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## FROM SOCIAL INTERACTION TO AUTONOMY: LUDIC EXPERIENCES IN AQUATIC ENVIRONMENT FOR CHILDREN WITH AUTISM SPECTRUM DISORDER

### DA INTERAÇÃO SOCIAL À AUTONOMIA: VIVÊNCIAS LÚDICAS NO MEIO LÍQUIDO PARA CRIANÇAS COM TRANSTORNO DO ESPECTRO AUTISTA

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#### ABSTRACT

The present study aimed at assessing ludic experiences in aquatic environment facilitated by a non-governmental organization in Florianópolis, state of Santa Catarina, for the social interaction of children with Autism Spectrum Disorder (ASD). This is a qualitative research based on three instruments: systematic observation, participant observation and semi-structured interviews. Five children with ASD, a Physical Education teacher, a psychologist, five Physiotherapy students and four family members participated in the study. The results showed that the aspects intrinsic to the ludic experiences worked as facilitators of social interaction between the children with ASD and the volunteers; three of these children showed interest to get involved and take part in games through social interaction. In conclusion, the ludic experiences enabled the children to cultivate verbal or gestural communication skills and build ties of trust with the volunteers and other children.

**Keywords:** Ludic aquatic experiences. Social interaction. Children. Autism Spectrum Disorder.

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#### RESUMO

Este estudo analisou o papel de vivências lúdicas no meio líquido facilitadas por uma ONG de Florianópolis (SC) para a interação social de crianças com Transtorno do Espectro Autista (TEA). Trata-se de uma pesquisa qualitativa, desenvolvida por meio de três instrumentos de pesquisa de campo: a observação sistemática e a participante e as entrevistas semiestruturadas. Participaram cinco crianças com TEA, sete profissionais (uma profissional da educação física, uma psicóloga, e cinco estudantes de fisioterapia) e quatro familiares. Dentre os resultados estão: aspectos intrínsecos à própria formatação das vivências lúdicas atuaram como facilitadoras de momentos de interação social entre as crianças com TEA e os voluntários, e três dessas crianças demonstraram interesse em envolver-se e criar brincadeiras, por interação social. Concluindo-se que as vivências lúdicas possibilitam às crianças cultivar habilidades de comunicação verbal ou gestual e criar laços de confiança com os voluntários e demais crianças.

**Palavras-chave:** Relações interpessoais. Criança. Jogos e brinquedos. Meio aquático

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#### Introduction

Considering therapeutic purposes, there are some institutions and Non-Governmental Organizations (NGOs) that provide children with Autism Spectrum Disorder (ASD) with activities based on ludic elements in order to improve individualities and expand potentialities. The Brazilian project so-called *Aqua Atividades* (Aqua Activities) promoted by an NGO is highlighted, whose main characteristics comprise being carried out in a ludic environment, being assigned for children who play according to their spontaneity, and occurring in aquatic environment, that is, a swimming pool. Such a project focuses on stimulating social interaction among the participants.

The ASD nomenclature is in accordance with the indications by the Diagnostic and Statistical Manual of Mental Disorders (DSM), elaborated by the American Psychiatric Association (APA)<sup>1,2</sup>. Autism is a disorder whose symptoms first appear during childhood and that mainly affect the areas of communication, behavior, and, thus, social interaction<sup>3-5</sup>. Several possibilities of this disorder manifestation exist, such as the difficulty of creating empathy, the motor domain commitment, and repetitive behavior, which might or might not be manifested<sup>5</sup>.

Based on Vygotsky's Socio Interactionist Theory<sup>6</sup>, social interaction is considered to be the main limitation shown by the individuals with ASD, since it is a manifestation of relationships in which there is reciprocity among individuals or between social groups. This reciprocity only occur when those involved have mastery of social instruments and signs to the point of understanding each other. It includes the language itself and the understanding of concepts or symbols that are part of communication.

