills such as language, cognition, knowledge of himself/herself and of other (Hartup, 1989). On the other hand, horizontal interactions occur in contexts in which the child can elaborate the basic skills already acquired in the vertical relationships in the conviviality with other children socially similar to him/her, to reach more complex levels of interaction. For example, in peer relationships, children learn to master skills such as collaboration, competition, conflict resolution, initiative and maintenance of exchanges, and building relationships subsequent in adult life (Hartup & Moore, 1990). Therefore, the development of more sophisticated social skills, which forms the basis of interpersonal relationships, can only occur between peers, which highlights the role of social interactions that take place in schools (Sanini, Sifuentes & Bosa, 2013).

Considering that the amount of time that Brazilian students stay in the school environment varies between 20 and 35 hours per week, and the relevance of the social exchanges that take place

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[2]The term "school inclusion" is used to refer to meeting the school needs of students with disabilities as defined by Neres and Kassar (2016).

[3]"Target Audience of Special Education" are students with disabilities, pervasive developmental disorders and high abilities/superendowment. (Brazil, 2008), being autism considered a disability as of 2012 (Brazil, 2012).

there, the schooling process is a suitable space for interventions focused on social skills (Nunes & Araújo, 2014). In this context, peer-mediated intervention has been prominent in the international scenario, not only because it is an intervention of proven effectiveness to promote the development of social skills, but also because of its applicability to the academic development of children with disabilities. The predecessors of this intervention modality define it as: "Situation in which a child, or a group of children, who is close to the target children in terms of age or level of development is taught to perform an intervention by instructions, without participation direct from an adult " (Odom & Strain, 1984, p. 545)[4].

Based on behavioral principles and on the social learning theory (Bandura, 2008), intervention employs mediation of/between peers or of/between a network of small groups with typical development, where they are instructed by an adult to mediate social and/or academic skills of children with disabilities. Peers play the role of intervention agents, acting as a model of behavior and mediators of learning for their mates. Children who receive such mediation, in turn, are encouraged to develop and enhance their repertoire of both social and academic skills.

The choice of the classmates for the intervention is usually carried out by the class teacher, taking into account criteria such as empathy, mastery of target skills that will be mediated, age range, regular attendance at school, among others (Kamps et al., 2014; Kasari, Rotheram-Fuller, Locke & Gulsrud, 2012). With regard to skills, it is necessary that the pair does not have a level of development far above the child receiving the intervention, in order to avoid the demotivation of one child or another. The age range should be as close as possible to the target child, since both must be present in the same classroom and have some common interests, such as plays, characters, etc. Regular attendance at school is also essential in the choice of peer, since it is necessary for him to be regularly present to participate in-group activities so that mediation is stable, continuous and effective.

The instruction of the peers for the intervention involves the teaching of specific social or academic strategies, such as invitation to play, assistance and demonstration of affection, direction of activities, always using moments of interaction and seeking to approach the target child in playful activities. Studies on PMI use different approaches to teaching strategies to be developed by children with autism. Some make use of verbal instructions, in which the peer orally indicates to the target child how the activity /game/action should be developed (Carter, Cushing, Clark & Kennedy, 2005; Goldstein, Kaczmarek, Pennington & Shafer, 1992; Kamps, Barbetta, Leonard & Delquadri, 1994; Kamps et al., 2014; Katz & Giralometto, 2013; Laushey & Helfin, 2000). Others use modeling principles, which consists of observing how the typical peer performs the activity, so that later the target student can perform/imitate alone (Kamps et. al., 2002;Pie rce & Shreibman, 1995), or even role-playing techniques or corrective feedback, to aid in understanding the procedures (Battaglia & Radley, 2014). In addition to the use of previous instruction on the skills to be developed (how to act, what to say), it is also observed the teacher's strategy to use the stimuli of the peers, in the context of established exchanges, to maximize the resources that the student already presents naturally in the interaction (Hundert, 2009).

In the academic world, PMI has been recognized as an Evidence-Based Practice[5]. There are at least 27 experimental studies that reveal sufficient evidence that allow indicating PMI as an effective strategy for students with autism at school (Neitzel, Boyd, Odon & Edmondson Pretzel,

[4]Authors' translation.

