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ORIGINAL

SWIMMING EFFECTS FOR YOUNG PEOPLE WITH AUTISM SPECTRUM DISORDER

EFECTOS DE LA NATACIÓN PARA JÓVENES CON TRASTORNO DEL ESPECTRO AUTISTA

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ABSTRACT

The aim of this research was to evaluate the effects of an aquatic activity program, in the aquatic skills of students with autism spectrum disorder (ASD). The program consisted of 15 sessions that emphasized entering and exiting the pool, water orientation and introduction to front crawl and backstroke. It was evaluated if the students were able to perform tasks, independently, with verbal and gestural instruction, physical conduct or did not perform the requested tasks. In general, students demonstrated improvement in entering and exiting the pool, respiratory control and displacements. In particular, it was noted the

positive development of the five participants, in the three required tasks, to enter and exit the pool. Research has shown that students with ASD can have positive results for the evolution of aquatic skills, and better participation in the proposed activities.

KEYWORDS: Autism spectrum disorder, Aquatic skills, Swimming, Water activities.

RESUMEN

El objetivo fue evaluar los efectos de un programa de actividad acuática con las habilidades acuáticas de los alumnos con trastorno del espectro autista (TEA). El programa consistió en 15 sesiones enfatizando la entrada y salida de la piscina, la orientación sobre el agua y la iniciación en el estilo crol y espalda. Se observó si los estudiantes eran capaces de realizar las tareas de forma independiente, con la instrucción verbal y gestual, con una conducta física o sin poder realizar la tarea solicitada. En general, los estudiantes desarrollaron tanto las entradas y salidas, como el control de la respiración y el movimiento de desplazamiento. En particular, se destaca la evolución positiva de los cinco evaluados en tres tareas específicas de entradas y salidas. La investigación ha demostrado que los estudiantes con TEA pueden presentar resultados positivos con respecto a la evolución de las habilidades acuáticas y una mejor aplicación de las actividades propuestas.

PALABRAS CLAVE: Trastorno del espectro autista; Habilidades acuáticas; Natación; Actividad acuática.

INTRODUCTION

The Autistic Spectrum Disorder (ASD) is a human development disorder that was studied by the science for nearly six decades. However, it still remains, in the field of science, some disagreements and significant questions unanswered[1].

For diagnostic purposes, the Diagnostic and Statistical Manual of Mental Disorders (DSM - IV) shows the ASD within the classification of Pervasive Developmental Disorders. Thus, it based the criteria on impairments presented at the communication skills, characterized by the difficulty in using aspects of verbal and nonverbal communication such as gestures, facial expressions, body language, rhythm and clarity in verbal language. Besides, it is based on the difficulty in relating to other people, inability to share feelings, gestures and emotions, the difficulty on using the imagination, which is characterized by the rigidity and inflexibility that extends to several areas of thought, language and behavior. Also, it is related to ritual and obsessive behaviors, literal understanding of language, lack of changes acceptance and challenges in the

creative process[2, 3]. These changes can be observed from very early ages, and they should appear until around three years of age[4].

Often, people with ASD are characterized by their self-stimulation behavior and gestural stereotypes like swinging the body and hands (hand flapping), self-aggression, interest in nonfunctional rituals or an insistence on following routines[2, 5].

The benefits of regular physical activity are established, and they confirmed the importance of exercises to maintain and promote the overall health and well-being. However, the participation in physical activities is usually a challenge for people with ASD due to lower levels of motor development, low motivation, difficulty in planning and generalization, and also, the difficulty about self-monitoring activities[6].

Although the differences in motor skills are not considered as significant factors in the diagnosis, children with ASD commonly show problems in the development of these skills. That is reflected in the overall coordination, thin and gross motor skills and motor control[7], which represent low levels of participation in physical activities and sports programs, in a long time [8, 9].

Sowa and Meulenbroek[8] reported, in their literature review, that several studies found positive results in improving physical fitness, and also, in reducing social inappropriate behaviors, after the participation in adapted physical activity programs, in which two types of exercises are mainly used: walking and swimming.

Working with tailored programs on swimming and water activities can help young people to improve their participation, social interaction, language development and adaptive behavior[10]. Added to this, constant temperature, buoyancy, relative density, pressure and water resistance seem to provide moderation in the level of excitement and anxiety of children and youth with ASD, as well as the reduction of non-functional behaviors, gestural stereotypes and self-stimulation[11].

Nowadays, despite the growing number of diagnoses and the recognition at increasingly early ages, there is still a low number of scientific articles that portray the relationship between physical activity and ASD. The systematic review, by Lang et al.[12], found only 18 articles between the years 1980 and 2006 that involved physical activity and persons with ASD. Sowa and Meulenbroek[8] found 16 articles that pointed out the effects of physical activity, in people with ASD. Therefore, this research aims to evaluate the effects of an adapted aquatic program in the aquatic skills of students with autism spectrum disorder.

MATERIALS AND METHODS

It is a qualitative-descriptive study based on the assessment of a group of five students with ASD who participated in an aquatic program activity.

The five participants showed characteristics commonly observed in people with ASD as the presence of a non-verbal language (some verbalized words, however, out of context, syllables or immediate and delayed echolalia), the frequent presence of self-aggression[5], gestural stereotypes[13], rituals and restricted interests[3]. These behaviors were more frequently seen before the classes (in the arrival and at the cloakrooms).

In order to describe the sample, the characterization of the studied subjects was performed as shown in Table 1:

Table 1. Research subjects by gender, age, diagnosis and characteristics.

