



## THERAPEUTIC SWIMMING PROGRAM IN SPORTS FOR ALL SETTINGS AND ITS EFFECT ON THE AQUATIC READINESS AND EMOTIONAL SATISFACTION OF CHILDREN WITH ID AND ASD

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### **Abstract:**

Children with intellectual disability (ID) and autism spectrum disorder (ASD) are participating more and more actively in exercise programs, with swimming being one of the most popular ways to improve motor and psychosocial skills for these children. The Sports for All program, led internationally under the central responsibility of each Ministry through the General Secretariat for Sport in cooperation with Local Authorities, promotes the global effort to adopt this model of sport for citizens with and without disabilities of all ages. However, research has not yet been conducted to investigate the effect of exercise on Sports for All environments for people with disabilities, even more so on therapeutic swimming programs in Sports for All settings. The purpose of this study was to examine the effect of a therapeutic swimming program within the Sport for All Program setting on the aquatic readiness and emotional satisfaction of children with ID and ASD. The sample consisted of 13 children with ID and ASD, participating in a therapeutic swimming program for a duration of 10 weeks at a frequency of 3 sessions per week, 60 minutes per session. Instruments included the use of pre- and post-measures of HAAR and WOTA1 for aquatic readiness and the SSI questionnaire completed at the end of the program to assess children's satisfaction. Non-parametric analyses (Wilcoxon and Mann-Whitney) that were used, identified statistically significant differences in

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aquatic readiness for both children with ID and ASD, whereas satisfaction of all children from their participation in the program was completely positive. In conclusion, the therapeutic swimming program produced significant improvements in aquatic readiness and emotional satisfaction for children with ID and ASD within a Sport for All setting that provides important services to children with disabilities and low socio-economic status, as in this case.

**Keywords:** therapeutic swimming, autism spectrum disorders, intellectual disability, aquatic readiness, satisfaction, Sports for All

## 1. Introduction

Children with disabilities are becoming increasingly active in exercise programs, with swimming being one of the most popular sports. Buoyancy of water facilitates movement and strengthens the body by enabling the performance of basic motor skills without strain or tension (Hutzler et al., 1998), allowing freedom of movement that is difficult or impossible to achieve on land (Lee & Poreta, 2013). As a consequence, aquatic activity increases the sense of satisfaction which is greater due to the freedom of movement and thereby enhances the self-confidence of children with disabilities (Fragala-Pinkham, Haley & O'Neil, 2008).

Activities in the aquatic environment are simultaneously educational, recreational, and therapeutic (Araujo & Souza, 2009; Rodrigues & Lima, 2014), contributing to psychosocial improvements for people with disabilities by improving mood, pleasure, well-being and overall quality of life (Tough, Siegrist & Fekete, 2017). There are various methods each with a different area of application for each disability and a wide range of aquatic activities ranging from adapted swimming to aquatic therapy (Kokaridas & Lambeck, 2015), with the main representatives being the Halliwick Method, Bad-Ragaz Ring Method (BRRM), Water Specific Therapy (WST), Ai Chi and Watsu (Brody & Geigle, 2009; Cole & Becker, 2004).

Therapeutic swimming has been shown to be an effective way of psychomotor skills training (Ansari et al., 2021; Yilmaz et al., 2004) and development of respiratory and oral skills (Casey & Emes, 2011), improving adaptive behaviors (eye contact) (Pan, 2011; Vonder-Hulls, Walker, & Powell, 2006), providing opportunities for social interaction (Battaglia, et al., 2019; Bremer, Crozier, & Lloyd, 2016; Chu & Pan, 2012; Mortimer et al., 2014; Pan, 2010), enhancing self-esteem, self-awareness, self-confidence, and positively impacting in autonomy (Moreno-Murcia et al., 2016; Yanardag, Akmanoglu & Yilmaz, 2013). Particularly for students with intellectual disabilities (ID) and autism spectrum disorders (ASD), therapeutic swimming has been shown to offer many benefits leading to improvements in their physical fitness and motor skills (Becker, 2009; Fragala-Pinkham et al., 2011; Mooventhan & Nivethitha, 2014; Wardle, 2013) due to the properties of water that allow more freedom of movement in the aquatic environment (Lee & Poretta, 2013; Pan, 2010; Yilmaz et al., 2004). Hence, in children with ID and ASD it has a positive effect

on cardiovascular endurance, muscle strength, speed, motor skills, agility, balance, and coordination as optimal results were shown both at motor and functional levels (Hartlage et al., 2021; Kim, 2004; Prupas, Harvey & Benjamin, 2006; Vonder-Hulls et al., 2006; Yilmaz et al., 2009).

In addition, therapeutic swimming for children with ID and ASD offers intense physical activity in a fun and motivating environment that improves social interactions and behavior of children with ASD (Mehrholtz, Kugler, & Pohl, 2011) who are characterized by sociability problems, communication and repetition of stereotyped behaviors (American Psychiatric Association, 2013) and children with ID (Mortimer, Privopoulos & Kumar, 2014) whose cognitive limitations co-exist with behavioral and adaptive ones in the educational and social environment (Schalock et al., 2010).