Children's play, in turn, is interrelated to some factors, such as the exercise of creativity, the ability to perform associations between concepts and social symbols, expressiveness, and the development of motor and cognitive skills<sup>6</sup>. By playing, a systematization of social and body knowledge occurs, which is relevant to the child's appropriation of the environment attributes in which he/she is inserted. Some authors<sup>7,8</sup>, committed to studying children with neurodevelopmental disabilities, point to the relevance of implicit play in activities, experiences and dynamics as a facilitator of children development.

Researchers from different areas are committed to assessing aspects of communication and sociability of children with ASD<sup>9</sup>, however, due to the complexity of this disorder manifestations, there are several gaps to be filled. The lack of consensus among the results of research on ASD highlights the significance of expanding studies on social interaction and ASD, in search of elements that represent concrete knowledge on the theme<sup>9</sup>. Therefore, the present study aimed at assessing the role of ludic experiences in aquatic environment facilitated by a NGO from the city of Florianópolis (SC) for the social interaction of children with ASD.

Considering the Physical Education scope little is mentioned about the activities for children with ASD, especially the ones that involve spontaneous play, let alone having the aquatic environment as a context. It's noteworthy that the activities developed in the aquatic environment have the physical characteristics of water as a differential, that is, hydrostatic pressure and buoyancy, which work as facilitators of the free expression of movements, displacements, and contact/interaction among the participants<sup>10,11</sup>.

## Methods

This study was contextualized in the Brazilian project so-called *Aqua Atividades* (Aquatic Activities) promoted by the NGO known as *Autonomia* (Autonomy) from the city of Florianópolis (SC), through which children with various neurodevelopmental disabilities, most of them with ASD, are encouraged to play and interact with each other and the other participants. The ludic experiences were carried out in aquatic environment, that is, a heated semi-olympic indoor swimming pool (25 meters long, 8 lanes and 1.90m deep) with water temperature between 25°C and 28°C, located in a university of Florianópolis (SC).

The *Aqua Atividades* project is multidisciplinary, which is run and coordinated by two professionals, a Physical Education teacher and a psychologist. There is also a group of volunteers consisted of Physiotherapy students, whose functions include organizing the materials, mediating and stimulating the interaction among the children, in addition to supporting the younger children (babies) who are not accompanied by their parents in the pool. The work of these volunteers is monitored and mediated by the professionals. There is no preparation or training course before the activities; however, a meeting is held at the beginning and end of each experience so that the professionals can discuss on some aspects, such as internal organization, particularities of each child, positive compliments, criticisms, and general suggestions.

The purpose of the project is to provide children with a stimulating ludic environment for social interaction and autonomy. It is worth mentioning that there are not previously systematized activities; on the other hand, the participants are given the freedom to experience and interact with as many people and toys/objects as possible. In each experience the children

enter the pool, preferably accompanied by their parents or family members, and the volunteers as well.

The experiences occur once a week on a fixed day, in the morning shift, with a total duration of 1h30min. Some materials are available, for example, different types of floats, stand-up paddleboards, kayaks, oars, floating basketball hoops, and others. A stand-up paddleboard works as a springboard for the children to jump into the water, to practice balance, or even to paddle in the pool (sitting or standing).

The social interactions among the participants are dynamic, whether child-child, child-volunteer, family-child, family-child-volunteer. Considering the time spent in the water, the children are free to experience with the materials mentioned as they want. Interaction dynamics provide several exchanges, both interpersonal and toys/objects. It is understood that learning is facilitated through games or spontaneous creations by using the materials, thus, it is why they are named ludic experiences.

### Participants

Five children with ASD participated in the study (Table 1). The inclusion criteria were as follows: 1 - Having started their participation in the *Aqua Atividades* project in 2017 and in the same semester when the collections were initiated. This choice was based on the intention of monitoring the linear process of social and emotional development provided by the participation of each child in the experiences since the beginning; 2 – Attendance, that is, 16 experiences were provided, and the participants should have a minimum of 50% presence.