[5]Evidence-Based Practices are interventions reported through researches whose effectiveness is proven according to a careful scientific evaluation by excellence centers. Some of these centers are the National Autism Center (http://www.nationalautismcenter.org/) and the National Professional Developmental Center (http://autismpdc.fpg.unc.edu/).

2008). One of the main advantages of this intervention is the versatility of being able to be implemented in naturalistic environments, such as the classroom, recreation, collective snacks and playgrounds (Nunes & Araujo, 2014; Zagona & Mastergeorge, 2016). Environments where the teacher acts daily and that are part of the routine of the child, places where spontaneous and playful exchanges occur, permeated by teaching opportunities experienced on a daily basis. In this sense, PMI differs from other, controlled and structured, clinical practices, since it is an Evidence-Based Practice with direct application in the school and educational field (Neitzel et al., 2008).

In a context of school inclusion, a content often present in teachers' reports refers to the difficulty in meeting the demands of the class in addition to those of the student with autism (Lima & Laplane, 2016; Schmidt et al. 2016). In the case of the PMI, this intervention decentralizes the attention time that the teacher dedicates exclusively to the disabled student, who starts counting on the attention and help of his/her classmates, sharing the responsibility of inclusion with the whole class (Chan et al., 2009). Although the teacher is at the forefront of the intervention, both in peer training and in the direct student follow-up, he is not the only teacher in this process as he has at his disposal the context as a whole, including classmates of the students with disability.

This intervention has been widely and continuously used in the context of Special Education, showing promising results, especially for the development of social skills of students with autism (Chang & Locke, 2016; Girolametto, Weitzaman & Earle, 2013; Kamps et al., 2014; Mason et al., 2014; Watkins et al., 2015). This is because social commitment is a central deficit for these children, which restricts interaction with peers in learning environments and is one of the main barriers to learning and participation. According to the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (APA, 2013), Autism Spectrum Disorder is characterized by changes in the areas of social communication and the presence of restricted and stereotyped behaviors, activities and interests.

The use of peers as a form of intervention in the classroom shows positive results not only for the student with autism, but also for their peers (Kamps et al., 2014; Koegel, Vernon, Koegel, Koegel & Paullin, 2012). There is evidence that classmates who participated in the interventions also increased their knowledge about autism and increased positive attitudes toward classmates with disabilities (Kasari et al., 2012; Mason et al., 2014; Thiemann & Goldstein, 2004).

Another advantage of PMI is its use with those who have little or no verbal skill, since in this intervention the initiative to interact and the instructions to the children with diagnosis come from the typical pairs, who serve as models of verbal and non-verbal peer interactions with autism. The interchanges resulting from the intervention are reflected in the increase in engagement time in the interaction, thus reducing the periods of isolation of the student with autism in school (Camargo & Bosa, 2009; Rotheram-Fuller, Kasari, Chamberlain & Locke, 2010).

Although PMI has wide international recognition and use, it is still little known in Brazil. There is a shortage in the national literature of reports about interventions that use peers in school and that are based on the same developmental theoretical principle of interaction to favor acquisition of social skills or learning.

Few national studies on the subject use the terminology "peer tutoring" (Matos, 2014; Ribela, Reis & Gioia, 2009; Santos & Mendes, 2008). Conceptually, this type of PMI can be defined as ateaching system in which students help each other (Goodlad & Hirst, 1989), in which peers assist their classmates in learning, what is being taught, through strategies of cooperation, repetition, and instruction (Fernandes & Costa, 2015).

Matos (2014) sought to investigate whether PMI facilitated and/or increased social and communicative interactions between children with autism and their peers, through a single case study, having as analysis a mixed approach. A 10-year-old child with autism enrolled in the fifth

grade and two classmates with typical development of the same age group participated in the study. To do so, they used as a basis a strategy called "Let's play together", which consisted of inviting the target student, and later in the modeling, to start and participate in the game. The games used in the intervention were ball games and hand clapping games (with imitation). The instruments of collection recorded the frequency of behaviors (initiation, response and interaction), having as defined criterion the count of the number of times the behaviors occurred and the duration of the behaviors recorded in time (seconds). The results of the study indicated that during the implementation of the program there was an increase in both the frequency and duration of social interactions between the child with autism and their peers.