P	M/F	Age	Diagnosis	Characteristics
1	M	15	Autism - invasive developmental disorder with features of autism spectrum.	Does not communicate verbally. It features self-aggression and aggression to the other. Demonstrates fixation on particular objects such as earrings, hats and glasses.
2	M	25	Severe mental retardation with autism	Uses verbal language in the form of immediate and delayed echolalia. Presents self-aggression and stereotyped movements. Performs rituals and follows routines (e.g. always keeps the slippers in the same place). Has difficulty accepting the touch and does not maintain eye contact.
3	F	9	Pervasive Developmental Disorder with traces of Autism	Prefers to be isolated and performs stereotypic movements with the hands (hand flapping).
4	M	14	Autism	Expresses preference for staying isolated and has difficulty accepting physical contact. Often presents stereotyped movements and routines obsession.
5	M	13	Autism	Seems to be uncomfortable with the noise and physical contact. Presents difficulty in accepting social rules such as respecting the place reserved for the class.

P = Participant; M = Male; F = Female.

As inclusion criteria, the participants must have: 1) diagnosis of ASD as reported in the institutional records; 2) to be properly registered to participate in the swimming program and have a minimum frequency of 75% of classrooms, and 3) to have a term of free and informed consent signed by their parents or guardians. Of the 20 students enrolled in the project, five met the inclusion criteria. All the others continued to participate regularly in the activities. This

research was approved by the Ethics Committee of the Federal University of Santa Catarina, under the protocol: 911/10.

The intervention program was comprised of 15 classes, with a duration of 80 minutes and divided into four moments of different activities as presented in table 2. The sessions were divided into four months, and held on Saturdays morning.

The classes were planned, organized and based on the parameters of teaching and development of aquatic skills for people with disabilities proposed by Lepore, Gayle and Stevens[14] and Winnick[15]. They emphasized the time before entering the pool (inputs / outputs), guidance on water and fluctuation, in the initiation of front crawl and backstroke.

Table 2. Description of the intervention.

Categories	Minutes	Activities
1. Activities in the classroom	20	Reception of the students; it was used figures of alternative communication, and a mural was established for information about the activities, swimming material, appropriated clothing for swimming and the expected behaviors. In the mural, sentences, pictures and figures of alternative communication were presented.
2. Entry in the pool	10	Taking showers, stretching and entrance to the swimming pool.
3. Aquatic activity - intervention	40	Intervention. Based on the parameters of aquatic skills development for people with disabilities proposed by Lepore, Gayle, Stevens[14] and Winnick[15], emphasizing orientation in the water, fluctuation and initiation in the front crawl and backstroke
4. Closure	10	Relaxation activities; Group Chat.

After the initial moment (classroom activity), the students were accompanied by teachers to the pool. The activities were carried out in a gym's pool with a calm environment, few visual stimuli and without the presence of parents or relatives.

The water activities were organized by following the regular parameters of swimming learning, with a progression from the safety rules learning, in the pool, development of early swimming skills (floating, breath control and propulsion), and finally, teaching swim strokes. The lessons were always planned, implemented and evaluated by the same teacher, who was specialized on adapted physical activity. The survey participants were also accompanied by a graduate assistant teacher or a student of physical education.

The students were assessed in a heterogeneous group along with fifteen other students, with intellectual disabilities, that were also enrolled in the adapted aquatic program. However, the participants, in this study, were accompanied by a teacher to each one of them. The others followed the instructions of the class teacher. Regarding the instructions for carrying out the activities, the tasks were initially explained verbally and directly to the group. After the verbal instruction,

the explanation of the task was performed with the help of images, pictures and photos organized by the teachers through the use of images taken from magazines, alternative communication, photos of materials, students and teachers themselves. Finally, in a third attempt to perform the activity, the teachers helped the students physically (driving physics).

A Samsung camera, model SD Flash Memory Camcorder, was used for recording and evaluating the classes. Thomas, Nelson and Silverman[16] and Zuchetto[17] emphasize that capturing images prevent the researcher from getting worried about recording what happened at the moment the observed behaviors occurred.

The capture of images enables the recording of behaviors and events that can be viewed and revised as often as necessary, in addition to enabling the observation of more than one person, at the time that teachers and students interact. Also, it is possible to stop and freeze the observed events, and finally, the researcher has a permanent record of what it was observed.

The first class and, after the beginning of intervention, the last classes of each month were filmed. The aquatic skills were assessed by using the videos. The following aquatic skills were evaluated: (1) Inputs / Outputs of the pool, (1.1) taking a shower before entering the pool, (1.2) entering the pool by using the stairs and (1.3) exiting the pool by using the stairs. (2) Breath Control: (2.1) Placing the whole head underwater (apnea diving), (2.2) blowing bubbles with the head underwater. (3) Displacement of crawl stroke: (3.1) fluctuation and displacement with floats (3.2) Displacement with leg kick in crawl style with floats (3.3) Displacement of free crawl. (4) Backstroke displacement: (4.1) fluctuation and displacement with floats, (4.2) Displacement with the leg kick in backstroke with floats (4.3) Free backstroke displacement.

It was possible to attribute value to each one of the specific skills as described in table 3. A spreadsheet was used for registry and analysis of the recording for each evaluated class.

Table 3. Assigned values regarding the achievement of aquatic skills.

Values	Way of performing the required task
0	Cannot do or refuses to do.
1	Performs with driving physics. Verbal and visual instructions are carried out with the driving physics.
2	Performs with verbal instruction and demonstration. The subject performs the task after verbal and visual instructions (using images, pictures and demonstrations) directly to the student.
3	Performs spontaneously after the group instruction.