**Table 1.** Characterization of the children

Children (fictitious names)	Age (years old)	Diagnosis (informed by parents during the interview, based on the assessment of other professionals not linked to the <i>Autonomy</i> NGO)
Henrique	10	Autism (mild level)
Daniel	4	Autism (without a specific diagnosis)
Júlio	8	Autism (hyperactivity, challenging opponent disorder)
Alice	4	Autism (without a specific diagnosis)
Theo	5	Autism (mild level)

Source: the authors

Table 1 shows that the children have different levels with regard to the diagnosis, and different age groups, however, this does not interfere with the purpose of the research, since the specific characteristics, in addition to the process of adaptation and development of each child were observed and assessed individually, without comparisons among them. Moreover, age differences allowed us to observe the experience resonances with regard to the social development of children at different age groups.

The parents of each child (except Alice's mother), aged between 33 and 54 years old, were also part of the research by answering interviews, in addition to five volunteers (two men) who worked directly with the 18-21-year-old children selected, and the coordinator of the *Aqua Atividades* project (a female 39-year-old psychologist); all of them are mentioned throughout the discussion under fictitious names. It is noteworthy that the individuals who showed themselves to be available and signed the forms of the Committee on Ethical Research with Humans participated in the research.

### Instruments and Procedures

This is a qualitative descriptive exploratory study that emphasizes the description of its

explicit and implicit peculiarities<sup>12</sup>. This investigation is the result of a master's thesis, and part of a broader study entitled in Portuguese as *O Brincar de Crianças com Transtorno do Espectro Autista* (Ludic Behavior of Children with Autism Spectrum Disorder), approved by the Committee on Ethical Research with Humans of the Brazilian university referred to as *Universidade do Estado de Santa Catarina* (UDESC), under opinion number: 1.814.571 (8/11/2016).

Three instruments were used for data collection: systematic observation, participant observation, both of them with the help of a field diary (FD), and semi-structured interviews. In the first phase, five systematic observations were made over consecutive weeks. During this period, the researcher stayed outside the pool, following the experiences without interacting with the participants. This stage was relevant in the sense of knowing the dynamics of the project (schedules, materials/toys used, and organization regarding entry and exit from the pool), its participants, aspects related to the organization of volunteers, characteristics and preferences of children in terms of toys and people, and parents' participation. Such observations were recorded in the field diary. The inclusion criteria of the participants were also established during this phase.

The participant observation occurred with the immersion of the researcher inside the pool during the entire experience for 12 consecutive weeks (3 months). These moments allowed the observation of the details on behavior and interests of the children and their social interactions, such as dialogues, silence, games, toys chosen, besides the implications of their participation over the months. This phase was recorded with an external video camera (Canon semiprofessional digital camera sat atop a tripod) and an internal one (GoPro Mini camera); then the videos helped filling up the field diary.

The semi-structured interviews, with specific scripts for each group of participants, volunteers, families, coordination, and direction, were previously scheduled, according to the availability of the interviewees. All interviews were recorded by using a smartphone's voice recorder.

### *Data Analysis*

The software NVIVO version 11 was used in order to assist in the data organization. Such software can support the upload of texts, audio recordings and videos, which facilitates the process of systematizing information, crossing the data, and creating the categories of analysis.

Data analysis was based on the content analysis technique proposed by Bardin<sup>13</sup>, following its three steps. Under this perspective, all the contents obtained during data collection were properly transcribed and assessed in search of information on the phenomena observed by describing, categorizing, and interpreting the data.

## **Results and Discussion**

### *Elements of Social Interaction during the Ludic Experiences*

During the experiences, two forms of social interaction were considered: passive and active. The first concerns those interactions through which the children acted in response to some stimulus initiated by others, such as looking into the eyes, allowing touch and/or hug, smiling back at someone, and answering questions. The second, that is, the active interaction, contemplates the moments when the child played a leading role during interaction. This mainly occurred through ludic behavior as a conductive element, especially the sharing of the same toy (often the boards and kayaks), in addition to participating in the same game, such as playing with balls or tagging. Searching for the other to play together is the apex, since such behavior is considered to be rare when coming from someone with ASD, as pointed out in the

literature<sup>3,14</sup>.