Children with ID and ASD have many sensory stimulations when they enter the aquatic environment. They need the time required to process the temperature, pressure, and sensation of water, as well as the sound, so instructors should be able to assist each individual with ID and ASD in their development of aquatic readiness (Langendorfer, Harrod, & Bruya, 1991) referring to skills related to balance, standing, walking and changing direction and positions in water, plus cognitive and social adaptation skills. Especially in the case of children, the assessment of associated readiness skills connected with the willingness of the individual to participate (Langendorfer and Bruya, 1995) was not addressed thoroughly until Humphries (2008), whereas research efforts (Pan, 2010) assessing the concept of aquatic readiness is still unrepresented. Therefore, therapeutic swimming programs in educational and sports environments should focus on the principles of learning theory, but with the role of aquatic readiness development as the basis, which plays a pivotal role in the determination of children with disabilities at any age to participate in aquatic activities (Langendorfer, et al., 2009) in all environments (education, rehabilitation, sport for all programs, etc.).

Sports for All (SFA) programs which include therapeutic swimming programs among other activities for people with and without disabilities, started in 1975 and have since been promoted internationally with the aim of providing equal opportunities for all citizens regardless of age, gender and ability, supporting the global effort to adopt this model of sport. This has been achieved through the operation of international organizations, the most important being the Commission on Sport for All, under the central responsibility of the Ministry concerned through the General Secretariat for Sport of each State, in cooperation with local authorities and other bodies, and with the ultimate beneficiaries being all citizens (Cousineau, 1998).

Reviewing the literature showed that no research has yet been conducted that investigates the effect of therapeutic swimming in Sports for All environments on people with disabilities, let alone in therapeutic swimming programs to improve the functional parameters of children and young people with ID and ASD. Therefore, the purpose of this study was to examine the effect of a therapeutic swimming program within the Sport for All Program setting on the aquatic readiness and emotional satisfaction of children with ID and ASD.

## 2. Methods

### 2.1. Participants

Thirteen developmental-age individuals with ID and ASD participated in the present study. The six (6) children were diagnosed with ASD and the other seven (7) children with ID, according to previous formal diagnosis conducted by the Centers for Interdisciplinary Assessment, Counseling & Support. The age of the participants ranged from 5 to 17 years and consisted of 7 boys and 6 girls. The group of children with ID consisted of four boys and three girls and that of children with ASD consisted of three boys and three girls.

### 2.2. Procedure

The sample consisted of children who registered in the therapeutic swimming program and fulfilled the criteria for participation in the Sports for All program. More specifically, the registration of the interested citizens was carried out under the responsibility of the authorities implementing the programs. Following an open invitation of the General Secretariat of Sports to each Municipality for the registration of citizens in the Sports for All program, the Municipality has chosen a number of supporting documents required for the organization and control of the procedure. These documents were the application of interest, the medical certificate allowing children with ID and ASD to participate, and a parental written statement. All documents were presented to the sports office of the Municipality for the registration and participation of children in the program. Those who did not meet the criteria were excluded from the program, i.e., there was a medical reason for not participating in swimming lessons (article 11, par. b, Law 2527/08-10-2013). Parents/guardians were informed and gave consent prior to their children's participation in the therapeutic swimming program.

### 2.3. Intervention Program

The therapeutic swimming program had a total duration of 10 weeks at a frequency of 3 times a week, 60 minutes per session in the small swimming pool of the municipal swimming pool of Trikala. Following the memorandum of cooperation signed between the Department of Physical Education and Sport Sciences of the University of Thessaly and the Municipality of Trikala, individualized support and guidance of each child with ID and ASD was possible, with the attendance of an undergraduate student of the adapted physical education specialty as an assistant for each child (ratio 1:1), always under the guidance and presence of the primary researcher in each swimming session.

The water temperature was 27 - 30°C. Each swimming session included:

- 5' preparation activities -entry into the aquatic environment (entering the water with or without assistance, contact with water and familiarization, face washing, sitting on the steps, contact with the assistant, etc.)
- 10' breathing exercises (swimming egg flip and egg races, bubbles-nose, mouth, at the same time-, look at the fish; listen to the fish, etc.).

- 10' control and balance activities (catch rings from the bottom, motorbikes, reach away, don't touch the floor, paddle, starfish, etc.).
- 20' activities and games of moving, changing positions, and simple progression activities (walk- normal, slope, spider steps, astronaut steps, tall skipping, bunnies, spaceship, sleep - wake up, wagons swim, kickboard activities, etc.).
- 10' cooperation and independence activities (snake, rocket launching, doggy, group games, train, chaser, etc.).
- 5' cool down activities (singing in a circle and imitating song movements, diving and exit activities, etc.).

Equipment used included swim kickboards, noodles float tubes, swim dive rings etc. The program goal was to promote aquatic readiness and independence along with enjoyment and satisfaction. Activities in the aquatic environment allowed children to learn and have fun at the same time, by using the physical properties of water while moving through various activities and games and individualized guidance whenever needed.

#### **2.4. Instruments**

The measurement tools used for research purposes included:

- Humphries' Assessment of Aquatic Readiness - HAAR (Humphries, 2008), which illustrates aquatic readiness in five sectors (mental adaptation, introduction to the water environment, rotations, balance and control of movement, independent movement in water).
- The Water Orientation Test Alyn 1 - WOTA 1 (Tirosh, Getz, & Katz-Leurer, 2008), which consists of 13 questions on a four-point scale (from 1 to 4) with 4 representing the successful performance of the activity for individuals aged 3 years and older with limited functional and cognitive skills.
- The Sport Satisfaction Instrument - SSI (Duda & Nicholls, 1992) which consists of 8 questions that examine participants' feelings during the program.