Ribela, Reis and Gioia (2009) analyzed a procedure to increase the occurrence of social interactions and to improve the nature of the interactions between atypical young people and their peers. Two young people with Down syndrome, aged 18, and two typical peers from the same classroom participated in the study. The time chosen for the intervention was physical education classes, which lasted 45 minutes. Initially ,the initial repertoires of social interaction of the participating students were evaluated, being followed by teacher's training and instructions before classes, and then oral tips and feedback immediately before and after his/her classes. After this step, the researchers withdrew all instructions to the teacher, to verify if this maintained the behaviors directed to the improvement of the social interactions between his/her students. The results suggested that this procedure was effective in increasing the amount of social interactions, as well as improving their quality.

Santos and Mendes (2008) investigated the effect of this intervention on the academic performance in two classes of a regular school, with and without peer tutoring. Through a multiple baseline research design, three peers were used, for each of the two students with disabilities, who received training twice a week to teach recognition and naming alphabet vowels. Improvements were identified in both groups. However, one of the participants who acted as control in the study obtained a gradual decrease in performance, in opposition to the findings of the literature on PMI, which indicates that peer tutoring may not always be effective, to which the authors indicate the need for further studies to determine the conditions that favor or hinder the effectiveness of the intervention.

It should also be noted that the peer tutoring intervention used in these studies did not follow the same protocol of the PMI, which can be observed in the absence of an instrument with criteria for selection of tutors, being chosen by examination, among other procedures. The PMI intervention protocol has the function of ensuring that the implementation reliably meets the way the research was developed, whose results show its efficacy as Evidence-Based Practice. In addition, the children in the study had no diagnosis of autis— one had intellectual disability associated with Down syndrome and, the other, without the identified condition.

In this context, the purpose of this study is to present a review on the Peer-Mediated Intervention in the education of students with autism, highlighting their origins and implications for research and pedagogical practice.

Origins, Types and Implications of PMI

The recognition that the behavior of peers profoundly influences individual behavior is not current (Rubin, Bukowski, Parker & Bowker, 2008). However, its systematized use as a form of intervention with children appears in the literature from the 1970s onwards. The Americans Samuel Odom and Philip Strain wrote one of the pioneering works in a review of studies on peer-mediated approaches, published between 1960 and 1980 (Odon & Strain, 1984). In this work, the bases of

what constitutes this intervention are described, organizing a taxonomy of the main typologies of PMI and its empirical evidences.

The instructions in the PMI, as a central point of this approach, are not standardized for all interventions, but determined in a personalized way from the initial objective set, resulting in a variety of models that can be followed by the peer and supervised by the adult. Odom and Strain (1984) highlighted three main types of PMI approaches: 1) proximity; 2) prompt/reinforce; and 3) peer initiation intervention.

In Proximity Intervention, children with typical development, socially competent, are placed side by side with the target child in a playful context. Although children with typical development do not receive prior training on how to behave in order to broaden the social interactions of the other child, this meeting, by itself, enables shared play. Teaching and learning occur through this natural and spontaneous exchange between children.

This approach of PMI originated in a study by Suomi and Harlow (1972), using a rigorous experimental design. The authors started from previous findings that monkeys raised alone up to six months of age present important social difficulties, such as stereotyped and self-injurious behaviors. In their experiment, monkeys that spent the first six months of life isolated were placed in coexistence with "therapist monkeys" (as the author calls them) for social rehabilitation. When in contact with the mother or older monkeys, few changes in social behavior were observed. However, when placed with monkeys three months younger and/or of the same age group, physical contact was more frequent and the interaction between them increased rapidly. The results showed a decrease in stereotyped and aggressive behaviors that practically disappeared, while social behaviors gradually increased in complexity to the point of no longer distinguishing between those monkeys early deprived of interactions and their peers. This experiment showed that exchanges between peers of similar ages result in greater gains in social development because they insist more on proximity and exchanges than those with advanced age or adults.