Some details regarding the actions of these children were observed, such as who they looked for, if so, who they interacted with, if so, which toys and games they preferred. The answers varied throughout the observation according to the expansion of the children's experiences. However, it can be said that there was a search for active social interaction, explicitly manifested by three of the children (Júlio, Theo, and Henrique). They interacted with each other and with other children and/or volunteers as well.

Interaction search occurred mainly among children (or directed to them) who showed autonomous behavior, that is, those who moved more across the pool and were not under the custody of their parents. During the experiences, the assessment on the search of some children for others with similar development level was based on Camargo and Bosa's argument<sup>15</sup>. The authors emphasized the significance of the search for 'peers' shown by children of similar ages whose field of interest was alike.

Interactions used to start because of objects/toys, such as the water pistol, the shark float, balls, and stand-up paddleboards, which were the most sought-after and used toys. Some examples of these moments: shooting someone with the water pistol and waiting for their return, which implies an invitation to play; entering a competition to see who hits the most number of balls in the basket; escaping together from the shark (someone on a float) (FD 19/08/17). This type of relationship contributes to the development of social skills, which is understood as the competence to perform broad forms of interactions between peers, for example, cooperation, competition, and intimacy, and, thus, for the acquisition of social competence<sup>15</sup>.

Investigations on childhood based on the theories of social development, for example the one by Kishimoto<sup>16</sup>, highlight playing as a social activity full of meanings, during which the children have the opportunity to make different exchanges with each other, exercise languages, establish contacts, share experiences, as well as experience various social roles. In the case of children with ASD, there are indications that the ludic context feeds the children's interest, and it is likely to provide them with learning aspects related to language and social interaction<sup>8</sup>.

Other intervention studies<sup>17-20</sup> found positive results with regard to improvement and/or increase in the social interactions of children with ASD after experiences with aquatic activities that stimulated sociability. Such investigations showed that interventions are significant and can make a difference to change the communication pattern of children with ASD. Motivation and opportunities for keeping interactions can be decisive to consolidate social skills.

In this sense, the observations and narratives of the volunteers, when playing the role of mediators during the ludic experiences, have details on the significance of socialization moments to help the children overcome the barriers of communication. In a report, Giovanni, 19 years old, said: 'Their speech is impaired, but communication is not', which suggests that communication goes beyond verbal language.

Other reports of volunteers follow the same pattern of argumentation: 'Interaction itself makes room for new situations that teach the child to act in a certain way' (Rafael, 18). 'People usually say that autistic individuals can neither get involved nor have a good social relationship, but it is not true, we only have to develop it, work on it in a way they like' (Giovanni, 19). Another volunteer (Bia, 19) uses the following strategy to instigate the approximation between the children: 'Say hi to him/her. Ask if he/she wants to play with you. With this encouragement speech, relationships and play happen'. (FD, 06/2/17).

Experiences in the weekly meetings favor an approximation between the volunteer and child to the point that intelligibility in communication exists among them. Signs, gestures, and forms of expression are understood in a two-way street. It is noteworthy that not all children who participated in this study had speech limitations. In this sense, Astorino et al.<sup>21</sup> highlight the significance of intervention programs as agents for developing social skills by considering

two points: the different forms of learning and their individualities.

In short, among the elements related to the role of the *Aqua Atividades* project with regard to the social interaction of children with ASD, the following ones are highlighted: aspects intrinsic to the organization of the project itself with the format of experience through which the children have external stimuli (visual and material) to create, discover and share, in a spontaneous play; the presence of volunteers as mediators who ensure safety and stimulate social interactions; the plurality of participants of different age groups and levels of motor and social development, working as peers.