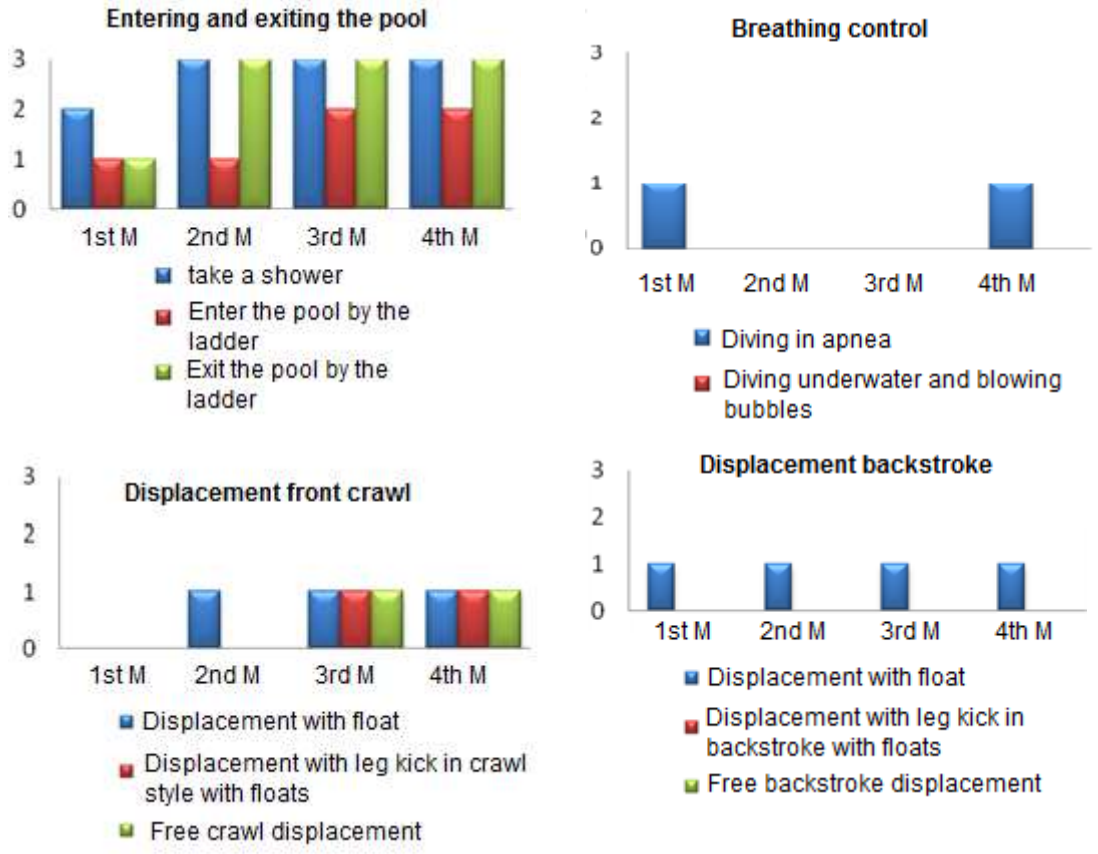
Adapted from Lepore, Gayle and Stevens (1998)

The criteria presented in table 3 were used as a parameter of the expected developments for each task, during the study, as suggested by Lepore, Gayle and Stevens[14].

RESULTS

In order to evaluate the effects of a swimming program on aquatic skills of students with ASD, the results of this research are presented in the form of figures containing graphs, and showing the evolution of each subject in every aquatic skill evaluated.

Accordingly, the results for the first participant (P1) are shown in Figure 1.



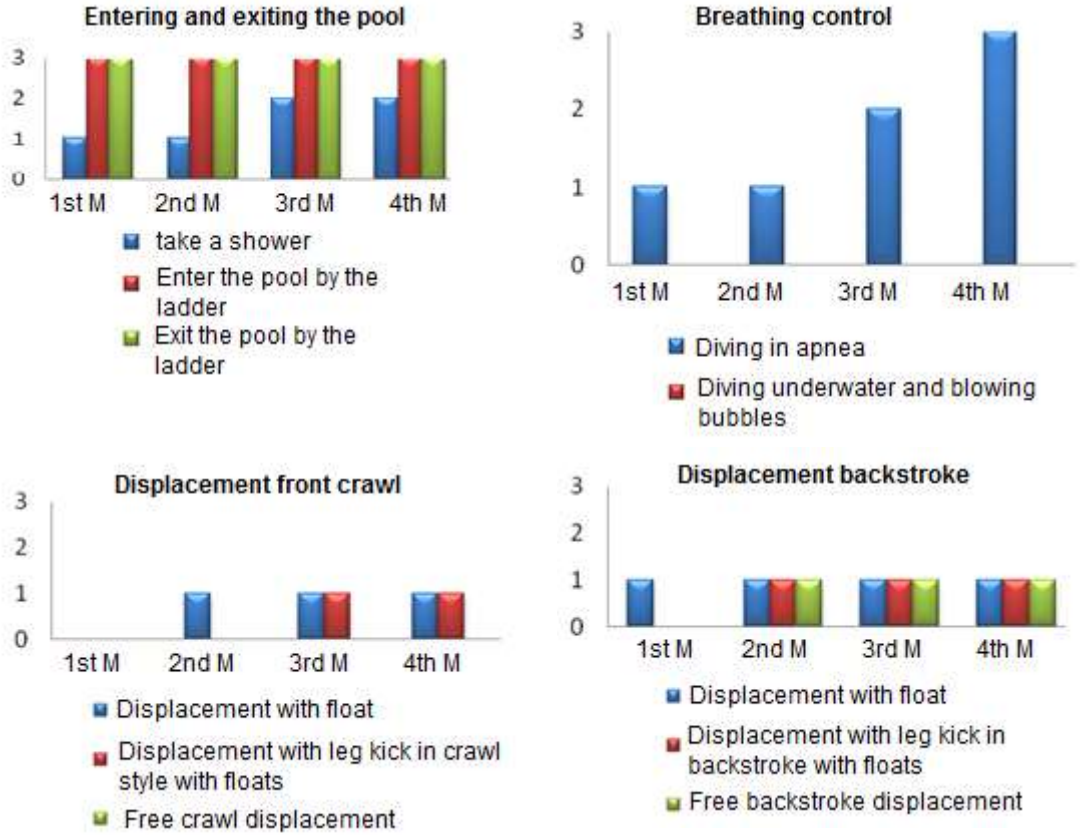
Legend: 1st M = first month; 2nd M = second month; 3rd M = third month; 4th M = fourth month; 0 = Cannot do or refuses to do; 1 = Performs with driving physics. Verbal and visual instructions are carried along with the driving physics; 2 = Performs with verbal instruction and demonstration. The subject performs the task after verbal and visual instructions (using images, pictures and demonstrations) directly to the student; 3 = Performs spontaneously after the group instruction.