HAAR and WOTA 1 were used at the beginning and at the end of the program. The SSI questionnaire was answered by the children's parents at the end of the swimming program.

In addition, the emotional satisfaction of the children with ID and ASD was also assessed by collecting qualitative data based on the triangulation technique (McNiff, 1993) which refers to the cross-tabulation, comparison, and use of data from three or more independent sources (Lincoln & Guba, 1985). This study involved observation and record keeping by the researcher, along with assistants' and parents' comments in each therapeutic swimming lesson. Triangulation ensures the reliability of information gathering, since evaluation and perceptions given by the three sides are accurate and get to the substance of the matter (Thomas et al., 2022).

## 2.5. Statistical Analysis

The statistical analysis of the data included: a) Descriptive analysis of the data by individual and group (ID and ASD), b. Non-parametric Wilcoxon dependent samples analysis to identify differences between initial and final measurements in each group, and c. non-parametric analysis Mann-Whitney U- independent samples to detect differences between individuals in terms of gender (boys - girls) and disability (ID and ASD). The level of statistical significance was set at <0.05.

## 3. Results

On the total sample of all participants with ID and ASD, non-parametric Wilcoxon analysis revealed statistically significant differences between pre- and post-HAAR and WOTA1 measurements, in favor of post-test results (Table 1).

**Table 1:** Wilcoxon results between pre and post-measurements of the whole sample

Test		Mean ± SD	Mean Rank	Z	P
HAAR	(pre)	.63 ± 0.15	7	-3,180 <sup>b</sup>	<b>.001</b>
	(post)	.73 ± 0.18			
WOTA1	(pre)	.63 ± 0.15	7	-3,193 <sup>b</sup>	<b>.001</b>
	(post)	.84 ± 0.16			

Similar Wilcoxon analysis results were noticed between pre and post-HAAR and WOTA1 measurements for the group of children with ID (Table 2).

**Table 2:** Wilcoxon results between pre and post-measurement of children with ID

Test		Mean ± SD	Mean Rank	Z	P
HAAR	(pre)	.50 ± 0.21	4	-2,366 <sup>b</sup>	<b>.018</b>
	(post)	.74 ± 0.22			
WOTA1	(pre)	.65 ± 0.18	4	-2.371 <sup>b</sup>	<b>.018</b>
	(post)	.85 ± 0.20			

Similarly, Wilcoxon analysis revealed statistically significant differences between pre and post HAAR and WOTA1 measurements of children with ASD (Table 3).

**Table 3:** Wilcoxon results between pre and post-measurement of children with ASD

Test		Mean ± SD	Mean Rank	Z	P
HAAR	(pre)	.45 ± 0.10	4	-2,201 <sup>b</sup>	<b>.028</b>
	(post)	.71 ± 0.12			
WOTA1	(pre)	.60 ± 0.12	3.5	-2.214 <sup>b</sup>	<b>.027</b>
	(post)	.83 ± 0.11			

In more detail, non-parametric Wilcoxon analysis was used to identify differences between pre- and post-measurements in HAAR stages for individuals with ID and

revealed statistically significant differences in all stages of the HAAR instrument (Table 4).

**Table 4:** Wilcoxon analysis results of HAAR stages for children with ID

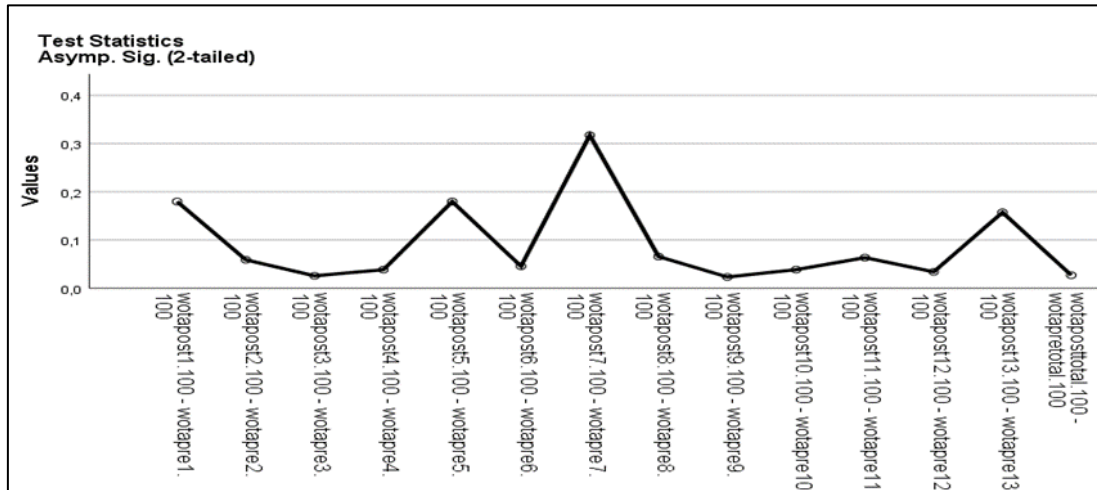
Stages		Mean ± SD	Mean Rank	Z	P
Mental adjustment	(pre)	.85 ± 0.22	1.50	-2,000 <sup>b</sup>	<b>.046</b>
	(post)	.91 ± 0.22			
Introduction to water environment	(pre)	.68 ± 0.29	2.50	-2,032 <sup>b</sup>	<b>.042</b>
	(post)	.90 ± 0.15			
Rotations	(pre)	.14 ± 0.17	3.50	-2,121 <sup>b</sup>	<b>.034</b>
	(post)	.52 ± 0.32			
Balance and control movement	(pre)	.58 ± 0.21	4	-2,232 <sup>b</sup>	<b>.026</b>
	(post)	.83 ± 0.17			
Independent movement in the water	(pre)	.26 ± 0.28	3.50	-2,226 <sup>b</sup>	<b>.026</b>
	(post)	.57 ± 0.35			

As for children with ASD, Wilcoxon analysis results showed statistically significant differences in the three out of five stages of the HAAR instrument (Table 5).