*From Interaction to Autonomy: First Steps and Aspects of Each Child's Individuality*

They end up seeing that it is not rocket science talking to someone, being affectionate with someone. (...) From the moment they see that interaction can be positive and that making little friends and playing with other people is possible, they understand that one does not have to live in his/her little world (Jessica, 18, volunteer)

Little can be said on how ASD interferes in the learning process, however, studies show that the greater the repertoire of skills and meanings, and the more constant the stimuli are, the greater the possibilities of understanding the contexts and interacting with them<sup>6,22</sup>. Based on this argument, it is understood that expanding the possibilities of the child to get along with each other can provide him/her with confidence to leave his/her internal world and interact with the external world with autonomy in the sense of being, acting and experiencing.

Given that the progresses in motor and social performance are mutually influenced, which generates self-confidence<sup>23</sup>, a way of reflecting on the achievement of autonomy, transposed into actions, was to observe the progress of children across the pool. It is known that a semi-olympic-size swimming pool has shallower edges and deeper middle, thus, most children focus on the shallow side over the weeks; however, as they become confident they begin to move more and more, and, then, they are familiar with other spaces (FD, 06/23/17). Therefore, it was seen that the more the children had self-confidence to advance to the bottom of the pool, the more they felt autonomous concerning parents and volunteers with regard to the search for interactions with other participants or by engaging themselves in games.

Understanding the manifestations of each child's social interaction is a way of understanding how the experiences affected them. Based on the Socio-Interactionist Theory<sup>6</sup>, it can be said that the sociability aspects shown by the children are linked to the minutia of these interactions and their scope. Thus, based on the statements of the volunteers and parents, as well as on the observations recorded over twelve weeks in the FD, the processes of social interaction of each child will be shown by emphasizing their individualities.

**Júlio**, unlike his first days, moved across the pool with his round float in the last weeks of participant observation; sometimes he was the protagonist in moments of interaction with other children, always with a smile on his face (FD, 08/25/17). According to the reports of the volunteers, this was a gradual and subtle process conquered by the boy's desire to experience his power, and also related to the support given to him.

Rafael, an 18-year-old volunteer, remembered a circumstance when Júlio actively sought interaction: 'a certain day he called me to play; I thought it was cool. He pulled me by the arm and said let's play'. Júlio's initiative to start a game draws attention and can be understood as an example of social competence, since initiative is related to the child's safety, curiosity and exploratory desire<sup>24</sup>. Chicon<sup>10</sup> obtained a similar response. The author showed a context where a child with ASD had the initiative to seek interaction with the individuals who had the role of mediators by encouraging play and interaction itself, that is, with those who were physically and emotionally close to the child.

Regarding some situations, such as those reported below, Júlio proved to be able to engage himself in symbolic make-believe games. Engaging in pretend play<sup>25</sup> involves an expression of potentiality by learning elements of communication and language, such as creativity and imagination, consequently social interaction itself.

I remember once I was with Theo, and Jessica [volunteer] was with Júlio. They both started playing. We didn't do anything, but they created a bus with the hula hoops, and we got into it (Bia, 19, volunteer).

Among the experience toys there was a shark float that caught the children's attention; it was often used by Júlio and Theo when playing tag, a game either initiated by the volunteers or Júlio (FD, 07/23/17).

Fies and Bichara<sup>7</sup> highlight that make-believe games for children with ASD can often be limited to the use of objects, so that gestural and verbal manifestations are scarce, given the difficulty of these children in creating more elaborate plots for their games. However, considering the situations reported, the involvement of the boys in pretend play comprised verbal dialogues and initiatives of the children themselves in starting make-believe.

**Theo**, as already mentioned, built lies of trust with Júlio by sharing moments of interaction, which is supported by the volunteer's report below:

We try to make one child interact with another, and when that happens it's amazing. For example, Theo and Júlio became friends; they always played tag together and went to the bottom of the pool, and we went after them (Maria Eduarda, 21, volunteer).

Tag is interpreted<sup>24:212</sup> as a type of dynamic game that involves a player chasing other players, thus, the desire of 'being caught, being loved and chasing and catching the other' is likely to be implicit. This represents a manifestation of symbolic play, which might indicate the presence of affection among children. In addition to participating in this game, both Júlio and Theo, after the second month of experience, went across the pool, each of them on his float or sharing the same kayak, however, always under the mediation of a volunteer.