The first studies with this mode of intervention showed encouraging results with children with autism (McHale, 1983). Six students with the disorder were grouped with others without disability in daily playful episodes for ten weeks. As a result, the former increased the frequency of social interactions with their peers and decreased the time of isolation. The same did not occur when students with autism were grouped with younger children (Lord, 1984), corroborating the previous findings about the importance of the peers being of similar ages

More recent studies (Camargo Rispoli, Ganz, Hong, Davis & Mason, 2016; Gutierrez, Hale, Gossens-Archuleta, & Sobrino-Sanchez, 2007; Scattoni, 2007) have emphasized that, by the very nature of autism, the simple proximity between classmates of similar ages, without planned intervention and training with peers, may not achieve the desired results. This is because the absence of specific planning that provides sources of motivation and support can make typical peers frustrated with the lack of response from classmates with autism and decrease their requests for interaction.

The second type of PMI approach is of a theoretical behavioral nature, called prompt/reinforce PMI (Odon & Strain, 1984). In this case, children with typical development are instructed to request certain social behavior of the child with autism, subsequently reinforcing the responses received to increase their frequency. Typical peers use verbal instructions to engage the target child in some social activity and subsequently use a reinforcement, usually verbal, to maintain or increase the frequency of the desired behavior. This type of approach can only use reinforcement, separately (if desired behavior is already present), or else instruction and reinforcement together.

Among the first studies involving prompt/reinforce PMI, we highlight Wahler's (1967) research, in which a group of five pre-school children were trained to respond with attention when the target children were exposed to social behaviors. Since attention had the role of reinforcer for

the pro-social behavior, verbal commands were used as an incentive to increase the frequency of these behaviors.

The use of prompt/reinforce PMI was more frequent in studies involving children with cognitive delays, such as intellectual disability (Guralink, 1976; Wiesen, Hartley, Richardson & Roske, 1967; Young & Kerr, 1979). In these surveys, typical peers were trained to develop increased verbalizations and social game through modeling. However, the positive results were evidenced more clearly when positive social attention was used, by the typical peer, as verbal reinforcement. Few records are found on studies involving this type of PMI with students with autism in the 1960s and 1970s, while several studies use verbal reinforcement as a strategy—for example, praises and positive feedback (Carter et al., 2005; Dugam et al., 1995; Kamps et al., 2002; Laushey & Heflin, 2000; Lee, Odom & Loftin, 2007). In some cases, verbal reinforcement is associated with primary reinforcements, such as small portions of a favorite snack. In other situations, secondary reinforcers are used, such as the access to a preferred toy or activity. These strategies are justified by the fact that other sources of parallel motivation may be necessary until social skills are acquired, making a gradual transition to more natural forms of reinforcement, until the interaction with the peers is possible (Camargo et al., 2016).

The third type of PMI approach is called Initiation Intervention. In this case, peers are instructed to take the initiative in interactions, that is, they create events to obtain social responses from the child. These initiatives can be to reach of a toy or the suggestion of a game. Strain, Shores and Timm (1977) made the first PMI interventions by initiative, with the objective of promoting the positive behavior of six preschool boys with behavioral problems. Improvements were observed in five of the six boys participating.

Then, Ragland, Kerr and Strain (1978) used this same type of PMI with three children with autism of school age. The authors conducted the training with a classmate to initiate the social interaction with the children, which resulted in an increase in social interaction in classroom activities and positive gains for all children involved. Although this type of PMI is more commonly used with children (Odon & Strain, 1984), it has already been used effectively with adults, including the elderly (Dy, Strain, Fullerton & Stowitschek, 1981).

By interrelating the different modes of PMI, it is perceived that, due to the nature of its intervention, all have shown positive results, largely because they are developed in environments where social exchanges and interactions are constant, such as in school. However, when thinking about the education of children with autism, we must take into account the idiosyncrasies of the disorder, when the non-directed or very broad interactions have little influence on the student's behavior and, consequently, the results are less consistent.