**Table 5:** Wilcoxon analysis results of HAAR stages for children with ID

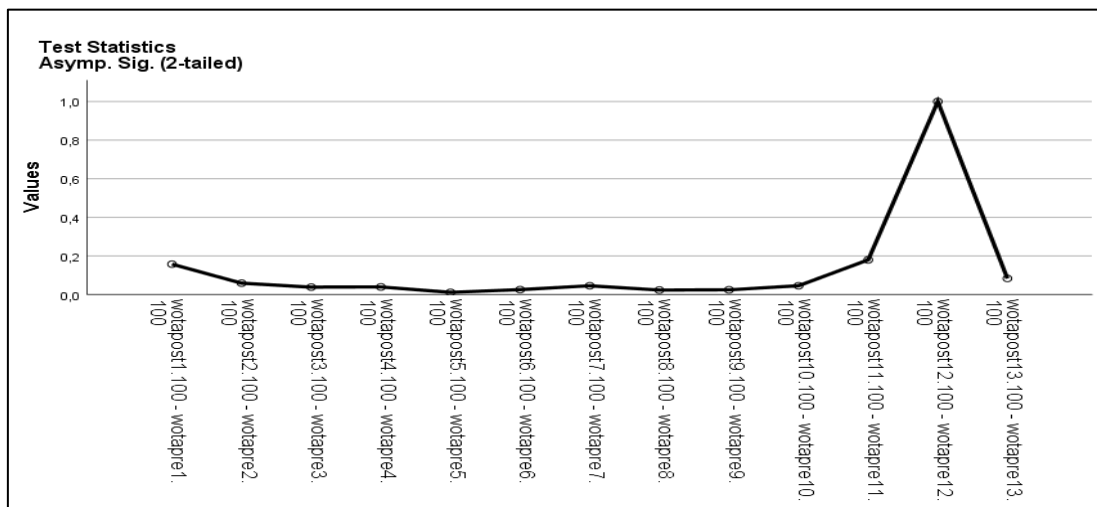
Stages		Mean ± SD	Mean Rank	Z	P
Mental adjustment	(pre)	.86 ± 0.10	2.50	-1,414 <sup>b</sup>	<b>.157</b>
	(post)	1.00 ± 0.0			
Introduction on water environment	(pre)	.55 ± 0.20	3	-1,841 <sup>b</sup>	<b>.066</b>
	(post)	.88 ± 0.11			
Rotations	(pre)	.11 ± 0.17	3	-2,264 <sup>b</sup>	<b>.024</b>
	(post)	.44 ± 0.27			
Balance and control movement	(pre)	.54 ± 0.12	3.50	-2,392 <sup>b</sup>	<b>.017</b>
	(post)	.77 ± 0.12			
Independent movement in water	(pre)	.19 ± 0.12	3.50	-2,207 <sup>b</sup>	<b>.027</b>
	(post)	.47 ± 0.19			

Non-parametric Wilcoxon analysis also identified differences between pre- and post-measurements of the WOTA 1 test of children with ID found in the following items: 3 (Exiting the pool, to the pool edge, p=.038), 4 (Bubbling bubbles in the water, p=.039), 5 (Side floating with instructor's help: lies on side with an ear in water, p=.011), 6 (Back floating, p=.025), 7 ("Splashing" water, p=.046), 8 (Submerging/diving, p=.023), 9 (Ability to maintain vertical position on: "short or long arm hold", p=.024), 10 (Progresses a long wall using hands and feet, p=.046). (Figure 1).



**Figure 1:** Wilcoxon analysis results of WOTA1 items of children with ID

As for children with ASD, Wilcoxon results showed statistically significant differences in the following items: 3 (Exiting the pool to pool the edge of the water,  $p=.026$ ), 4 (Blowing bubbles in the water,  $p=.038$ ), 6 (Back floating,  $p=.046$ ), 9 (Ability to maintain vertical position on: " short or long arm hold",  $p=.023$ ), 10 (Progresses a long wall using hands and feet,  $p=.038$ ), 12 (Holding rope: water at chest level,  $p=.034$ ) (Figure 2)



**Figure 2:** Wilcoxon analysis results of WOTA1 items of children with ASD

Furthermore, no differences in both pre- and post-measurements of HAAR and WOTA1 were noted using the Mann-Whitney U analysis in terms of gender (boys - girls), and disability (ID - ASD).