Figure 1. Graphs presenting the results of P1.

It is possible to observe that the skills performed earlier or at the end of the class (taking a shower, getting in and out through the pool ladder) showed better results when compared with other skills. It was seen that P1 began to perform with spontaneity two out of three required tasks. Moreover, all these activities were carried out without the driving physics, at the end of the intervention.

It is also highlighted the positive developments presented in the ability of front crawl displacements. The subject, in the first month, refused or could not perform any displacement (value 0); however, he was able to perform the three required tasks with driving physics, at the end of the intervention.

Regarding the results for the participant 2 (P2), the student showed an increase in all four aquatic skills, being more evident in the backstroke displacements and respiratory control as shown in Figure 2.



Legend: 1st M = first month; 2nd M = second month; 3rd M = third month; 4th M = fourth month; 0 = Cannot do or refuses to do; 1 = Performs with driving physics. Verbal and visual instructions are carried out with the driving physics; 2 = Performs with verbal instruction and demonstration. The subject performs the task after verbal and visual instructions (using images, pictures and demonstrations) directly to the student; 3 = Performs spontaneously after the group instruction.

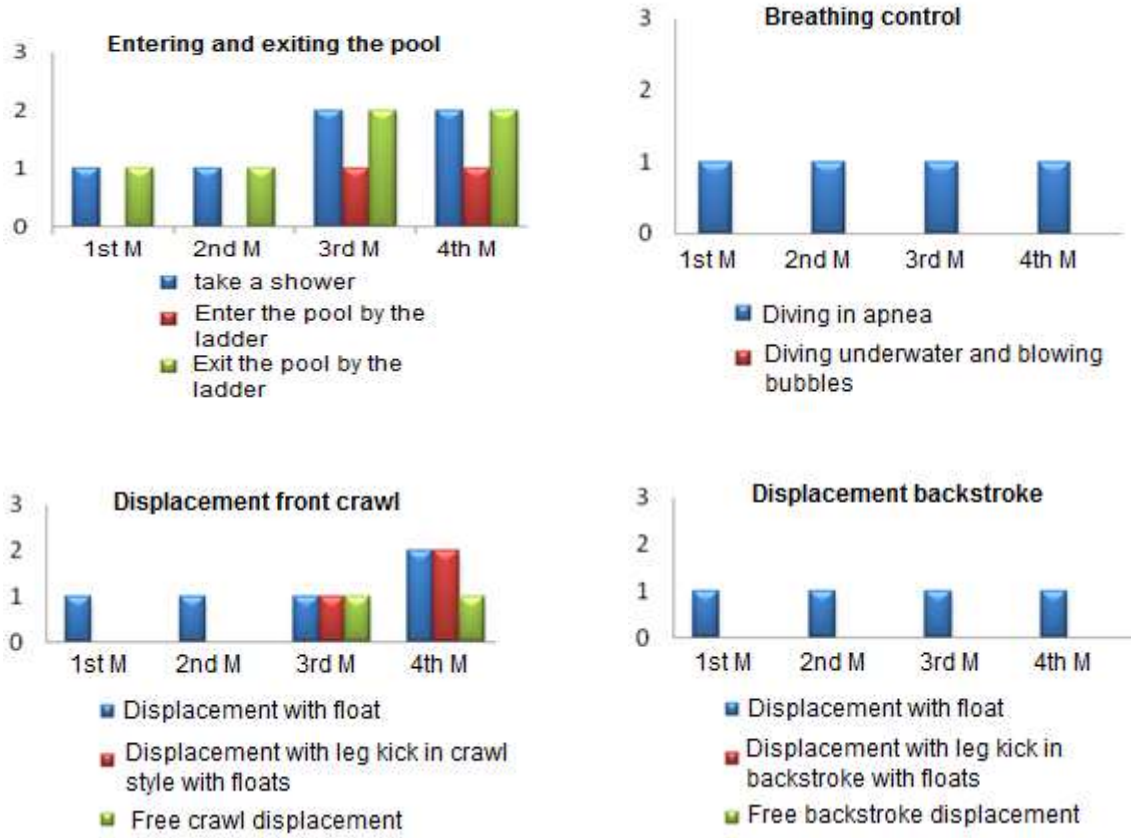
Figure 2. Graphs presenting the results of P2.

It was seen, during the intervention, that P2 achieved the breath hold diving, in relation to the respiratory control. The participant had an evolution of the initial situation performed with physical, gestural and verbal support to do it autonomously with the group (prevalence value 3).

