

Movement therapies for school age children with autism: A review of the
literature

A Synthesis of the Research Literature

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Courtney L. Bradish

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THE COLLEGE AT BROCKPORT
STATE UNIVERSITY OF NEW YORK
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Department of Kinesiology, Sport Studies, and Physical Education

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Cathy Houston-Wilson

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Chairperson,
Department of Kinesiology, Sport Studies, and Physical Education

Date

Table of Contents

Abstract.....	p.1
Chapter 1.....	p.2
Chapter 2.....	p.6
Chapter 3.....	p.11
Chapter 4.....	p.27
Chapter 5.....	p.33
References.....	p.35
 Appendix A	
Article Grid.....	p.38

Abstract

One in every 68 children in the United States has autism spectrum disorder (ASD), affecting boys more than girls (4:1). Physical activity is important for children with ASD because it promotes life-long fitness and prevents chronic conditions. The purpose of this synthesis was to determine the most effective research-based movement therapy for children with autism, as well as discuss the advantages and disadvantages of each therapy presented.

The literature review used peer-reviewed scholarly articles to examine evidence-based research in the areas of music therapy, dance therapy, yoga therapy and aquatic therapy. Results indicated family-centered music therapy (FCMT) improves the quality of social and parent-child interactions and a motivating social environment for preschool aged children. Yoga therapy displays positive effects for treating behavioral difficulties in elementary school children. Aquatic therapy was recommended for secondary children with ASD, due to the reductions in inappropriate behavior and increased on-task behavior. Recommendations for parents and physical educators include implementing activity schedules, performing tasks in sequential order, modifying instruction, modifying equipment and using visual aids.

Overall, research indicated that dance therapy, music therapy, yoga therapy and aquatic therapy have advantages and disadvantages in treating children with ASD. Movement therapies can be used successfully for individuals with ASD but not every individual will experience the same benefits.

Keywords: autism spectrum disorder, movement therapy, music therapy, aquatic therapy, dance therapy, yoga therapy

Chapter 1- Introduction

The Good Doctor is a TV show about a young autistic surgeon who relocates from a quiet country town to join the surgical unit at the San Jose St. Bonaventure Hospital. The young man named Shaun is unable to personally connect with individuals around him, but he ends up finding his niche in saving lives. He is autistic. Individuals with ASD have tremendous potential, especially when they find their niche.

The incidence of individuals with Autism Spectrum Disorder (ASD) has increased dramatically in the last few decades. ASD usually effects boys more than girls, with approximately a 4:1 ratio. One in every 68 children in the United States has autism (Centers for Disease Control & Prevention, 2016). It is a long-term diagnosis, usually discovered in early childhood (Brondino, Poli, Rocchetti, Provenzani, Barale & Politi, 2015). ASD presents in the individual in the form of social deficits and sometimes an obvious and defining behavioral trait. In order to be diagnosed with ASD “the individual must present a lack of social skills, including impairment in the use of nonverbal communication, lack of peer relationship development skills, non-spontaneous interactions with others, reciprocity, lack of imaginative play, and a lack of communitive exchange” (Finnigan & Starr, 2010).

Individuals with ASD use movement therapies as a means of intervention, but movement therapy can also be used as a type of physical activity. Physical activity is important for children with ASD because it promotes life-long fitness and prevents chronic conditions. “Children with ASD or other developmental disabilities who have limitations in physical activity are at risk for obesity and certain ASD medications have been shown to cause significant weight gain” (Fragala-Pinkham, Haley & O’Neil, 2011,

p. 230). In addition to the benefits of physical activity, movement also provides an avenue to social interaction, especially for children. There are multiple movement therapies individuals with ASD can participate in to increase abilities in all three domains, psychomotor, cognitive and affective.

Individuals with ASD will also usually require some type of movement therapy to improve their interactive skills. The specific type of therapy is unique to each child and there is not one therapy that fits all children with ASD. Movement therapies must be adapted to each child with autism, depending on the symptoms and needs, because each autistic child presents their own particularities.