Regarding the Sport Satisfaction Instrument - SSI which consists of 8 questions that examined participants' emotions as completed by their parents at the end of the program, all parents without exception responded that they were completely satisfied with the therapeutic swimming program. As a result, a completely positive score (100%



of all the answers) was achieved for each question and for the questionnaire as a total (Figure 3)

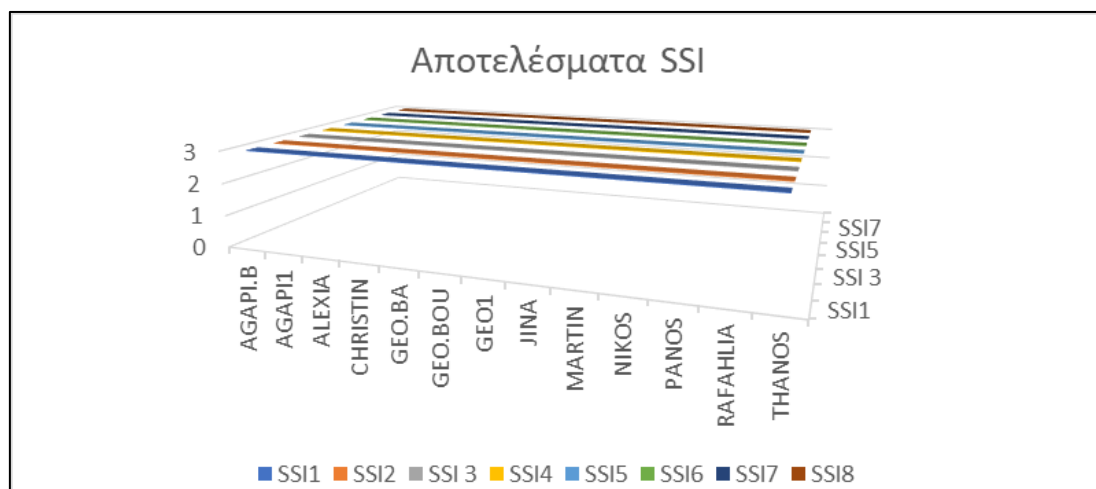


Figure 3: Descriptive results of Sport Satisfaction Instrument

#### 4. Discussion and Conclusion

The purpose of this study was to examine the effect of a therapeutic swimming program within the Sport for All Program setting on the aquatic readiness and emotional satisfaction of children with ID and ASD. Comparison between pre and post-test results in both measurement tools (HAAR and WOTA 1 tests), showed that all participants exhibited significant improvement in aquatic readiness following the completion of the swimming program. Since no previous therapeutic swimming studies included both disability groups together in their research design, the findings of this study were compared with findings of researches that included ID or ASD participants separately, showing similar aquatic readiness improvement for children with ASD (Caputo et al., 2018; Chu and Pan, 2012; Huettig & Darden-Melton, 2004; Pan, 2010; Vodakova, 2022; Yilmaz et al., 2004) and children with ID (Bataglioni et al., 2018; Boer & Beer, 2019; Hakim et al., 2017; Kokaridas, Aggelopoulou & Walters, 2000; Milligan et al., 2022; Yilmaz et al., 2009).

More specifically, analysis of the HAAR test by stage showed that children with ID in this study improved in all HAAR stages whereas children with ASD showed improvement in three of the five stages (rotations, balance-controlled movement, and independent movement in water). Similar post-results were also noted in the studies of Pan (2011) and Zanobini & Solari (2019) with aquatic readiness improvement recorded in the four out of the five stages of the HAAR measurement tool for children with ASD. The findings of this study agree also with the results of Pan's (2010) research investigating the effectiveness of a 14-week swimming program on the aquatic readiness and physical fitness of children with and without ASD. Pan's (2010) findings showed maximum improvement in the stages of introduction to the water environment, balance and controlled movement, and independent movement in water, whereas moderate

improvement was noted in the mental adaptation and rotation skills of children with ASD.

Furthermore, examination of WOTA1 pre and post-scores per task showed post-improvements in five tasks for both groups with ID and ASD (exiting the pool to pool edge, blowing bubbles in the water, back floating, ability to maintain vertical position on short or long arm hold, progressing on a long wall using hands and feet). Children with ID further improved in three additional tasks (side floating with instructor's help, "splashing" water, submerging-diving), while children with ASD improved in the "holding rope" task. This indicates that children with ID accepted with more ease the contact of water to their faces as compared to children with ASD, a finding that was also evident during the swimming sessions. Similarly, Vodakova (2022) study evaluated the aquatic readiness of children with ASD using WOTA 1 in a nine-week intervention and reported positive results for all ASD participants, with greater improvement in functional abilities, mental adaptation, and the "side floating with the instructor's help". However, children with ASD similar to our study did not master to the extent certain tasks such as performing "bubbles" or "submerging/diving" (Vodakova, 2022). Thus, familiarization exercises of facial contact with water are particularly suggested to be more frequent in a swimming program designed for children with ASD.

Finally, gender and disability did not emerge as factors that played a significant role in aquatic readiness, probably due to the small sample of this study. In a way, this shows that since the therapeutic swimming program appeared to benefit participants to the same extent regardless of gender and disability, what mattered most was the participation in the program itself.