The graphs also show the evolution of this student, in the displacements. Initially, the participant could not perform or refused to do the tasks (prevalence

of values zero), and from the third month, he began to achieve, at least, five specific tasks with the teachers help (prevalence values of 1).

The results presented in the figure are related to the third participant (P3). They highlight the evolution in the skills of taking a shower, getting in and out by the pool ladder and displacement crawl.

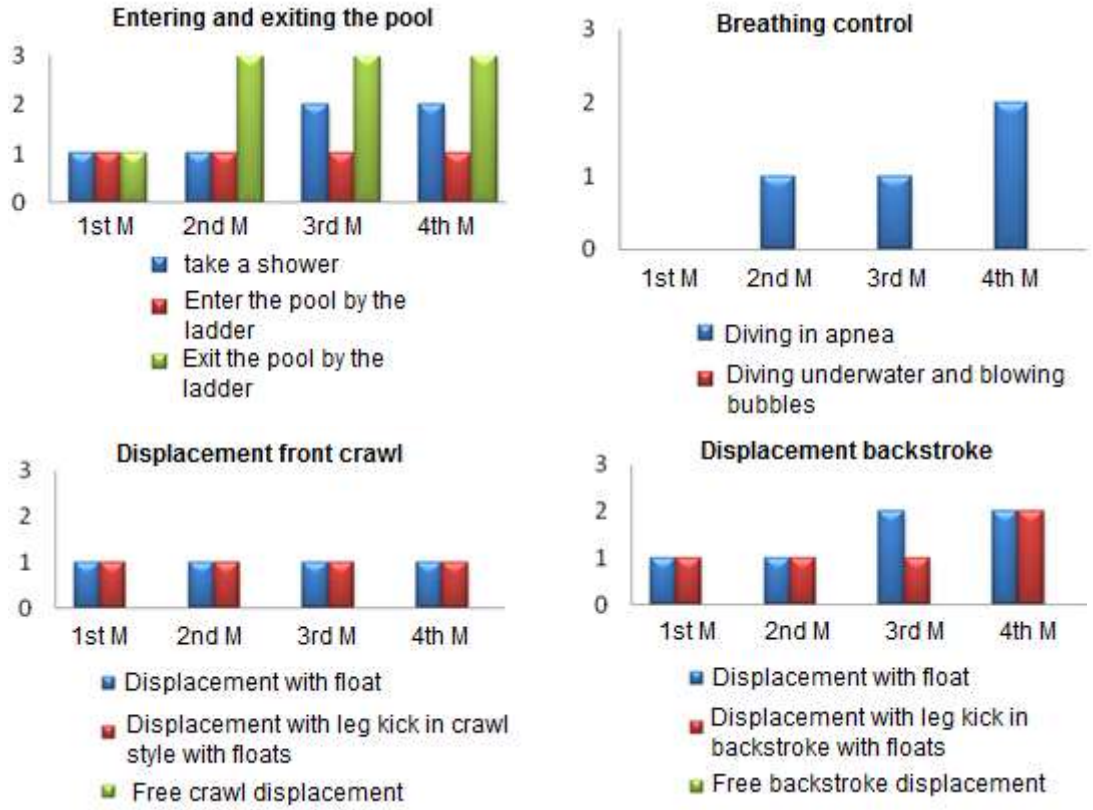


Legend: 1st M = first month; 2nd M = second month; 3rd M = third month; 4th M = fourth month; 0 = Cannot do or refuses to do; 1 = Performs with driving physics. Verbal and visual instructions are carried out with the driving physics; 2 = Performs with verbal instruction and demonstration. The subject performs the task after verbal and visual instructions (using images, pictures and demonstrations) directly to the student; 3 = Performs spontaneously after the group instruction.

Figure 3. Graphs presenting the results of P3.

The P3 evolved in the skills of inputs/outputs and displacement in front crawl, in comparison to other evaluated tasks. For the latter, there was a detachable evolution, going from the value zero (not performed) to carry out without driving physics teachers (prevalence value 2). In addition, the student, after overcoming the challenge of remaining alone in the pool, made a qualitative leap in evolution and participation in aquatic activities, getting to perform two tasks without the help of teachers' physical conduct.

Like other students, the participant 4 (P4) showed improvements in inputs/outputs and displacements. Furthermore, he presented better results for respiratory control as shown in Figure 4.

