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Research Article

Utilizing the Aquatic Exercises Approach Intervention (AEAI) Program for a Filipino Adolescent with Autism

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ABSTRACT

Acquiring swimming skills is critical for individuals with autism spectrum disorder (ASD) since drowning is one of the leading causes of death for the ASD community (National Autism Association, 2011). A qualitative content analysis research design was used to investigate the effect of aquatic exercises approach on the development of swimming skills needed by a student with ASD to swim independently. The study used a 10-day Aquatic Exercises Approach Intervention (AEAI) program. Also, the Swimming and Water Independence Measure (SWIM) test consists of eleven swimming skills, developed by the Halliwick's Association of Swimming Therapy, was used for the pre-test and post-test. A detailed description of progress was created for each of the swimming skills. The study showed that the AEAJ program showed significant improvements in ten of the aquatic skills. The only exception was the Breath Control skill wherein the student maintained his score in both assessments. The findings showed that the AEAJ program can help a student with ASD acquiring the swimming skills needed to swim independently. However, future lessons may include more than one student or make changes to the program adaptable to diverse groups.

Keywords: *Aquatic exercises, Student with autism, Swim independently, Swimming skills*

Introduction

According to the National Autism Association (2011), there is an urgent need to teach individuals to swim because drowning is one of the leading causes of death for children or adults with autism. Autism Spectrum Disorder

is defined as a set of neurodevelopmental disorders. It is “diagnosed by a significant impairment in social communication and repetitive sensory and motor behaviors” (Park et.al, 2006). Children diagnosed with ASD may be more vulnerable to injury due to sensorimotor

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deficits or behavioral abnormalities such as hyperactivity, social avoidance, and poor judgment (Lee & Newschaffer, 2006).

Over the years, Filipinos diagnosed with Autism have grown in number. According to the data from the Commission of Human Rights in 2019, there are around 1.2 million or 1 in 100 Filipinos that have Autism. As the number of children diagnosed with ASD in the Philippines increases, with no known cure, it is clear that addressing the needs of this population is critical (Hall, 2013). Additionally, children with ASD are often drawn to water sources (Kennedy Kreiger Institute, 2011, p. 1). As recent studies find that the serenity of water bodies provide relief from their increased anxiety. In the December 2017 issue of Injury Epidemiology, it is said that children with ASD are 160 times more likely to drown than the general pediatric population. One of the researchers of that previous study, Dr. Li, the founding director of the Center for Injury Epidemiology and Prevention at Columbia, expressed in her study that swimming is an essential survival skill for

children with autism. Every year, approximately one in every four children with ASD 'elope,' or wander away from supervision (Pederson, et.al.,2021). Elopement could have a substantial impact on ASD patients' mortality which has been reported to be approximately twice as high as that of the general population (Mouridsen et.al., 2008). Prioritizing learning how to swim via a structured program is an important skill for them to develop their water skills and prevent drowning (Peden & Franklin, 2020).

For people with ASD, aquatic interventions and appropriate swim lesson programs can offer remarkable and significant opportunities especially when their environment, experienced barriers, and doses of practice are assessed properly (Munn, Ruby & Pangelinan, 2021). In schools and institutions, swimming can be used as an alternative to other forms of physical activity to help children with ASD develop their motor skills, social skills, and communication abilities (Marzouki & Soussi, 2022).