Theo's mother, Marcia, 34 years old, reported an episode that occurred during a meeting with the boy's school teachers. At the family day party, Theo made sure his 'pool friends' would be there by justifying that they were part of his family. The importance given by the child to the *Aqua Atividades* project group shows how much this involvement had been affecting him beyond the experience moments. Under this perspective, Mapelli et al.<sup>26</sup> explain that the family is the child's first socialization environment, which offers care and welcome their needs.

Theo's mother rarely entered the pool, however, this did not bother the boy, who over the weeks, like Júlio, participated and started games, including pretend play, in addition to exploring the toys and materials available and circulating across the pool (always followed by a volunteer). Theo also allowed been touch (he used to go to one's arm); he rarely talked, but smiled back at someone, thus, it is understood that there was reciprocity with regard to Theo's social interactions.

**Henrique** said what he most liked to do when he was in the pool:

Playing with the ball and splashing water. I also like diving and running through water when my dad is swimming near me. I got out of the pool like this [gesture of movement]. (Henrique said during the interview with his father Fernando, 54).

Since Fernando always participate in the sense of taking care and sharing moments, the games usually involved both. The father said that he had taken his son to take part of the *Aqua*

*Atividades* project because he believed the boy needed to interact. Fernando said: ‘when Henrique is at home he is always alone in his bedroom. I see that the TV is not on. (...) Sometimes it is as if he were alone in that world; I go there and pull him along’.

The father's concern finds support in the literature that discusses the significance of providing motivation and opportunities to arouse the interest of the child with ASD for social contact and avoid isolation<sup>17,19,20</sup>. Throughout his participation in the experience, Henrique showed interest in interactions, creation of games, empathy, and progression with regard to going across the pool. In the last month of participant observation, he remained predominantly playing with the volunteers and other children on the stand up paddle board, in the bottom of the pool, unlike the first weeks when the interaction was limited only to his father (FD, 08/18/17).

Henrique started in moments of active social interaction, mainly with children of his same age group<sup>15</sup>. From his second month of experiencing activities on, the search for interaction became more constant; it is likely to be related to the body self-confidence acquisition, as well as to the approximations conquered. An example is when Henrique searches for Peter (participant diagnosed with Down syndrome. They are in the same age group):

Henrique goes near Peter and hits a ball on his head. Henrique's father comes close and touches his back at the same time Peter turns to Henrique. Peter looks at Henrique, he says something and leaves. Fernando, his father, tries to get the boy's attention with a ball by keeping away to make his son seek it, but the child turns around and walks towards Peter. (FD, 16/06/17).

Henrique's distinguished participations in collective games, and even his speech about his favorite games during the experiences, show his interest in creating or inserting himself in the games.

**Alice** had recently been diagnosed with autism when she started to participate in the ludic experiences. Her parents were looking for ways to learn how to deal with the girl's limitations. She is the only one among the children of this study who still does not go alone. The girl's dependence on the parents might explain the difficulty in interacting, since she avoids contact with those who get close to her, in addition to not accepting the use of the float in the pool.

When interviewed, a volunteer talks about the girl, highlighting the social openness obtained in a slow and careful process: ‘it was little by little; I gave her a hand, and she put her hand on it, and, thus, she was becoming confident and coming closer (...) the last week she was on my lap’ (Bia, 19).

One day, a volunteer suggested that Alice's mother, Eva, 35 years old, allowed the girl to enter the pool accompanied only by volunteers. Surprising everyone, the girl showed a passive interaction; she smiled back, manipulated objects and went on the lap of two volunteers. The mother was surprised by the girl's behavior and said she had never seen her daughter so comfortable with other people and that she was happy about it (FD, 12/08/17). This reinforces the observation by Mapelli et al.<sup>26</sup>, whose study highlights a mother's expectation of seeing her child with greater independence and, thus, with greater capacity for socialization.