The emotional satisfaction of the children with ID and ASD derived from their participation and assessed using the SSI questionnaire completed by their parents at the end of the swimming program, was totally positive. Such a broad positive acceptance and enjoyment of the program was captured by representative sayings of the parents recorded in questionnaire notes of the researcher, in an attempt to describe their emotions in more detail and depth. In particular, all parents reported their children's full satisfaction and enjoyment after each lesson as well as their impatience to participate in each next swimming session, a behavior that was also easily visible by the researcher and the assistants throughout the program. Parents also noted that since the program started and throughout its duration, their children exhibited a more positive attitude during other daily life activities, with enhanced self-confidence and general mood. Most importantly, parents reported that the therapeutic swimming program helped their children to improve water tolerance since prior to participation all children showed resistance to performing self-care skills such as washing their face or taking a bath, while following completion of the program all children developed these important daily life skills. Thus, it can be said that the improvement of skills such as water tolerance contributes to aquatic readiness, and affects positively the daily life of children with ID and ASD, in agreement with Pan (2010) who similarly concluded that the improvement

of kinesthetic skills such as sense of space and coordination in the aquatic environment develops self-confidence and the daily life skills of children with ASD.

In conclusion, the therapeutic swimming program used in this study proved an effective intervention for improving the aquatic readiness and emotional satisfaction of this sample of children with ID and ASD. Participation of children with ID and ASD in a therapeutic swimming program within a Sports for All setting has also a serious social dimension. Sports for All programs are internationally provided free of charge to citizens, which is particularly beneficial for children with disabilities and their parents who -at least regarding this sample of ID and ASD children- all came from families with low socioeconomic status. The fact that children with disabilities with low social and economic means can participate in relative therapeutic swimming programs in the Sports for All context free of charge, makes the benefits of this program even more significant.

Therefore, international support for the Sports for All program is very important to provide stability every year for the program to continue and emphasize the importance of expanding Sports for All program implementation in more municipalities internationally, for the most benefit of people with disabilities. As the results of this study showed, children with ID and ASD can indeed benefit physically and emotionally from their participation in a therapeutic swimming program with the right qualified instructor, something that outside the context of the Sports for All program may not have been possible due to socio-economic barriers.

The present research appears innovative as it examines for the first time the effect of a therapeutic swimming program on aquatic readiness and satisfaction of developmental age people with ID and ASD in Sports for All settings. Therefore, this does not allow generalizations -along with the small sample of the research- about the effect of aquatic readiness on all children with ID and ASD. Nevertheless, the improvement observed in all measures indicates that the participation of children with ID and ASD in a therapeutic swimming program in Sports for All environment may indeed be beneficial.

Another limitation is that the effectiveness of this program could be partially attributed to the number of assistants being present in each lesson that allowed for individualized guidance whenever needed (e.g., if a child with ASD walked away and needed someone to bring them back to performing the exercise). This greatly facilitated the smooth running of the program and the active participation of a larger number of children with ID and ASD during each swimming session than usual. However, this program could also be replicated with a smaller number of students in each lesson without assistants (up to a ratio of 1:3-4 between the swimming instructor and children for safety reasons), since each child with ID and ASD in this study did not follow a different program from the others in each lesson but they all performed the same exercises in the same swimming environment. This in itself, also highlights the need to recruit more qualified aquatic instructors in similar programs for the most benefit of a larger number of participants with disabilities.

Overall, there is still a relatively limited number of studies examining the effectiveness of therapeutic swimming programs for young individuals with ID and ASD while this study appears the first of its kind in the Sports for All context. Thus, it is imperative to conduct more similar researches for children with ID and ASD and other disabilities especially in the Sports for All setting in different municipalities internationally, for the most benefit of citizens with disabilities with fewer socio-economic opportunities in life.

### **Conflict of Interest Statement**

The authors declare no conflicts of interest.

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### **References**

- American Psychiatric Association (APA). 2013. Diagnostic and statistical manual of mental disorders (DSM-5). *American Psychiatric Publications (5th edition)*.
- Ansari, S., Hosseinkhanzadeh, A. A., AdibSaber, F., Shojaei, M. & Daneshfar, A. (2021). The effects of aquatic versus kata techniques training on static and dynamic balance in children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 51(9), 3180-3186. <https://doi.org/10.1007/s10803-020-04785-w>
- Araujo, L. G., Souza, T. G. (2009). Natación para portadores de necesidades especiales. *Revista EFDeportes*, 14(137).
- Bataglioni, G. A., Zuchetto, A. T., Nasser, J. P. & Schmitt, B. D. (2018). Development of aquatic skills in a child with visual and intellectual disability. *Revista Internacional de Medicina y Ciencias de la Actividad Física y del Deporte*, 18(70), 395-411. <https://doi.org/10.15366/rimcafd2018.70.012>
- Battaglia, G., Agrò, G., Cataldo, P., Palma, A. & Alesi, M. (2019). Influence of a specific aquatic program on social and gross motor skills in adolescents with autism