Throughout the last few decades, interventions and movement therapies have been documented to be effective for individuals with ASD. Movement therapies can assist in improvements in the individuals' three domains of learning (psychomotor, cognitive and affective), and contribute to an improved emotional state and leisure development (De Vries, Beck, Stacey, Winslow & Meines, 2015).

Some different types of movement-based therapies include music therapy, dance therapy, yoga and aquatics therapy. Music therapy has been used by multiple therapists and educators to facilitate communicative behaviors and social engagement with other individuals (Simpson & Keen, 2011). Yoga is used by most individuals on a daily basis for relaxation and/or fitness. Yoga has been used to treat behavior problems in individuals with autism spectrum disorder (Rosenblatt, 2011). Aquatic therapy involves swimming and other types of water play. "The water environment provides children with ASD with sensory input and postural support to facilitate improvements in sensory and social behaviors, and motor skills" (Fragala-Pinkham, Haley & O'Neil, 2011, p. 231).

Dance is a very creative yet powerful type of therapy because it is an activity some individuals enjoy and perform every day. Dance interventions enhance self-perception and improve many aspects of the social/affective domain (Hildebrandt, Koch, & Fuchs, 2016). Given all the options available, which movement therapy is most effective for school age children with autism?

Purpose

The purpose of this synthesis is to determine the most effective research-based movement therapies for children with autism, as well as discuss the advantages and disadvantages of each therapy presented. The following research questions will be answered:

1. What movement therapies are available for individuals with ASD?
2. Which therapies are most effective with pre-school children, elementary children, and secondary children?
3. Does gender make a difference in the effectiveness of movement therapies?
4. What are the barriers/facilitators to different types of movement therapies?
5. What are some recommendations for educators regarding best practices for working with school age children with autism?

Operational Definitions

1. Autism Spectrum Disorder: a developmental disability significantly affecting verbal and nonverbal communication and social interaction, engagement in repetitive activities, stereotyped movements, resistance to environmental change, and unusual responses to sensory experiences (Winnick & Porretta, 2017)

2. Movement therapy: Multiple therapies used in a variety of forms, for intervention strategies, stress relievers and other factors (Winnick, Porretta, 2017)
3. Physical Therapy: Services aimed at preventing/healing of conditions resulting from injury, disease or other causes (Block, 2010)

Assumptions

1. It was assumed that all participants in each study answered all questionnaires, interview questions and assessment questions honestly.
2. It was assumed that the data collection instruments and methods used in each study were valid and reliable.

Delimitations

1. Studies had to be published after the year 2005 and be from peer reviewed academic journals.
2. Only studies that included children in school grades k-12 were used.
3. Articles had to include information on movement-based therapy interventions specifically for ASD.

Limitations

1. Individuals in the studies included children with different levels of autism spectrum disorder.
2. The sample sizes used in the studies were often small.
3. The number of studies available make it difficult to generalize results.

Chapter 2- Methods

The purpose of this chapter is to discuss the methods used to synthesize relevant research in regard to the most effective intervention strategies for individuals with autism. This chapter will discuss the data collection, data analysis and the data coding processes.

Data Collection

Research articles for this synthesis were collected by utilizing the Drake Memorial Library database system. Through this system, EBSCOHOST search engine and the Education Source Complete was used by entering specific key words to yield desired results. SportsDiscus database was the main search engine used.

In order for an article to be considered and used for the critical mass it needed to be a scholarly, peer reviewed article written after the year 2005. Keywords such as *movement therapy, autism, children, aquatics, yoga, dance, music therapy* and a combination of those words were utilized during the search process.

The first search within EBSCOHOST, included key words *movement therapy, autism and children*, which yielded 44 articles. In order to narrow the search to specific intervention strategies, keywords such as *aquatic therapy, autism and children* were used and this yielded four articles. Out of those ten articles, four of articles were used for the critical mass because they met all the criteria. The next search replaced *aquatic therapy* with *yoga therapy*, yielding four articles, with one new article being added to the critical mass. The search was done again, this time replacing *yoga therapy* with a new keyword of *music therapy*, yielded 60 articles and added four articles to be used in the

critical mass. The last search for this database was replacing the keyword *music therapy* and replacing it with *dance*, yielding four articles using two for the critical mass.