**Daniel** received the diagnosis of ASD when he was two and a half years old. Among the participants, he was the one who showed the least behavior change during the research period. A possible explanation is associated with the boy's strong connection with his parents, who always participated in the experience. The following was said about him:

He is always quiet. There has been no great change in personality up to now. He's very shy, but I talked to him. He was with a toy, and I asked, ‘what's this?’ I felt



he liked it. 'Are you going to go into the pool with it?' He didn't answer. I think his father often entered the pool with him because the boy was like that. He doesn't answer much, he minds his own business; but if we encourage him by saying 'let's do such a thing', he agrees. The last time I was with him, he went up on the board. It's little by little, it's a gradual process, but it always works. (Maria Eduarda, 21, volunteer).

After two months of experience, Daniel showed no initiative for interacting with anyone other than his parents. When the volunteers came close to him, he did not cry nor avoided such approximation; sometimes he went on the kayak or the board without his parents, but he kept quiet and very attentive to both, the dumbbell he used to carry and what went on around him (FD, 09/06/17).

Maybe Daniel's a case like Alice that we're going to have to conquer little by little so that he can be set free. Once I stayed with him on the board, he focused on what he was doing (Bia, 19, volunteer).

His mother, Maria, 42, said 'Daniel used to be a child who was always alone, he didn't speak, didn't seek to interact (...) today he even participates in presentations at school.' The parents said that in 2017 he began to receive several stimuli and showed changes in behavior, but it could not be attributed to any specific cause. In the course of the experiences he smiled little, avoided eye contact, but he was not completely resistant to passive interaction, since he answered when asked and accepted to go on the kayak with somebody.

The present study aimed at assessing the role of ludic experiences in aquatic environment facilitated by an NGO for the social interaction of children with ASD. It is understood that each child, when respected according to his/her individualities, experienced different trajectories by enjoying the interaction opportunities at different levels. The results were corroborated by the observations of the parents and volunteers. Considering the five children, the oldest three ones were more open-minded to the approximation of others other than their parents. They were more motivated to get involved, take part in games and look for social interaction, besides being confident to move around without assistance, even in the bottom of the pool. All these actions observed in the context of experiences permeate elements of social interaction, such as reciprocity and understanding of social signs<sup>6</sup>.

## Conclusions

Regarding the limitations of this study, the lack of similar academic productions is highlighted so that a discussion on the results and the differences in age and diagnoses of the children would be performed. In terms of research this might hinder the organization of parameters of children submitted to the same stimuli, although in practice diversity contributes to social interactions.

The characteristics of the ludic environment experienced (*Aqua Atividades*), that is, colors, sounds and challenges related to changing from the outside environment to the aquatic one, provided the children with new possibilities and learning. Therefore, over twelve weeks of participant observation, although no complex plot or continuous verbal dialogues were identified, it was seen that the children, each at their own pace, were able to cultivate verbal or gestural communication skills and build ties of trust with the volunteers and other children by developing elements for their autonomy in a fluid and welcoming environment, such as the aquatic one.

Autonomy is the central idea that the organizers of the experiences want to convey. A set of values and attitudes is added to autonomy, and helps in the sense of how to conduct such

experiences. For example, breaking with the overprotection of parents, encouraging children to develop their own interests and expand aspects related to sociability.

Moreover, although no other investigations were found that evidenced spontaneous play as a background for social interaction associated with ASD, the results of the present study were similar to other investigations<sup>10,15,20,21,23</sup>, which had their context in aquatic activities for children with ASD, that is, the ability to acquire social skills and make progress.

However, most studies show their findings in terms of ‘advance and/or improvement’ with regard to sociability as an answer to a certain type of intervention. Thus, a question is raised: would it be the moment to think about what really there is in common in all intervention models capable of achieving such results?

Regarding all possibilities there is something in common: the presence of human contact with a person attentive and patient to interact with the child. There is interaction marked by the acceptance of one another as legitimate.

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