Theoretical Framework

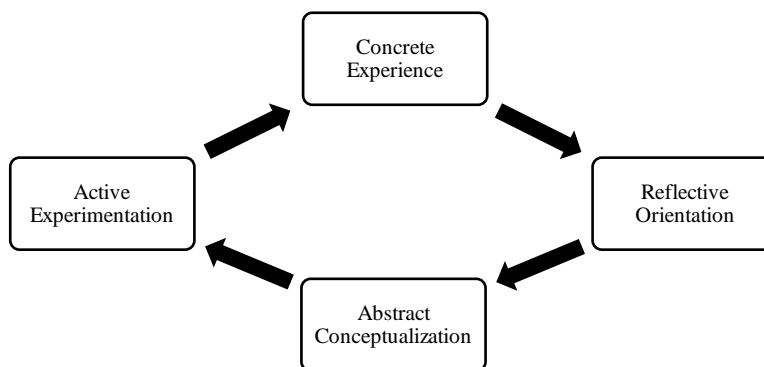


Figure 1. Kolb's Learning Cycle

Kolb's experiential learning theory served as the foundation for this paper which focuses more on the experience and the role of mental processes in learning. Activity-based interventions were more effective than traditional methods of teaching for children with developmental disabilities. This was due to the fact that it benefits the child's interests and intrinsic motivation (Ozen & Ergenekon, 2010). Kolb's experiential learning theory has four stages which guided the process of this research. First,

active experimentation took place in the first phase of the paper wherein the learnings of the instructor and researcher was taken into account. Given the experience of both the instructor and one of the researchers with traditional swimming, learn-to-swim activities, the Halliwick's Approach to teaching swimming and children with disabilities, an aquatic exercise activities intervention swim program was developed. Next, the concrete experience phase took place. This was where the student goes

through the intervention phase and the instructor was teaching the aquatic exercise activities intervention program. Following this was the reflective observation stage. The researcher assessed the data gathered post-intervention and reviewed the progress made by the student.

Lastly, the abstract conceptualization stage took place during the latter part of this paper. The researcher finalized all the data gathered from the pre- and post-intervention phase and be able to address the objectives of the paper.

Conceptual Framework

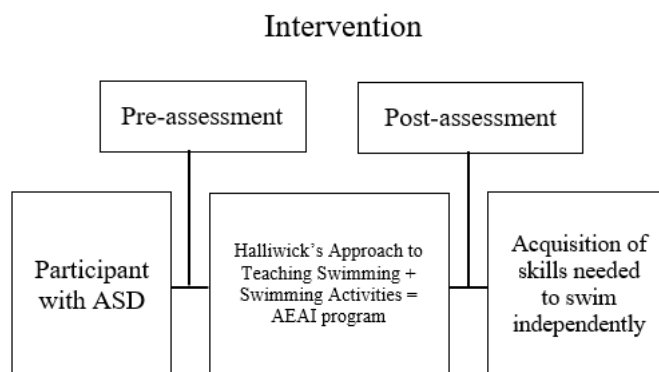


Figure 2. Intervention Conceptual Framework

This paper evaluated the effectiveness of an aquatic exercise approach intervention program on the swimming independence of a student with ASD. The student with ASD went through a 10-day intervention called the AEAJ program which includes a pre-assessment and post-assessment. The progress of the student were identified using the SWIM assessment tool which focuses on the aquatic skills the participant needs to swim independently. With this, the data collected in the pre- and post-assessment phase were used as a basis of the results of this study as well as the instructor’s and researchers’ observations.

Purpose of the Study

Individuals with ASD are drawn to water sources like lakes, ponds, and swimming pools (Kennedy Kreigger Institute, 2011, p.1). According to the National Autism Association (2011), drowning is one of the leading causes of death for children and adults with ASD. Given the increased risk of drowning, acquiring swimming skills is critical for the said population. By adapting the Halliwick’s Approach to Teaching Swimming the study can evaluate the effects of aquatic exercises on the swimming independence of a student with ASD. Specifically, the study aims to identify necessary aquatic

skills as well as the appropriate exercise approach and to determine how these affect an individual with ASD to swim independently. All results from post- and pre-tests will be explained through a qualitative content analysis.

Methods

This qualitative research study investigated the effect of aquatic exercises approach on the development of swimming skills a student with ASD needs to swim independently. This research design was done in an etic approach which involved the perspective of the researchers as observers. The study used an assessment tool which examined the effect of the aquatic skills an individual needs to swim independently. The participant with ASD was selected through purposive sampling from the referral of someone. The student was initially contacted via his mother through a personal text message. Then the researchers scheduled a call with the guardian to explain the details of the study. Given that the participant is still not of legal age, the mother of the participant signed an informed consent form concerning the participation of her child in the study. The instructor that conducted the sessions was a qualified swimming instructor with over 30 years of teaching experience and has been

coaching athletes with disabilities since 2007. The aquatics exercise program used was developed by the instructor and researchers based on the objective of the study.