The second search within Education Source Complete, included key words *music therapy, autism and dance*. The first search of music therapy and autism resulted in 89 articles, adding another keyword of *children* reduced the search to only two articles, of which none were used for the critical mass. The second search, consisted of *dance* and *autism* resulted in five articles and adding *children* as a keyword reduced my search to zero articles. This left a final total of ten articles for the critical mass and exhausted the literature.

The ten final articles were all peer-reviewed, scholarly articles that were published after the year 2005. These specific parameters were used to determine that the information being used was current and relevant to the present day. The overall findings of the articles being utilized needed to include intervention strategies for individuals with autism by presenting data in a variety of fashions and data collection. Thus, articles included research on one or more of the following; children, autism, intervention strategies, yoga, dance, music therapy, movement therapy and aquatics.

The critical mass of research articles used for this synthesis were collected from the following journals, *Journal of Alternative and Complementary Medicine, Behavioral Sciences, Journal of Physical Education and Sport, Adapted Physical Activity Quarterly, Journal of Music Therapy, National Autistic Society, Developmental of Disabilities, and Developmental Neurorehabilitation.*

Data Analysis

Out of the ten research articles that were included in this synthesis, eight were quantitative, one was qualitative and one article used both quantitative and qualitative methods. The main data collected for the quantitative studies were skill-based assessments, questionnaires, interviews, observations and videos. The main data collected for the qualitative studies were observations, interviews, video recordings, and field notes. The interviews and questionnaires used in these studies were coded into categories, and used for calculation of percentages, means and descriptive statistics using SPSS.

Quantitative

The seven quantitative studies within the critical mass focused on individuals with autism spectrum disorder and the positive and negative effects of different movement intervention strategies. Most of the articles used ANOVA, SPSS and multiple assessments specific to the intervention strategy being used. For example, the subtheme of music used multiple data analysis procedures, paired sample t-tests, ALT-PE coding sheets, percentages and frequencies along with Minitab 16 and Cohen's d.

The swimming articles used multiple data analysis as well. For example, one article used chi-square or t-tests for demographic information and used multiple swimming assessments which were coded into paired t-test, percentages and frequencies. Another analysis used was ANOVA and again ALT-PE. The variety of methods used in these articles varied depending on the number of participants, research questions and what the authors wanted to achieve overall in the study.

The yoga article used two different types of measurements which coded the data into percentages, mean scores and differences between pre-and post-test scores. This

article had used the BASC-2 and the ABC scale to provide this study with results and findings.

The one dance article which was quantitative used SPSS 20 to analyze the data. SPSS 20 was used to calculate averages, percentages, standard deviations and the use of a 2x2 ANOVA. The significant differences between groups used the post-hoc. The level of significance used was $p < .05$. Overall, the data presented using these types of analyses provided readers with information and data to describe the differences, similarities and the changes that may have occurred in these studies.

Qualitative

Out of all the research reported, only two articles for the critical mass were qualitative. The first article that was qualitative was based on the effects of aquatic therapy. The authors used a survey/questionnaire consisting of three different sections focusing on improvements, effects, limitations and whether or not the OT treated individuals with autism with aquatic therapy.

The second article, which used both qualitative and quantitative data, utilized a semi-structured interview. The semi-structured interview was for parents only, consisting of questions specific to the perceptions of changes in the quality of the parent-child relationship.

Coding of Data

The coding of the research articles used for this synthesis started by utilizing an article grid. This broke down the articles into specific areas that created an easier format for understanding and reporting each article. Sections consisted of purpose, methods/procedure, analysis and findings. Once the articles were organized into the

article grid, notes were kept with commonalties and differences between articles.

Different themes were identified from these notes that will be used within chapter three to discuss the articles findings. In addition, each article was matched to a research question in an effort to ensure that each research question was adequately adhered.