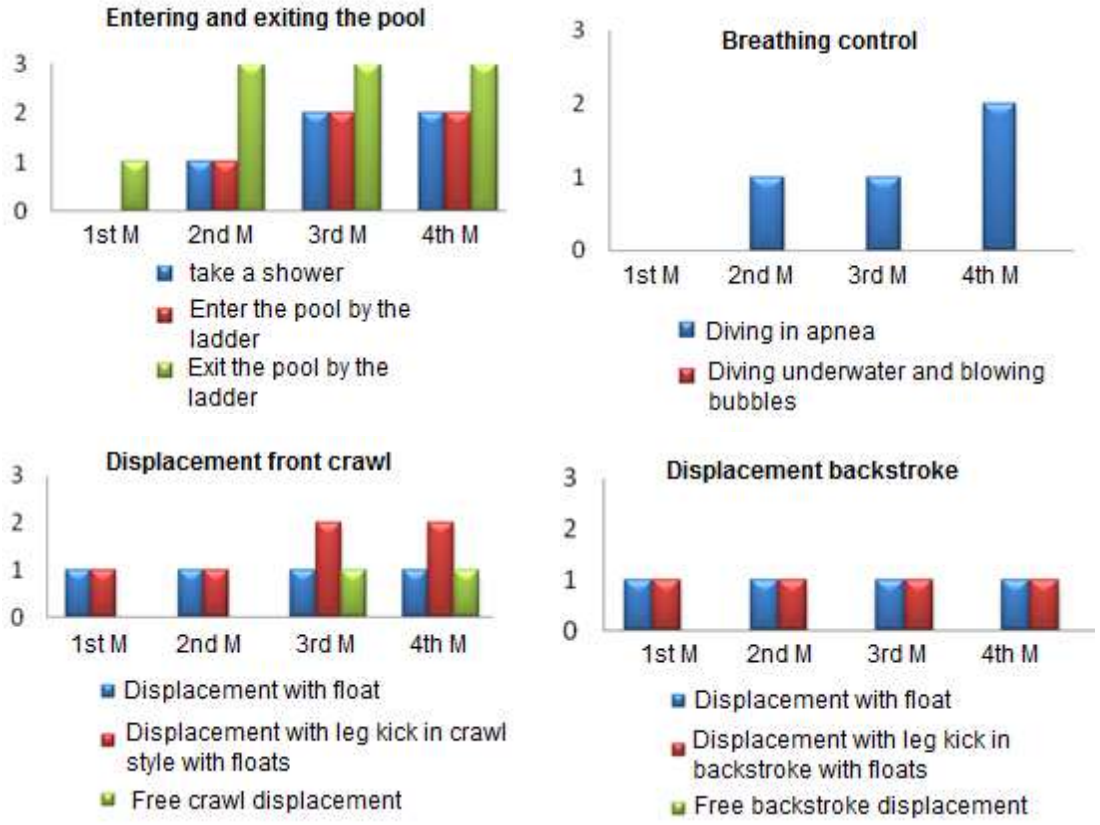


Legend: 1st M = first month; 2nd M = second month; 3rd M = third month; 4th M = fourth month; 0 = Cannot do or refuses to do; 1 = Performs with driving physics. Verbal and visual instructions are carried out with the driving physics; 2 = Performs with verbal instruction and demonstration. The subject performs the task after verbal and visual instructions (using images, pictures and demonstrations) directly to the student; 3 = Performs spontaneously after the group instruction.

Figure 4. Graphs presenting the results of P4.

The results show, in the graph, the main developments of apnea diving and backstroke. At the end of the intervention, there was a prevalence of value 2 for these skills. The participant also evolved on exiting the pool by respecting the end of the class and going out of the pool independently.

The participant 5 (P5) presented the greatest evolution in swimming and the relationships with teachers, peers and environment. Initially, the P5 refused to take a shower and get into the pool by the ladder. However, in the second month of intervention, he began to respect the place reserved for the activities, as well as take a shower and get into the pool by the ladder as shown in the figure 5. In addition, it can be seen that from the third month the student had a marked improvement in the skills of respiratory control and displacement crawl with floats.



Legend: 1st M = first month; 2nd M = second month; 3rd M = third month; 4th M = fourth month; 0 = Cannot do or refuses to do; 1 = Performs with driving physics. Verbal and visual instructions are carried out with the driving physics; 2 = Performs with verbal instruction and demonstration. The subject performs the task after verbal and visual instructions (using images, pictures and demonstrations) directly to the student; 3 = Performs spontaneously after the group instruction.

Figure 5. Graphs presenting the results of P5.

In general, positive results were observed in the four items assessed. In particular, it highlights the positive developments of the five subjects evaluated in the three specific tasks of inputs/outputs (taking a shower, getting in and out of the pool by the ladder). Unlike the first month, when there were moments in which the students could not or refused to perform the activity (value 0), at the end of the intervention, all the participants were able to achieve the exercises. Most of the students only performed them with verbal and gestural instruction and without the teachers physical conduct (prevalence in figures 2 and 3).

It was possible to notice a significant advance in the skills of apnea diving, in relation to the breathing control. This skill is essential for the autonomy in the pool, and also, to the development of other skills. However, none of the students tried to perform the skill of releasing the air with their heads underwater.

When evaluating the complex skill of displacement floating in the pool as shown in the results, the participants evolved in different skills, in their own way, showing preference or ease in one or another task.

DISCUSSION

The present study, aiming to evaluate the effects of a 15-week program of water activities adapted in aquatic skills for students with autism spectrum disorder, found that, in general, the participants evolved on inputs and outputs of the pool, as well as respiratory control and displacements. The presented results are supported by previous investigations that also pointed out improvements in aquatic skills of people with ASD, as a result of a program on water activities [18-22].

The evaluated students were in an initial stage of adaptation to the aquatic environment, safety rules and appropriate behaviors. Besides, representing a security issue, a better social interaction, recognition and respect for the aquatic environment might be considered as a prerequisite for the participation of these students in swimming programs and aquatic activities[19].

The confirmation of this initial stage may be observed in distinctive attitudes as the non-use of swimming cap (P1, P2 and P4), and the prevalence of values 0 and 1 to take a shower and use the stairs to all participants. The P3, in early classes, refused to stand alone in the pool, and he spent most of the class holding up the ladder or the teacher. The assessments also revealed that the P4, in the initial stage of adaptation, refused to wet his face.

This investigation found further progress on inputs and outputs (taking a shower, getting into the stairs and exiting the pool by the stairs) than the other assessed skills. The improvement on independence and autonomy, in the aquatic environment, may have represented an important step in other skills evolution.

The result differs from the observed by Chu and Pan[18], Pan[20] and Rogers, Hemmeter and Wolery[23]. These authors found that students demonstrated ease, could already enter the pool independently or with minimal assistance and; thus, they achieved better the tasks related to swimming.

Commonly, people with ASD have difficulty with speech, language and communication[24, 25]. Martinez[25] says that an adapted aquatic program should collaborate with developing ways of communication that are necessary and appropriate for the proper functioning of the program and students' progress through gestures, signs, pictures, posters and cards.