Case profile: alias “JC”

JC is a 16 year old adolescent male diagnosed with Moderate Autism concomitant with ADHD based in Metro Manila, Philippines. He was in 9th grade. JC’s mother shared that he started therapy as early as 18 months. He had both an Occupational Therapist and Speech Pathologist at that age. His main problem was his gross motor skills. With that, his initial diagnosis was dyspraxia, then became ADHD and it kept evolving. In 2016, their doctor confirmed that it was Moderate Autism concomitant with ADHD. In his early teens/pre-puberty, his hormones were changing and he struggled to make sense of how he felt. He exhibited irritability and combative behavior especially when he had difficulty expressing himself. He has been working closely with his therapists in order to address that. JC was also diagnosed with a seizure disorder when he was 5 years old. Late nights and high stress levels would trigger it and he is currently taking maintenance medications to avoid it. He is also treating his scoliosis and has been recommended to wear a brace by his doctor for a year. He started wearing his body brace has been going to his scoliosis therapy every week to address his hip misalignment, gait correction and balance training. He was also advised to lose weight to help his spine but was asked to avoid exercises that would involve jumping and running. With this, dry swimming during his PE sessions and swimming was highly encouraged. The mother expressed her interest in this study’s aquatic exercise approach as this might help JC. She gave her consent to allow JC to participate in this study. Prior to this, she mentioned that JC had at least 5 years of experience and went through swimming lessons but since he had dyspraxia, he tended to forget skills easily.

Instruments

The instrument used for the pre- and post-test was an assessment tool called the Swimming and Water Independence Measure (SWIM) test produced by the Halliwick’s

Association of Swimming Therapy to record the participant’s basic ability to function within any swimming pool setting. The assessment tool focused on the aquatic skills the participant needed to swim independently. The SWIM test have 6 sections.

- Section One, contained the introduction of the assessment scheme.
- Section Two, was an information sheet to be filled up before the pre-test containing the background information of the participant to be assessed.
- Section Three, involved the recorded evaluation made by the instructor. Information were observed and recorded through a video for analysis of the participant’s performance.
- Section Four, involved the transference of the individual performance scores recorded in section three onto a pool-skills chart.
- Section Five, was a visual log called the pyramid of achievement.
- Section Six, was the appendix guideline which will be reviewed by the assessor before starting the assessment.

The AEAJ program consisted of activities that were taught in the Halliwick’s Approach to Teaching Swimming and the following was adapted and aligned by the instructor and researchers in order to create the AEAJ program. The AEAJ program was conducted in a 15 meter swimming pool. The aquatic exercises made use of toys such as ping pong balls, plastic bowls and pails and submerging objects like a toy fish and sinking sticks. The student wore proper swimming attire which were a swim cap, swim goggles and trunks or jammers.

Procedure

The researchers contacted the swim instructor, the participant and their parent to ask for their willingness to participate in the research study. With the assent given by the participant and their mother, the researchers set up an online call to explain the procedure of the study and to get a background information on the participant (participant’s diagnosis, symptoms, educational background, age, sex and swimming experience) and the swim instructor to brief him regarding the intervention phase

to be created. The location and schedule of the intervention phase for both the participant and instructor were discussed.

The researchers and swim instructor did an individual research on the Halliwick's Approach to Teaching Swimming. They worked together to adapt and aligned the exercises used in Halliwick's Approach to Teaching Swimming and developed the AEAI program. The AEAI program was validated by the experienced swim instructor. The SWIM was obtained by sending a personal email to the chairperson of the Halliwick's Association of Swimming Therapy and had the permission to use the material with proper credit.