Chapter 3- Literature Review

The purpose of this chapter is to review the literature that examines the available movement therapies for children with ASD. This chapter will discuss each of the ten articles used in the critical mass and describe methods used and the results. Specifically, articles are grouped into the following four themes: music therapy, aquatic therapy, dance therapy and yoga therapy.

Music Therapy

Music and on-task behaviors in preschool children with autism spectrum disorder.

Children with ASD in pre-school are hyperactive, off-task and are growing continuously. Authors Dieringer, Porretta & Sainato (2017), supported this by investigating their evidence-based research with the goal of “determining the effect of music (music with lyrics versus music with lyrics plus instruction) relative to on-task behaviors in preschool children with ASD in a gross motor setting.” (Dieringer et al. p. 217). The intervention was subcategorized for comparison into two themes: *music with lyrics* versus *music with lyrics plus instruction*. There were five (four males and one female) participants in this study. The inclusion criteria for the participants included being diagnosed with ASD using the DSM-IV, a history of off task behaviors, along with parental consent. The participants were measured during three to five different sessions through observation and the Academic Learning Time in Physical Activity to ensure off task behaviors and collect data about the significance of motor delays in children with ASD.

The study took place at a private integrated preschool in the lunchroom where the only equipment was poly spots, beanbags, a sound system and a video camera.

Participants individually attended four 10-minute music sessions per week. Baseline data of instruction only was used. The independent variable was presenting music with lyrics and music with lyrics plus instruction. The dependent variable was on-task behaviors consisting of a movement (running), visual attention, appropriate use of equipment, transitions between activities and physical activity engagement within five seconds. Music was played at the same volume level during each session, songs were placed on shuffle and all songs were selected from “Greg and Steve’s Kids in Motion” CD.

Data was recorded daily on a preestablished data sheet, developed by the researchers, along with the individual video recordings from the sessions. To show statistical significance, an interobserver agreement (IOA) of 80% was required for the data to be collected. The IOA required both researchers to agree that the target behavior of on-task and off-task behaviors were met. The overall IOA totaled 93% for all five participants demonstrating statistical significance.

The findings of this study showed two participants were positively engaged in multiple on-task behaviors during *music with lyrics* while the remaining three participants were not engaged. (15%, 9%, 68%, 65%). However, the study was skewed on baseline participation scores and number of sessions participants attended.

The findings of this study also indicated that all participants demonstrated higher mean percentages of on-task behaviors during *music with lyrics plus instruction* when compared to baseline data. Specifically, *music with lyrics* was ineffective at promoting on-task behaviors for children with ASD. All participants exhibited lower percentages of

music with lyrics during the on-task behavior session. The participants needed to be reminded multiple times about staying in the movement area. Participant five was the only participant who would sing as well as dance during the music which could be due to a sensory overload issue causing the participant to be inactive during the study.

Results of this study showed a need to provide additional supports to the participants to increase on-task behavior. The participants in the study increased on-task behaviors during music with lyrics plus instruction when compared to the music with lyrics condition. Repetitive behaviors and rocking back and forth decreased throughout the music with lyrics plus instruction sessions in participants one and five. Participants two, three and four decreased in inappropriate behavior during music with lyrics plus instruction but did not reach or excel over the participants personal baseline percentage enough to provide positive results. Overall, the study's findings supported music with lyrics plus instruction as an effective means of increasing percentages of on-task behaviors when compared with instructions and demonstrations.

The effects of music therapy incorporated with applied behavior analysis verbal behavior approach for children with autism spectrum disorders.

Another quantitative study written by Lim & Draper (2011), aimed at comparing “a common form of Applied Behavior Analysis Verbal Behavior (ABA VB) approach and music incorporated AB VB method in the speech production of children with ASD” (p. 532). This study explored perceptions of music patterns and how it effects the production of speech in children with ASD. The participants in this study incorporated 22, three to five year old preschoolers (seventeen boys, five girls) who were verbal or preverbal, and met the diagnostic criteria for ASD. Each music therapy session consisted

of five trials for each assigned verbal operant. Each participant was assigned a set of target words for three specific training conditions- *music*, *speech* and *no-training*.