It is observed that all the three types of PMI use different instructional techniques. While proximity PMI is based on the principles of modeling, that is, the child with autism must learn the skills by imitation of the peer, prompt/reinforce PMI uses direct training of the peers on what skills should be reinforced in the target student. Although the literature on PMI does not clearly identify more efficacy of one over another, it should be considered that direct and tangible teaching (reinforcement) would be more appropriate for students with autism than teaching by observation (vicarious learning), given the difficulties of imitation and identification of salient stimuli in the environment typically associated with these pupils (Murphy et al., 2017). Despite the potential effectiveness of learning by modeling as a learning strategy, the simple insertion of a student between his/herclassmates without incorporating other intervention procedures is not enough to provide significant gains to the child with less social skill (Gutierrez et al., 2007; Hartup, 1989).

Currently, new approaches and configurations of PMI have been studied, combining and merging the types described above. Modifications include, for example, the use of positive reinforcement strategies not only for the target child but also for peers with typical development

(Fetig, 2013) as well as stimulation and feedback throughout the activities to maintain the motivation of the peers for interaction, which may be threatened by the difficulties of engagement in reciprocal exchange with the classmate with autism (Kaya, Blake & Chan, 2015). Among the current formats of PMI that integrate these procedures, Peer Incidental Teaching, Recess Buddies and Peer Networks have received attention in the literature.

Incidental Peer Education is characterized by not defining a predetermined sequence of strategies for interactions from the beginning to the end of the intervention, such as the traditional model. The difference is based on the use of environmental arrangements (objects, toys) to make the environment attractive to the child, using cues, or his/her own initiatives, to initiate, maintain and increase exchanges between peers (Hundert, 2009). Studies that used this model of PMI for the promotion and development of speech showed gains for both typical children (Owen-DeSchryver, Carr, Cale & Blakeley-Smith, 2008) and children with autism (McGee, Almeida & Sulzer-Azaroff, 1992; McGee, Krantz, Mason & McClannahan, 1983) as a result of mediation to occur more spontaneously, not following pre-established strategies.

Another PMI approach can be translated as Recess Buddies, which is characterized by not determining the choice of fixed peers for the intervention (Hundert, 2009; Mason et al., 2014). It consists of a system of relay between classmates to participate in the intervention with the target student. The whole class receives guidance on inclusion, difference/disability, and the importance of interactions and play together. Every day a classmate is drawn to intervene with the target student and perform the proposed activities, such as games with maps, basketball or play tag (Fettig, 2013).

The Peer Network approach has many characteristics in common with the Recess Buddies. They may even be used in combination (Mason et al., 2014). Both involve children with autism receiving mediation by a group of children with typical development and previous training of the peers for this intervention (Garrison-Harrel, Kamps, Kravits, 1997; Kamps, Potucek, Lopez, Kravits & Kemmerer, 1997). However, this approach involves a smaller group of typical children, usually aged 3 to 5, who interact at predetermined times of the school period, individually chosen, according to each child with autism. This mode also shows positive results on social interaction, despite the disadvantage of requiring a large amount of time in specific training for this small number of children, usually outside the classroom, time that could be spent on intervention (Hundert, 2009).

Regardless of the type of PMI approach used, evidence of its effectiveness is supported, justifying the fact that it is considered an evidence-based practice (Fettig, 2013). However, what draws attention is its potential use for the inclusion of students with autism, a field lacking effective practices, especially for the development of social skills.

Kamps et al. (2014), for example, evaluated the impact of this intervention using the Peer Network model to promote social skills, more specifically the frequency of communicative acts of elementary school students with ASD. An experimental design of a single case study with multiple baselines was employed between participants. The intervention agents were the staff of the school, which took place in two environments: in the resource room and in the speech therapy room. Four children with autism and eight typical peers participated in this study. The school staff assisted the peers, who were previously trained by the study researcher. The intervention took place over a period of three months, for approximately 30 minutes, three times a week. At such times, the child with autism sat at the table between the two peers with typical development and the intervention agent (school employee) sat together only when directing the instruction sessions to the peers. Cooperative games (memory, puzzles and books), a table with the visual program of the lesson and a teaching plan to the employee were used. Each session was divided into 10 minutes, where the adult conducted the instructions on each skill to be mediated, 10 to 15 minutes of free play and five minutes of feedback. The results showed an increase in initiatives of responses and that were related

to the total of communicative acts for all four participants during the peer mediation sessions, with an increase in the frequency of initiatives in two and of responses in three of the four participants.