Intervention

The participant underwent a 10-day AEAI program that included a pre- and post-assessment as well as eight sessions of swimming activities. The skills introduction and progression table was shown in Table 1. Each session lasted 60 minutes, with a 5-minute briefing by the observer/researchers with the accompanying caregiver or parent at the start. The researchers also required the caregiver or parent to be present on site in case of an emergency during the lesson.

Table 1. Skills Introduction and Progression Table

| Week | Day | TARGET SKILLS |
|------|-----|--|
| 1 | 1 | PRE-ASSESSMENT |
| | 2 | Session 1: Mental Adjustment & Disengagement |
| | 3 | Session 2: Transversal Rotational Control |
| 2 | 4 | Session 3: Sagittal Rotational Control |
| | 5 | Session 4: Longitudinal Rotational Control (part 1) |
| | 6 | Session 5: Longitudinal Rotational Control (part 2) |
| 3 | 7 | Session 6: Combined Rotational Control |
| | 8 | Session 7: Upthrust & Balance |
| | 9 | Session 8: Turbulent Gliding & Progression to Basic Movement |
| 4 | 10 | POST-ASSESSMENT |

Day 1 was the pre-assessment session and Day 10 was the post-assessment session, 60 minutes was allotted for the assessment using the SWIM assessment tool. This tool focused on the following aquatic skills - (1) Water Entry Development, (2) Water Adjustment Development, (3) Breath Control Development, (4) Balance Development, (5) Backwards Transversal Rotation Development, (6) Forward Transversal Rotation Development, (7) Sagittal Rotation Development, (8) Longitudinal Rotation Development, (9) Combined Rotation Development, (10) Water Stroke Development, (11) Exit Development. All assessments were performed by the same instructor knowledgeable in the use of the assessment tool. The outcome measures were administered at the beginning (pre) and at the end (post) of the intervention.

Analysis of Data

A qualitative content analysis was conducted. The student's achievements at the start and end of the swimming course were analyzed and a detailed description of progress was created for each of the eleven swimming skills. The detailed narrative came from the swim instructor at the end of the intervention phase and the notes by the researchers as observer were used as supporting data.

Results and Discussion

The Halliwick's Association of Swim Therapy [Halliwick AST] developed the SWIM It is an assessment scheme used to record an individual's ability to function in any pool setting. The following were the pool skills needed for an individual to swim independently:

Table 2. AEAJ Program Pre- and Post-Test Results

| Aquatic Skill | Pre-assessment | Post-Assessment |
|-----------------------------------|-----------------------|------------------------|
| A: Water Entry | 6 | 7 |
| B: Water Adjustment | 4 | 7 |
| C: Breath Control | 7 | 7 |
| D: Balance | 2 | 6 |
| E: Backwards Transversal Rotation | 1 | 6 |
| F: Forward Transversal Rotation | 3 | 7 |
| G: Sagittal Rotation | 1 | 6 |
| H: Longitudinal Rotation | 1 | 6 |
| I: Combined Rotation | 1 | 6 |
| J: Water Stroke | 2 | 7 |
| K: Exit | 2 | 4 |

Based on the table above, the student showed significant improvement in most aquatic skills as seen with the score differences in the post- and pre-assessments. For the water adjustment skill, the student scored 7 points in the post-test as compared to the pre-test with only 4 points scored. The balance skill improved which had an initial score of 2 points then to 6 points in the post-test. While the score for the forward transversal rotation increased in the post-test with 7 points coming from 3 points during the pre-test. The student’s water stroke skill score also increased from 2 points to 7 points. Similarly, the exit skill showed improvement with a score of 2 points in the pre-test and 4 points from the post-test. A notable

5-point differences were observed from the post- and pre-assessment of the backward transversal rotation, sagittal rotation, longitudinal rotation, and combined rotation skills. All four skills increased scores from 1 to 6 points in the pre- and post-assessment respectively. The student showed minimal improvement on water entry with 6 points from the pre-test and 7 points from the post-test. While for the breath control skill, no improvements were observed with the student scoring 7 points in both tests. Overall, the student had an improving score from the initial 30 out of 77 pre-assessment result to the 69 points scored out of the 77 during the post-assessment.