As it was noted, the P5 showed difficulties in meeting the placeholder for the activities and rules of conduct in the aquatic environment. Nevertheless, with the participation in the construction of rules and proposed activities with photos and figures, he began to have more positive initiatives as waiting for the moment to enter the pool, as well as the entrances and exits. Thereby, it is believed that the use of photos and pictures of alternative communication

contributed heavily in the process of learning initial skills of entry/exit and taking a shower before entering the pool.

Rogers, Hemmeter and Wolery[23] reported that students took between 6-8 sessions to acquire a new skill among the three studied: leg crawl, crawl stroke and lateral breathing. At the end of the 15 sessions, in the present study, all participants presented improvement in tasks evaluated for the inputs and outputs; however, the students developed the other skills in different ways, among them. After the intervention, each student developed a unique repertoire on aquatic skills, demonstrating preference or ease in each task[19].

The skills performed within the pool, during the main part of the class, can represent the tasks with the highest degree of complexity and; then, they result in a slower evolution compared to the skills for entering and exiting the pool. However, regardless of this result, children and young people with ASD present a definite trend about swimming activities initiation[26], as well as the improvement of aquatic orientation task[10]. Preliminary, the studies also indicate that the great difficulty of the tasks may provoke a decrease in spontaneous movements, and increase responses opposite to the activity[10, 26].

Reid and O'Connor[27] suggest that the proposed activities should monitor the social and cognitive demands of the participant. Therefore, the tasks with a high level of complexity or requiring high level of social interaction may not be appropriate, at certain times, according to the features presented by a person with ASD.

Unlike the studies of students with Asperger syndrome and high functioning autism[18, 20] that found independence and spontaneity, in the assessed individuals, to release air bubbles into the water, the data presented in this study showed that participants were able to perform the apnea diving. However, they did not demonstrate any intention of releasing the air into the water. Nonetheless, it was possible to observe that the activity of placing the face into the water seemed to be a crucial moment because the other activities were quickly performed. In order to break this barrier, it is necessary to include floating and moving with more confidence and autonomy.

For displacements, the difficulty in accepting the touch and stereotyped movements, which are characteristics commonly observed and described for people with ASD, may have influenced the slow evolution of this skill. Rosenthal-Malek and Mitchell[5] cited that the literature reports that behaviors described typically for people with ASD, in general, can interfere with the positive performance of social behaviors and several skills learning.

Still, there was a presence of high values for displacements at the end of the intervention. According to the scale used to monitor these skills, the lowest value (zero) represents the student that was unable or refused to perform a task and passed through two intermediate steps: (1) driving physics, 2) verbal

instruction and demonstration directed to the student, and the highest one (three) represented spontaneity in the tasks, it is believed that the participants evolved to the extent of accepting better physical and visual contact, as well as verbal and gestural teachers instructions.

Although the pool itself frequently represents an environment with lots of sensory stimulations, it is also observed, in the present study, that the aquatic environment represented a location with well-demarcated limits, without music and with little fuss. Also, without a lot of materials that could potentially draw the participants' attention and influence the identification and memorization of each relevant space for activities, making the participants' actions more autonomous[27, 28].

Previous studies indicate, in addition to the results regarding physical activity, positive results related to a decrease in stereotyping and aggressive behavior[12, 29], a significant decrease on antisocial behaviors and improved social skills and communication[20, 30]. Since that was not quantified in the current research, some developments, in these behavioral variables, were observed for greater involvement with the group, and the proposed activities were carried out. It was seen, in relation to the P2, that stereotyped movements and rituals adopted, at certain times, undermined the participation in class. In other moments, they were used by teachers as a motivational strategy for carrying out the proposed tasks.

As an example for diving, the teachers used an object for attachment (the material was always with the student) to motivate him to overcome the obstacles and progress in the assessed skill. Thereby, the student spent less time with the object and performed more activities. In relation to the P5, at the end of the intervention, there was a greater uptime with the group unlike the striking isolation of the initial classes.

These variables indicate limitations and suggestions for future articles, the assessment of behavioral variables such as the reduction of negative behaviors, stereotypes, frequency of expected and positive behaviors, in the proposed tasks, beyond the times' record in different activities.

CONCLUSION

In conclusion, the study showed that students with ASD can participate in a program of aquatic activities, present positive results regarding the evolution in aquatic skills and the best achievement of the proposed activities. It is possible to suggest that the intervention promote the development of aquatic skills, especially, in the initiation and adaptation to the aquatic environment (inputs and outputs of the pool) as shown in the researched results.

It is understood that the concerns on maintaining the program with individual support for students with ASD, information before and after school, the use of

different forms of verbal and non-verbal communication, strongly contributed to the development of the skills assessed. The evaluation criteria suggest that the program help the participants to achieve the tasks with greater autonomy, allowing greater participation in activities and the initial development of swimming techniques.