To measure the most effective training condition, the participants were separated into two groups (verbal and pre-verbal). Each group had their own separate collection of operant words (30 in total). Songs were chosen by the researchers to include lyrics including target words or phrases. Each line of the song ended with a target word.

The methods of collecting pre-and post-data were collected in regard to the production of the target words. A verbal production evaluation scale (VPES) measured the production of the target words according to the four components and the total score was used for the pre-and post-test scores. The post-test was designed to measure the individuals' verbal production in functional communication. The individuals received both music and speech trainings three days a week for two weeks. Paired sample T-tests were conducted to evaluate the effects of the training condition which was music vs. speech vs. no-training on specific target words. VPES had a mean score of 34.45 and an SD of 14.77 for music training compared to speech training which had a mean score of 32.91 and a SD of 15.53.

After statistical analysis, the study showed there was no significant difference between music and speech training, however, results demonstrated music and speech training had a significant effect on the verbal operant production compared to no-training at all. According to Lim & Draper (2011) "the findings suggest that music can be incorporated into the ABA VB training method and that musical stimuli can be successfully used to enhance verbal production in children with ASD" (p. 543). There was a positive correlation between the pre-test and the post-test findings, concluding

there was a significant interaction between the intraverbal production after the training. It was suggested the intraverbal production trainings for children with ASD can help produce vocabulary words similar to “echolalia” and a child with ASD could utilize the same words functionally.

Overall, results indicate both music and speech trainings are effective for production of the four ABA verbal operants. The findings support a carefully designed and functionally organized musical stimuli can be an effective antecedent variable for the ABA verbal operant particularly in echoic training. Target words or phrases from the studies speech training showed tact with corresponding pictures were produced the most. The language training the participants received through mand, tact, echoic and intraverbal provided them with verbal imitation skills and verbal production skills. Summarizing, that the participants increased their language development specifically social skills, vocabulary, and communication between peers, teachers and parents. The increase in the participants’ language development provided evidence of a link between music and language development in children with ASD.

Family-centered music therapy to promote social engagement in young children with severe autism spectrum disorder: A randomized controlled study.

Thompson, McFerran & Gold (2013), used a mixed method approach to examine “the impact of family-centered music therapy on social engagement abilities” (p. 840). The randomized controlled study included a sample size of 24 participants. Pre-and post-intervention data was collected to determine results. Inclusion criteria consisted of: (1) diagnosis of ASD (2) between three to six years of age (3) no verbal communication (4) agreement to attend a family-centered intervention program. Two conditions were used

over the course of 16 weeks in this study 12 participants who participated in home family centered music therapy (FCMT) in addition to their intervention program, and the remaining 11 participants who only received the once-a-week intervention program for 16 weeks.

Data was collected through four different parent-rated measures, semi-structured parent interviews focusing on parents' perceptions of any changes in the parent-child relationship and observations of music therapy sessions. The music therapy sessions utilized songs, improvisation, and movement to music to address five different aspects of social communication including shared attention, focus on faces, turn taking, response to joint attention and initiation of joint attention. The data analysis consisted of utilizing Minitab 16, specifically two-sample t-tests that were assuming equal variance based on raw scores. For the effect size of the group, this study used Cohen's *d*, evaluating a one-sample t-test. The interview data was analyzed based on a phenomenological approach which focused on the treatment groups' parents and descriptions of changes in the parent-child relationship.

The results of this study concluded that there were no significant differences between the two groups at baseline for age, diagnosis, sibling involvement, English skills and hours of care. The effects of social engagement showed a statistically significant effect of FCMT for the Vineland Social-Emotional Early Childhood Scale (VSEEC) and parents saw improvement in their child's social interactions at home and in the community. There was also a significant improvement in interpersonal engagement within FCMT sessions, but there was no significant difference for SRS-PS. This means that social responsiveness stayed the same for the children participating in the study. The

effects on speech increased in parent-reported speech and language interaction, but there were no significant effects of the treatment. This study also found that the effects on parent-child relationships showed no significant effect of treatment, but informally positive effects could be concluded. In other words, the effects on the parent-child relationship based on the data analysis was not significant at a $p > .05$ level, but positive effects were noticed anecdotally by family members. For example, parents reported their child communicating better in their home environment and participating in play with other children including family members. Overall, this study indicated that parents saw improvements in their child's social interactions with others including imitation skills, sharing, co-operating, playing with others and communicative behaviors in social contexts after the FCMT intervention.