The PMI was also the intervention chosen by Katz and Girolametto (2013) to study the social interactions of three children with autism, aged between four and five, in early childhood education. It was developed an experimental study that used intra-subject multiple baseline to verify the level of participation and duration of the interactions. To participate in the study, typical peers should demonstrate prior interest in interacting with children with autism, having language and social skills developed, and being in the same classroom as the target children. On the other hand, teachers should have at least five years of experience in schools with children of this age group and six months with a child with special needs. It was used playful material lavailable in the preschool, such as storybooks, puppets and communication boards.

The procedures consisted of four consecutive steps over four months of intervention: 1) training of two preschool teachers, 2) social skills training for all participating children (target child and peers), 3) twelve 20-minute game sessions, three times a week for four weeks; and 4) follow-up and support sessions to educators. The first step occurred in two sessions informing teachers about the procedures and objectives, and the second step consisted of five half-hour sessions with each child. The third step involved building blocks and play dough games (10 minutes for each material), and in the fourth step, through contact by telephone, the educator explained his/her doubts regarding the intervention, which were answered by the researcher, in order to offer support to the professional who was in school.

The effectiveness of the intervention was confirmed by visual inspection of the data that were collected by filming, and it was calculated the percentage of two variables: interactive participation, that is, interaction that should extend beyond the initiative of response, and the duration of these interactions, which should be longer. Significant and encouraging results were observed, such as the 100% increase in the frequency of play sessions for both social engagement and social skills promotion of the three participating children. In addition, the intervention was considered appropriate and feasible to be developed in naturalistic environments, such as schools, where the control over the variables is lower.

In the same line of research, Koegel et al. (2012) evaluated whether socialization would improve the interests of interaction of children with autism when mediated by their peers. The study used a multiple-baseline experimental design in which three children with autism, with an average age between four and five years, enrolled in preschool participated. Following the Recess Buddies approach, the period chosen for the interventions was the recess time in the schoolyard, when the children sat at picnic tables, to snack with their peers, for approximately 15 minutes, followed by 30 to 45 minutes of free playtime. Peer mediations occurred at both times. Interventions were performed systematically with one participant at a time, at the beginning of the snack period. Both engagement with peers and spontaneity in verbal initiatives were evaluated. The evaluator attributed scores when the child with autism responded to mediation by speaking, playing, creating situations of interaction with his/her peers, discussing the activity or listening to a classmate when making a sustained eye contact.

The results showed that none of the children engaged with their peers in the pre-intervention phase, where the baseline remained zero. After the intervention began, the engagement gradually increased, reaching, in one case, 100% at the end of the interventions. The spontaneity of the verbal initiatives of children with autism followed the same pattern, that is, it started from a 0% stability in the pre-intervention phase and increased throughout the intervention. The data discriminated that those activities that focused on the interest of children with autism, when mediated by peers, resulted in gains in both the frequency of social engagement and verbal initiatives.

To verify the effects of a peer-mediated social skills program on the frequency of communicative acts of students with autism, Mason et al. (2014) used teachers from a school to implement Recess Buddies-type PMI. The criterion for selection of peers was based on the fact that students with autism were in the same classroom as the target child. The intervention agents, trained by the researchers, acted in sessions that occurred from two to three times a week in the recreational area, interspersed by periods of instructions to peers. Guidance to classmates involved the use of visual aids to respond and initiate interactions during a structured play activity. Children with typical development were instructed to interact and request responses and/or communication initiatives from the participants with autism. The results showed an increase in the frequency of communicative acts in the target children soon after the introduction of the intervention, proving its effectiveness.

In addition to empirical studies, systematic review studies also sought to analyze the results of peer-mediated interventions. Chan et al. (2009) carried out a systematic analysis of the studies that used PMI with students with autism. The search was performed in the databases *PsycINFO*e *Educational Resources Information Cent*er (ERIC) using the descriptors: developmental disabilities, autism, mental retardation, disabled, peer mediation, peer training, peer-mediated intervention and peer support. Although there was no time-limited delineation, the research was restricted to include onlypeer-reviewed studies and in English. In addition, the studies should have as participants in the intervention people diagnosed with Autism, Asperger Syndrome or Pervasive Developmental Disorder (PDD). The 42 selected studies had a total of 172 participants and 396 trained peers. The results reported were positive (91% of all studies analyzed), but the review pointed out that most studies are limited in the evaluation of fidelity, which is usually absent. Only two studies were considered of good magnitude because they included 15 participants each, five studies had only one participant, 29 with two or three participants and eight studies from four to ten participants. The age of participants with autism ranged from 2 to 13 years, of which 138 were male and only 34 were female.