REFERENCES

1. Mello AMSR. Autismo: guia prático. 6 ed. São Paulo; Brasília: AMA; CORDE; 2007.
2. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4 ed. Washington D.C: American Psychiatric Publishing; 2000.
3. Bosa C, Callias M. Autismo: breve revisão de diferentes abordagens. Psicologia: Reflexão e Crítica. 2000;13:167-77. https://doi.org/10.1590/s0102-79722000000100017
4. Klin A. Autismo e síndrome de Asperger: uma visão geral. Revista Brasileira de Psiquiatria. 2006;28:s3-s11.
5. Rosenthal-Malek A, Mitchell S. Brief report: the effects of exercise on the self-stimulatory behaviors and positive responding of adolescents with autism. J Autism Dev Disord. 1997 Apr;27(2):193-202. https://doi.org/10.1023/A:1025848009248
6. Todd T, Reid G. Increasing Physical Activity in Individuals With Autism. Focus on autism and other developmental disabilities. 2006;21(3):167-76. https://doi.org/10.1177/10883576060210030501
7. Pan C-Y, Tsai C-L, Chu C-H. Fundamental Movement Skills in Children Diagnosed with Autism Spectrum Disorders and Attention Deficit Hyperactivity Disorder. Journal of Autism and Developmental Disorders. 2009;39(12):1694-705. https://doi.org/10.1007/s10803-009-0813-5
8. Sowa M, Meulenbroek R. Effects of physical exercise on Autism Spectrum Disorders: A meta-analysis. Research in Autism Spectrum Disorders. 2012;6(1):46-57. https://doi.org/10.1016/j.rasd.2011.09.001
9. Staples K, Reid G. Fundamental Movement Skills and Autism Spectrum Disorders. Journal of Autism and Developmental Disorders. 2010;40(2):209-17. https://doi.org/10.1007/s10803-009-0854-9
10. Yilmaz I, Yanarda M, Birkan B, Bumin G. Effects of swimming training on physical fitness and water orientation in autism. Pediatr Int. 2004 Oct;46(5):624-6. https://doi.org/10.1111/j.1442-200x.2004.01938.x
11. Vonder Hulls DS, Walker LK, Powell JM. Clinicians' perceptions of the benefits of aquatic therapy for young children with autism: a preliminary study. Phys Occup Ther Pediatr. 2006;26(1-2):13-22. https://doi.org/10.1080/J006v26n01_03
12. Lang R, Koegel LK, Ashbaugh K, Regester A, Ence W, Smith W. Physical exercise and individuals with autism spectrum disorders: A systematic review. Research in Autism Spectrum Disorders. 2010;4(4):565-76. https://doi.org/10.1016/j.rasd.2010.01.006
13. Levinson LJ, Reid G. The Effects of Exercise Intensity on the Stereotypic Behaviors of Individuals With Autism. Adapted Physical Activity Quarterly. 1993;10(3):255-68. https://doi.org/10.1123/apaq.10.3.255
14. Lepore M, Gayle GW, Stevens SF. Adapted aquatics programming: a professional guide. Champaing: Human Kinetcs; 1998.
15. Winnick JP. Educação Física e Esportes Adaptados. 3 ed. São Paulo: Manole; 2004.

16. Thomas JR, Nelson JK, Silverman SJ. Método de pesquisa em atividade física. 5 ed. Porto Alegre: Artmed; 2007.
17. Zuchetto AT. A trajetória de Laila no AMA : historias entrelaçadas [Tese de Doutorado]. Campinas: Universidade Estadual de Campinas; 2008.
18. Chu C-H, Pan C-Y. The effect of peer- and sibling-assisted aquatic program on interaction behaviors and aquatic skills of children with autism spectrum disorders and their peers/siblings. Research in Autism Spectrum Disorders. 2012;6:1211-23. https://doi.org/10.1016/j.rasd.2012.02.003
19. Huettig C, Darden-Melton B. Acquisition of Aquatic Skills by Children with Autism. Palaestra. [Article]. 2004 Spring2004;20(2):20-46.
20. Pan CY. Effects of water exercise swimming program on aquatic skills and social behaviors in children with autism spectrum disorders. Autism. 2010 Jan;14(1):9-28. https://doi.org/10.1177/1362361309339496
21. Prupas A, Harvey WJ, Benjamin J. Early Intervention Aquatics: A Program for Children with Autism and their Families. JOPERD: The Journal of Physical Education, Recreation & Dance. [Article]. 2006;77(2):46-51. https://doi.org/10.1080/07303084.2006.10597829
22. Pan CY. The efficacy of an aquatic program on physical fitness and aquatic skills in children with and without autism spectrum disorders. Research in Autism Spectrum Disorders. 2011;5(1):657-65. https://doi.org/10.1016/j.rasd.2010.08.001
23. Rogers L, Hemmeter ML, Wolery M. Using a Constant Time Delay Procedure to Teach Foundational Swimming Skills to Children With Autism. Topics in Early Childhood Special Education. [Article]. 2010;30(2):102-11. https://doi.org/10.1177/0271121410369708
24. Dulcy FH. An integrated developmental aquatic program (IDAP) for children with autism. National Aquatics Journal. 1992 Spring;8(2):7-10;6.
25. Martinez CA. Adapted Aquatics for Children With Autism. Teaching Elementary Physical Education. 2006;17(5):34-6.
26. Killian KJ, Joyce-Petrovich RA, Menna L, Arena SA. Measuring Water Orientation And Beginner Swim Skills of Autistic Individuals. Adapted Physical Activity Quarterly. 1984;1(4):287-95. https://doi.org/10.1123/apaq.1.4.287
27. Reid G, O'Connor J. The Autism Spectrum Disorders: Activity Selection, Assessment, and Program Organization. Palaestra. 2003 Winter2003;19(1):21.
28. Schultheis SF, Boswell BB, Decker J. Successful Physical Activity Programming for Students with Autism. Focus on Autism & Other Developmental Disabilities. [Article]. 2000 Fall2000;15(3):159. https://doi.org/10.1177/108835760001500306
29. Macdonald M, Esposito P, Ulrich D. The physical activity patterns of children with autism. BMC Res Notes. 2011;4:422. https://doi.org/10.1186/1756-0500-4-422
30. Yilmaz I, Birkan B, Konukman F, Erkan M. Using a constant time delay procedure to teach aquatic play skills to children with autism. Education and Training in Developmental Disabilities. 2005;40(2):171-82.

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