- spectrum disorders: Three case reports. *Journal of Functional Morphology and Kinesiology*, 4(2), 27-30. <https://doi.org/10.3390/jfmk4020027>
- Becker, B. E. (2009). Aquatic therapy: Scientific foundations and clinical rehabilitation applications. *Paper Presented at the PM&R*. <https://doi.org/10.1016/j.pmrj.2009.05.017>
- Boer, P. H., & de Beer, Z. (2019). The effect of aquatic exercises on the physical and functional fitness of adults with down syndrome: A non-randomised controlled trial. *Journal of Intellectual Disability Research*, 63(12), 1453-1463. <https://doi.org/10.1111/jir.12687>
- Bremer, E., Crozier, M., & Lloyd, M. (2016). A systematic review of the behavioural outcomes following exercise interventions for children and youth with autism spectrum disorder. *Autism*, 20(8), 899-915. <https://doi.org/10.1177/1362361315616002>
- Brody, L. T., & Geigle, P. R. (2009). *Aquatic exercise for rehabilitation and training*. Human Kinetics.
- Caputo, G., Ippolito, G., Mazzotta, M., Sentenza, L., Muzio, M. R., Salzano, S., & Conson, M. (2018). Effectiveness of a multisystem aquatic therapy for children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 48(6), 1945-1956. <https://doi.org/10.1007/s10803-017-3456-y>
- Casey, A. F., & Emes, C. (2011). The effects of swim training on respiratory aspects of speech production in adolescents with Down syndrome. *Adapted Physical Activity Quarterly*, 28(4), 326-341. <https://doi.org/10.1123/apaq.28.4.326>
- Chu, C. H., & Pan, C. Y. (2012). 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*, 6(3), 1211-1223. <https://doi.org/10.1016/j.rasd.2012.02.003>
- Cole, A. J., & Becker, B. E. (Eds.). (2004). *Comprehensive aquatic therapy*. Butterworth-Heinemann.
- Cousineau, C. (1998). Leisure and recreation and the 'sport for all' policy in developing countries: critical analysis. *Leisure and recreation and the 'sport for all' policy in Developing Countries: Critical Analysis*, 29-48.
- Duda, J. L., y Nicholls, J. G. (1992). Dimensions of achievement motivation in schoolwork and sport. *Journal of Educational Psychology*, 84(3), 290-299. <https://doi.org/10.1037/0022-0663.84.3.290>
- Fragala-Pinkham, M., Haley, S. M., & O'Neil, M. E. (2008). Group aquatic aerobic exercise for children with disabilities. *Developmental Medicine & Child Neurology*, 50(11), 822-827. <https://doi.org/10.1111/j.1469-8749.2008.03086.x>
- Fragala-Pinkham, M. A., Haley, S. M., & O'Neil, M. E. (2011). Group swimming and aquatic exercise programme for children with autism spectrum disorders: a pilot study. *Developmental Neurorehabilitation*, 14(4), 230-241. <https://doi.org/10.3109/17518423.2011.575438>

- Hakim, R. M., Ross, M. D., Runco, W., & Kane, M. T. (2017). A community-based aquatic exercise program to improve endurance and mobility in adults with mild to moderate intellectual disability. *Journal of Exercise Rehabilitation*, 13(1), 89–94. doi: 10.12965/jer.1732838.419
- Hartlage, A., Nicholson, C., Silvius, A., & Ennis, B. (2021). The Effect of Aquatic Physical Therapy on Children with Down Syndrome. *The Journal of Aquatic Physical Therapy*, 29(3), 73-77.
- Huettig, C., & Darden-Melton, B. (2004). Acquisition of aquatic skills by children with autism. *Palaestra-Macomb Illinois*, 20(2), 20-25.
- Humphries, K. M. (2008). "Humphries" Assessment of Aquatic Readiness", *unpublished master's thesis*. Texas Women's University, Denton, TX.
- Hutzler, Y., Chacham, A., Bergman, U., & Szeinberg, A. (1998). Effects of a movement and swimming program on vital capacity and water orientation skills of children with cerebral palsy. *Developmental Medicine & Child Neurology*, 40(3), 176-181 <https://doi.org/10.1111/j.1469-8749.1998.tb15443.x>
- Kim, E. S. (2004). Effects of aqua exercise program on the improvement of static balance in child with mental retardation. *The Journal of Korean Physical Therapy*, 16(1), 208-246.
- Kokaridas, D., Aggelopoulou-Sakadami, N., & Walters, B. (2000). An intervention in the Halliwick method procedures (swimming) for a group of individuals with Downs syndrome. *European Journal of Special Needs Education*, 15(2), 218-231. <https://doi.org/10.1080/088562500361637>
- Kokaridas & Lambeck, J. (2015). The Halliwick Concept: Toward A Collaborative Aquatic Approach. *Inquiries in Sport & Physical Education*, 13(2), 65-76.
- Langendorfer, S. J., Quan, L., Pia, F. A., Fielding, R., Wernicki, P. G., & Markenson, D. (2009). Scientific review: Minimum age for swim lessons. *International Journal of Aquatic Research and Education*, 3(4), 451-469. <https://doi.org/10.25035/ijare.03.04.12>
- Langendorfer, S., & Bruya, L. D. (1995). *Aquatic readiness: developing water competence in young children*. Champaign, IL, Human Kinetics Publishers.
- Langendorfer, S., Harrod, D. K., & Bruya, L. D. (1991). Prescriptive aquatic instruction: a developmental approach. *The National Aquatics Journal*, 7(1), 14-15.
- Lee, J., & Poreta, D. L. (2013, January). Enhancing motor skills of children with autism spectrum disorder: A pool-based approach. *Journal of Physical Education, Recreation and Dance*, 84(1) 41-45. <https://doi.org/10.1080/07303084.2013.746154>
- Lincoln, Y.S. & Guba, E.G. (1985). *Naturalistic inquiry*. Sage.
- McNiff, J. (2006). *Teaching as learning: An action research approach*. Routledge.
- Mehrholz, J., Kugler, J., & Pohl, M. (2011). Water-based exercises for improving activities of daily living after stroke. *Cochrane Database of Systematic Reviews*. 42(4), 358-358. <https://doi.org/10.1002/14651858.CD008186.pub2>
- Milligan, H., Glanzman, A., Waasdorp, I., Kinslow, T., Hagenbaugh, M., Pipan, M. & Palombaro, K. (2022). The Benefits of Group Aquatic Therapy for Young Children