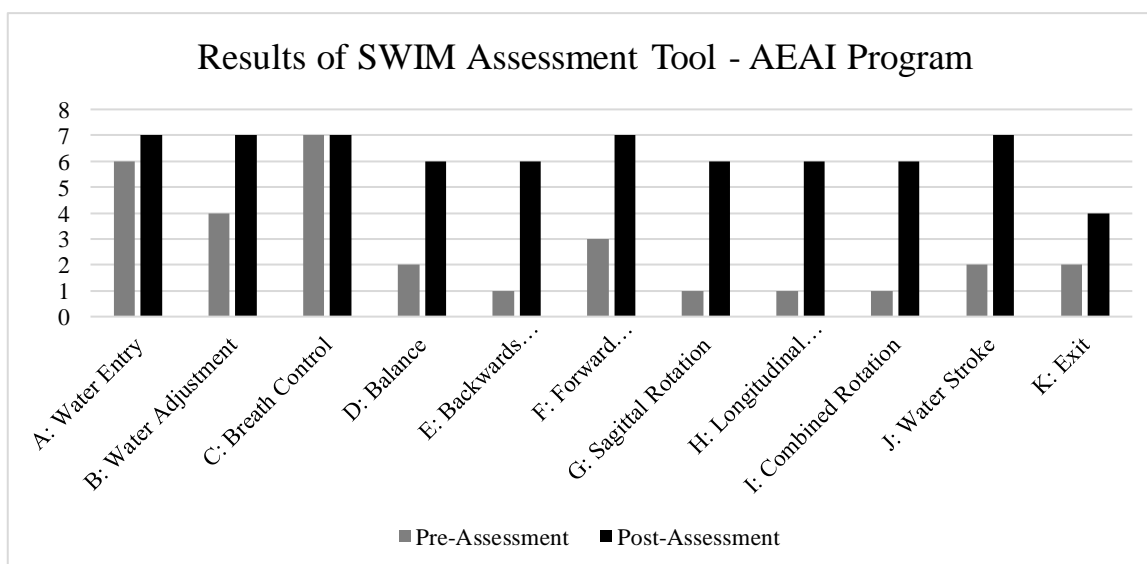


Figure 3. Comparison of points obtained on the pre-test and post-test phase with the SWIM test according to individual swimming skills.

From figure 3 it was evident that the student made progress in all eleven skills. The skills with the most improvement were backwards transversal rotation, sagittal rotation, longitudinal rotation and combined rotation. The student did not experience any difficulty with the breath control skill which was shown in his pre- and post-assessment.

Pool Skill A - Water Entry Development

At the beginning of the AEAJ program, the student scored 6 points during the pre-assessment. Given that the student had problems with his balance due to his scoliosis condition, he needed assistance with the initial position which was a seated position by the pool. On the first day, the student expressed that he was excited for the class. The instructor had no problem with the beginning session.

He was able to enter the pool independently although required physical assistance. As soon as he got into the water he was able to get into a stable position. The instructor's comment on the first day was he successfully performed the water entry skill without the need of assistance by the 6th session. The student voluntarily entered the pool from a seated position by the pool edge and was able to get to a stable position on his own. At the end of the AEAJ program, he was able to score 7 points during the post-assessment.

Pool Skill B - Water Adjustment Development

The student scored 4 points during the pre-assessment. This skill involved the student to balance in a chair position with feet on the floor. Given that JC has been diagnosed with scoliosis early this year, he had trouble performing the skill and would need assistance from behind. The instructor took note that from the 1st session to the 3rd session, JC was not comfortable doing the chair position, which is why he refused to do the exercises at all. On his 4th session, JC agreed to perform the exercise as he started the session in a good mood. He requested that the instructor should watch him doing the exercise, JC asked if he could hold the instructor's hand. Right before the 6th session, the student's mother happily reported that JC could do the exercise and hold the position while waiting for the instructor to arrive.