A variety of methods was used to train the typical peers in the implementation of interventions such as verbal guidance, modeling, continuous feedback, visual cues, instruction manuals, and video instruction. In general, the main result is that the implementation of PMI is compatible with a typical classroom routine, that is, appropriate for use in a naturalistic environment, which indicates the potential of this intervention in schools. More specifically, the results show that, in relation to the methods used for the instruction of peers, 28 studies have used verbal instruction, 25 studies, modeling, 11 studies, continuous feedback and, as the least used, are cited the visual aids. As for the variables, most of the studies analyzed included social skills (attention, communication, interaction) and a minimum of academic skills (fluency and reading comprehension, social studies teaching, mathematics).

Another recent review investigated PMI for children and adolescents with autism (Chang & Locke, 2016). This systematic review also selected studies by searching the databases *Psyc INFO*, *Educational Resources Information Center* (Eric) and PubMed, covering the fields of education, psychology and medicine. We found 1,343 articles using the keywords autism, social skills, peer-mediated intervention, and school. From this total, only five met the inclusion criteria, that is, set up with experimental group design (all single case studies were excluded), the participants had a diagnosis of autism, used the PMI to develop a social skill (e.g., peer engagement, initiations, responses) and described peer training. The results showed that four of the five studies were conducted in the school environment, while only one occurred in a camp. All studies concluded that participants increased target-social skills after the intervention (e.g., social initiations, social responses, social communication). Although PMII is promising to address social skills, there are still many areas that are not contemplated with this approach (e.g., children with different levels of

impairment and different age groups, and students in Primary and Secondary Education, whose interests are more focused on learning). In addition, they have suggested that future research involving PMII should measure the fidelity of the implementation of the intervention.

A systematic review by Watkins et al. (2015) sought to evaluate the studies on the use of PMI for the development of social skills in inclusive environments between 2008 and 2014. Of the 36 articles found, only 14 were analyzed, which met the inclusion criteria, that is, experimental studies with students with autism who received intervention in an inclusive context (rooms with isolated therapy were excluded). The generalization and maintenance of the skills developed, as well as their social validity, verified in the studies analyzed are important indicators of the effectiveness of the intervention. These authors conclude that the characteristics of the participants (related to the lack of capacity, interest or motivation) and the type of social deficit of the individuals (related to a desired behavior or the increase of initiative) are important considerations in the choice of a PMI intervention. That is, the choice must take into account the characteristics of the participants and how these characteristics may affect or interact with a particular treatment approach.

The theoretical and empirical reviews concluded that the PMI is a valid intervention to develop social skills with students with autism, but is not restricted to this area of development. The PMI that is used specifically for the development of formal learning has been called *Peer-Assisted Learning Strategies* (PALS). For almost twenty years, PALS has been studied in classrooms, being appropriate for students with different levels of difficulty, which is why it is recognized by the American Department of Education as an Evidence-Based Practice (Mcmaster, Fuchs & Fuchs, 2006).

Mcmaster et al. (2006) reviewed the research with PALS to better describe its effectiveness, including the benefits and limitations of the program. Despite the proven effectiveness of large-scale studies, the authors suggest that not all children with disabilities show gains in reading skills through this intervention. This group includes those students with cognitive deficits, low levels of phonological awareness and attention or in situations of social vulnerability. Regarding the benefits, the importance of the feasibility of PALS in the school context is attributed, using teachers as agents of intervention. For students, to the evidence of gains in vocabulary expansion, are added the increases in word recognition, reading fluency (speed and accuracy), reading comprehension, phonological awareness development, and so on.

Despite the benefits of PALS and PMI, there are no experimental studies as yet, identifying their efficacy in relation to the construction of learning (pre-academic and formal skills) of students with autism. However, both are shown as adequate interventions to be employed in the context of school inclusion of these students.