- with Down syndrome. *The Journal of Aquatic Physical Therapy*, 30(1), 12-21. doi:10.1097/PXT.0000000000000011
- Ministry of Education & Culture (2013). Organization and Operation of Sports for All programs, article 11, par. b, Law 2527/08-10-2013
- Moovenhan, A., & Nivethitha, L. (2014). Scientific evidence-based effects of hydrotherapy on various systems of the body. *North American journal of medical sciences*, 6(5), 199. doi: 10.4103/1947-2714.132935
- Moreno-Murcia, J. A.; Huéscar Hernández, E.; Polo, R.; López, E.; Carbonell, B.; Meseguer, S. (2016). Efecto de los cuentos en la competencia acuática real y percibida en infantes. *Revista internacional de Medicina y Ciencias de la Actividad Física y el Deporte*, 16(61), 127-138. <https://doi.org/10.15366/rimcafd2016.61.010>
- Mortimer, R., Privopoulos, M., & Kumar, S. (2014). The effectiveness of hydrotherapy in the treatment of social and behavioral aspects of children with autism spectrum disorders: A systematic review. *Journal of Multidisciplinary Healthcare*, 7, 93–103. <http://dx.doi.org/10.2147/JMDH.S55345>
- Pan, C. Y. (2010). Effects of water exercise swimming program on aquatic skills and social behaviors in children with autism spectrum disorders. *Autism*, 14(1), 9-28. <https://doi.org/10.1177/1362361309339496>
- Pan, C. Y. (2011). 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*, 5(1), 657-665. <https://doi.org/10.1016/j.rasd.2010.08.001>
- Prupas, A., Harvey, W. J., & Benjamin, J. (2006). Early intervention aquatics a program for children with autism and their families. *Journal of Physical Education, Recreation & Dance*, 77(2), 46-51. <https://doi.org/10.1080/07303084.2006.10597829>
- Rodrigues, M. N. & Lima, S. R. (2014). Atividades motoras acuáticas en la coordinación corporal de adolescentes con deficiencia intelectual. *Revista Brasileira de Ciências do Esporte*, 36(2), 369-381. <https://doi.org/10.1590/S0101-32892014000200007>
- Schalock, R. L., Borthwick-Duffy, S. A., Bradley, V. J., Buntinx, W. H., Coulter, D. L., Craig, E. M. & Yeager, M. H. (2010). Intellectual disability: Definition, classification, and systems of supports. *American Association on Intellectual and Developmental Disabilities*. 444 North Capitol Street NW Suite 846, Washington, DC 20001.
- Thomas, J. R., Martin, P., Etnier, J. & Silverman, S. J. (2022). *Research methods in physical activity*. Human Kinetics.
- Tirosh, R., Getz, M., & Katz-Leurer, M. (2008). Halliwick-based aquatic assessments: reliability and validity. *International Journal of Aquatic Research and Education*, 2, 224 – 236. <https://doi.org/10.25035/ijare.02.03.04>
- Tough, H., Siegrist, J., & Fekete, C. (2017). Social relationships, mental health and wellbeing in physical disability: A systematic review. *BMC Public Health*, 17(1), 414. <https://doi.org/10.1186/s12889-017-4308-6>
- Vodakova, E., Chatziioannou, D., Jesina, O., & Kudlacek, M. (2022). The Effect of Halliwick Method on Aquatic Skills of Children with Autism Spectrum Disorder.

- International Journal of Environmental Research and Public Health*, 19(23), 16250.  
<https://doi.org/10.3390/ijerph192316250>
- Vonder-Hulls, D. S., Walker, L. K., & Powell, J. M. (2006). Clinicians' perceptions of the benefits of aquatic therapy for young children with autism: A preliminary study. *Physical & Occupational Therapy in Pediatrics*, 26(1-2), 13-22.  
[https://doi.org/10.1080/J006v26n01\\_03](https://doi.org/10.1080/J006v26n01_03)
- Wardle, J. (2013). Hydrotherapy: a forgotten Australian therapeutic modality. *Australian Journal of Herbal Medicine*, 25(1), 12-17.
- Yanardag, M., Akmanoglu, N., & Yilmaz, I. (2013). The effectiveness of video prompting on teaching aquatic play skills for children with autism. *Disability and Rehabilitation*, 35(1), 47-56. <https://doi.org/10.3109/09638288.2012.687030>
- Yilmaz, I., Yanardağ, M., Birkan, B., & Bumin, G. (2004). Effects of swimming training on physical fitness and water orientation in autism. *Pediatrics International*, 46(5), 624-626. <https://doi.org/10.1111/j.1442-200x.2004.01938.x>
- Yılmaz I., Ergu N., Konukman F., Agbuğa B., Zorba E. & Cimen Z. (2009). The effects of water exercises and swimming on physical fitness of children with mental retardation. *Journal of Human Kinetics*, 21, 105–11.
- Zanobini, M., & Solari, S. (2019). Effectiveness of the program “Acqua mediatrice di comunicazione” (Water as a mediator of communication) on social skills, autistic behaviors and aquatic skills in ASD children. *Journal of Autism and Developmental Disorders*, 49(10), 4134-4146. <https://doi.org/10.1007/s10803-019-04128-4>



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