The instructor took note that on the 7th and 8th session, JC was comfortable moving around the pool without a helper or assistance needed. At the end of the program, he was able to score 7 points during the post-assessment.

Pool Skill C - Breath Control Development

The instructor took note that the student performed the breath control exercises exceptionally. He was able to submerge into the water with no fear evident, blow objects across the pool and pick up objects from pool bottom with no hesitation. JC really enjoyed the exercises that involved blowing and holding his breath, which is why the instructor would include this during play time every session. The student scored 7 points during the pre-test assessment and maintained the same score during the post-assessment test.

Pool Skill D - Balance Development

The student scored 2 points during the pre-assessment. Before the AEAJ program, JC's mother shared that he was advised to go through scoliosis therapy. With his scoliosis, his balance was affected. On day 1, the instructor observed that JC can balance in a vertical position but would need assistance. The exercises from the AEAJ program that may have helped him are "sway like a tree", "360 degree rocketship", "tap and balance", "rocking the boat", "walking forwards and backwards" and "whirlpool exercise". These exercises encouraged the activation of the stabilizer muscles needed to maintain his upright position. With this, he improved and scored 6 points in the post-assessment.

Pool Skill E - Backwards Transversal Rotation Development

The student scored 1 point during the pre-assessment. The instructor took note that the student was unable to lean back into the water or even start a rotational movement. The instructor took note that they had difficulty convincing the student to perform the "inverted supermans" activity which involved lying down in a supine position. The student struggled to stretch out his body in order to assume the position and on the 3rd and 4th attempt he was

able to do so given that the instructor was supporting his hips and back to keep him from sinking and flipping over. On the 6th attempt, the instructor slowly removed his hand on that count of 3 so that the student could perform the “inverted supermans” exercise with no assistance. Student was able to perform it on his own for 2 more repetitions during Session 3 of the AEAJ Program.

However, one of the exercises that the student was not able to achieve was the log roll. This was mainly due to the student’s inability to assume the proper position. Despite the student’s ability to assume the supine position, he could not proceed with the rotational movement because he was afraid that water would enter his nose which could be a past negative experience. Towards the end of the program, the student was able to build his confidence because of the succeeding exercises that he was able to accomplish. He scored 6 points during the post assessment because he was able to rock backwards with assistance from the initial curled position.

Pool Skill F - *Forward Transversal Rotation Development*

The student scored 3 points during the pre-assessment. Starting from a back float position, the student can lift his head forward and stretch arms forward while being supported, but was unable to rotate from back to front without assistance. The instructor expressed that the student was unable to perform the “pancake flip” exercises during their second session because of his fear of water entering his nose as soon as he changed position. The student gets distracted easily by other people around the pool area which may have caused him to lose focus on the current exercise on hand.

Exercises that involve floating in supine position and many repetitions of such helped the student to be comfortable and confident. Towards the end of the program, the student scored 7 points which meant that he successfully performed a backfloat and rotated to the front lying position unaided and without touching the pool floor.

Pool Skill G - *Sagittal Rotation Development*

The student scored 1 point during the pre-assessment. The instructor observed that the student was unable to bring his head back to the center when tilted sideways from a chair position with feet on the floor. This could be due to his current condition of scoliosis which hindered his successful execution of the exercise. The student expressed that he felt slight pain while bringing his head back to the center. Exercises such as the “backfloat”, face submersions and breath holding helped the student achieve this skill. At the end of the program, JC scored 6 points.

Pool Skill H - *Longitudinal Rotation Development*

The student scored 1 point during the pre-test assessment. The student started the session unable to lie on his back or start a rotation. The instructor noticed that the student exhibited fear and lacked confidence to perform the starting position which is lying on his back. The student was able to advance this skill through exercises that developed balance and floating. During the “pass-the-ball” exercise in session 6, the student was able to maintain the back position while passing the ball from the left hand to the right hand. He was able to perform this even though during the process of passing the ball, he would sink slightly and have water on his face but not totally submerge his nose. Student noticed that his face would resurface again after sinking which helped him build his confidence. Given this breakthrough, he was able to score 6 points at the end of the AEAJ program.