Considerations

Based on the discussions and the studies analyzed, we can see the potential contribution of PMI to the pedagogical practices and to the school inclusion of students with autism. Many studies have already pointed out its efficacy in naturalistic environments and make important points to be considered in the development of skills of these students.

Thus, Peer-Mediated Intervention offers an important contribution to both researches and pedagogical practices. Regarding the first, the scarcity of national researches on the subject, together with the evidences of effectiveness in international studies, highlights the importance of investing in studies on PMI in Brazil. Its feasibility of being implemented in school space fills a gap in the scenario of national school inclusion, placing it as an important alternative. Therefore, it is necessary to investigate how this intervention can be used with Brazilian teachers and students, adjusting and

adapting the protocol used in American researches to the Brazilian reality. In this sense, it is important to maintain the equivalence between the results recorded in the researches and its implementation in schools through fidelity measures that guarantee the accuracy of the intervention, an aspect that is consistently pointed out in international researches as little reported in the studies and fundamental for the validity and reliability of the results (Wollery, 2011).

As for pedagogical practices, the possibility that support for students with autism can be provided not only by teachers but also by their classmates can help in a paradigm shift, that is, that the teacher should be the only responsible for inclusion and development of the child with autism in the classroom (Schmidt et al., 2016). PMI and PALS offer a change of perspective when they propose that peers themselves can assist the teacher in mediating the skills of their students in the classroom.

In general, the PMI and PALS appear in the literature as a possible effective pedagogical practice for teachers working with school inclusion, in terms of intervention especially for children with autism in the process of schooling. Its large-scale implementation can aid the development of the academic and social skills of students with autism, filling one of the gaps in training of teachers often reported in the national literature (Nascimento et al., 2016; Nunes et al., 2013; Schmidt et al., 2016; Terra & Gomes, 2013).

The PMI involves other important dimensions to be considered within the work developed by the school. This review has identified evidence of advances not only related to the promotion of skills of the target student, but also in relation to aspects that include the school inclusion itself in a broad sense. It shifts the centralization of teacher's attention in the classroom to the intervention in various contexts of the school, such as the schoolyard, for example. It has in peer-mediation its strongest point, which advances from vertical interactions (interaction with the teacher) to horizontal interactions (support from peers of the same age group), allowing access to more complex development skills. It minimizes social isolation in school, consistently reported in the inclusion of students with autism, increasing the time the student engages in the task. In addition to the student with a disability, the PMI also shows contributions to the social and emotional development of typical peers who are related to the target student, affecting the classroom atmosphere as a whole.

This review highlights the relevance that these intervention shave been showing over the last few years, especially in the field of inclusive education. Most of the interventions with students with autism are described in clinical or laboratory contexts, in which PMI and PALS proved to be capable of being implemented in schools. Thus, despite the fact that they are being developed, especially in an international scenario, the wide variety of contexts in which they can be carried out, together with the low cost and the possibility of implementing them in naturalistic environments, make them promising in the Brazilian reality.

However, it is necessary to emphasize that although PMI is a favorable strategy, the variety of types that involve this intervention must be analyzed carefully. Its choice and implementation should consider the context of the school, the characteristics of the target student and the teacher, as well as the specific objectives to be achieved (Lubas, Mitchell & Gianluca, 2016). It is from these variables that the educator will direct the actions to be developed both in relation to the typical peer (who will be ahead of the intervention) and in relation to the schooling of the disabled student (who will receive the intervention). In addition, we should plan them in order to avoid potential limitations of peer-mediated interventions such as the risk of exposure of children with disabilities due to excessive attention to their limitations, harm to the achievement of learning objectives of the typical peers due to the inadequacy of the time devoted to assisting the disabled classmate and the fragility of the intervention's fidelity for being implemented by children and not by professionals (Chan et al., 2009).

It is important to emphasize again that both international and national studies make little use of these interventions for the development of academic skills of students with autism, which are essential as goals in the schooling process. Although the results of PMI on academic learning, using more specifically PALS, are still incipient, it is suggested to carry out studies that contemplate and deepen this theme in the Brazilian reality.

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