Pool Skill I - *Combined Rotation Development*

The student scored 1 point during the pre-assessment. The instructor expressed that initially the student was uncomfortable bending from the hips while lifting the knee up to assume the chair position. This was seen in both deep and shallow water. He had trouble maintaining balance because he did not know how to use both arms purposefully to achieve the chair position. The exercises from the AEAJ program such as “360 degree rocketship”, “whirlpool exercise”, “sway like a tree (moving)” and most especially “dolphin jumps” helped the student get over his fear of entering

the water with his face getting submerged from a falling position.

Since he was able to succeed in the exercises mentioned above, the student scored only 6 points but could not bring him to score 7 points because of the instances where there was hesitation on the student's part.

Pool Skill J - *Water Stroke*

The student scored 2 points during the pre-assessment. The instructor took note that the student was able to push off and glide on back or front for 5 meters with physical support from him. Exercises such as the "back float (stationary)", "back float (moving)" "front submersions" and "torpedo kick" helped the student develop the skill of pushing off and gliding on back and front for 10 meters and changing direction on own volition. At the end of the program, the student was able to score 7 points.

Pool Skill K - *Pool Exit*

The student scored 2 points during the pre-assessment. The instructor expressed that the student experienced difficulty balancing due to his scoliosis. Student could not physically exit the pool without assistance due to his weight and upper body strength. No amount of encouragement or motivation could change the mind of the student because he knows that he will not be able to do it without the assistance of the instructor. With this, the student scored 4 points in his post-assessment because although he could place his hands on the poolside, bounce upwards and wiggle onto the poolside he still need the support from the instructor to be able to fully exit the pool.

Among the 4 skills where the student scored 1 point and was able to achieve a score of 6 points, it was the backward transversal rotation skill which stood out the most. The student started with the fear of being in a supine position because he was afraid that he would sink and water would enter his nose. The instructor helped the student overcome this fear by supporting his hips and back therefore allowing him to fully stretch out his body while in supine position without water entering his nose. Doing three to four repetitions of this exercise while the teacher provides support was able to give the student the experience of

floating on his back without water entering his nose and then the breakthrough came on the 6th attempt when the instructor no longer supported his back and hips so that he could perform the back float on his own.

The skill where the student needed to improve on was the pool exit where the student places his hands on the poolside, bouncing upwards and wiggling on to the poolside without helpers support. He was not able to score the maximum of 7 points because of his limitations which were his weight and lack of upper body strength.

Conclusion

It can be concluded that an aquatic exercise approach program can aid in the development of aquatic skills needed by a student with ASD to swim independently. Swimming has many benefits for children with ASD, including physical, behavioral, and mental health, as well as water safety. Learning to swim is especially important for the said population due to the high probability of drowning. All educational institutions should include a swim program as part of their curriculum.

"Halliwick is a very successful approach to teaching swimming through games and activities, in group work whenever possible." (Garcia, 2012) Despite the fact that this study only included one student, the findings confirm that an aquatic skills approach swim program adapted from Halliwick's Approach to Teaching Swimming can definitely help develop the aquatic skills of a student with ASD for them to swim independently. Because the swim program is taught through swim activities rather than traditional formal lessons, this can have a positive impact on the child.

"By providing educational environments that meet the needs of students with ASD, we can help them to succeed in learning social, behavioral, and academic skills that will positively influence their current and future lives" (Murray, 2015). Finding a teaching method that they enjoy and that works for them in the learning environment can guarantee a positive response.

The study's findings show that an aquatic exercises approach program adapted from Halliwick's Approach to Teaching Swimming can definitely help a student with ASD acquire the

aquatic skills required for a student with ASD to swim independently. Future lessons, however, may include more than one student or make modifications to the program so that it can be adapted to diverse groups of students.

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