Based on this study, the use of FCMT may have the potential to increase drive and motivation in children with ASD. Family-centered music therapy can potentially make a positive difference on individuals with ASD by improving social engagement skills, and the parent-child relationship.

Aquatic Therapy

Group swimming and aquatic exercise programme for children with autism spectrum disorders: A pilot study.

Fragala-Pinkham, Haley & O'Neil (2011) used a mix of qualitative and quantitative approaches for the purpose of evaluating the effectiveness of a 14-week aquatic programme for children with autism spectrum disorder (ASD) that involved 20-30-minutes of aerobic activities, five to ten minutes of muscular strength and endurance exercises and a five-minute cool down (Fragala-Pinkham et al. 2011). The participants

were included in the study if they had a diagnosis of ASD, were a child between six and twelve years old, were able and willing to participate in aquatics, were not involved in any other interventions, did not have a need for constant monitoring and had the ability to follow directions. A total of 12 individuals (seven -intervention group, five- control group) were included in the study after parental consent was received.

Participants were measured based on execution of lower body and trunk strengthening exercises. Multiple types of aquatic equipment was used. The training intensity was set at 50-70% of max HR and individuals were required to perform 20 minutes of moderate to vigorous exercise two times a week. The tools to collect measurements of swimming skills included a Swimming Classification Scale, YMCA Water Skills Checklist, Brockport Physical Fitness Test and the Multidimensional Pediatric Evaluation of Disability Inventory Mobility Scale (M-PEDI). A questionnaire was used to record parent's perceptions of satisfaction at the end of the study. After statistical analysis, the data showed group differences on the Swimming Classification Scale and mobility skills post-intervention, and key factors were identified by the parent's questionnaire. There were significant improvements in swimming skills for the intervention group.

It can be concluded that all the participants in this study improved on one or more levels on the Swimming Classification Scale. Parents reported that they felt like their child improved and they found enjoyment both for themselves and their child through participation in the intervention. Overall, this study supports a positive increase in the parent-child relationship and the effectiveness of a swimming program for children with

ASD. A highlight of the intervention was that the parents enjoyed the program because it was something they could do with their child.

Effects of Water Exercise Swimming Program on Aquatic Skills and Social Behaviors in Children with Autism Spectrum Disorder.

Pan (2010) investigated “the effectiveness of a 10-week water exercise swimming program (WESP) on the aquatic skills and social behaviors of sixteen boys with autism spectrum disorders” (Pan, 2010, p. 9). Participants in this study were between the ages of two and nine and had the ability to follow instructions. Sixteen children were included in the study (Eight in group A, eight in group B) and completed a water exercise program that consisted of 20 sessions over a 10-week period, working on social and floor warm-up activities, one-to-two small group instructions, whole group games and cool-down activities.

The method for collecting data in this study was very specific. Each participant was assessed on aquatic skills and social behavior three times, once at entry (baseline), again after ten weeks and a third time after an additional ten weeks. The children in Group A received the WESP during the first ten weeks, and the second assessment after, while the children in Group B received the same intervention in reverse order. The tools used to measure the children included the HAAR checklist and the SSBS-2. The HAAR checklist was divided into five different stages- mental adjustment, introduction to water, rotations, balance and control and independent movement in water. The SSBS-2 assessed the social competence and antisocial behaviors of the children with ASD

The results of this study indicated that there were no statistical differences between the children in Group A or Group B pre-intervention aquatic skills. Immediately

following the intervention, the WSEP showed improvement for aquatic skills in four out of the five stages. The total number of antisocial behavior problems in the participants also decreased. Reversing the order of intervention did not generate statistically significant differences between the groups. This entails that the study demonstrated improvements for water orientation skills, breathing skills, floating skills and entry/exit skills for children with ASD. Encouragingly, the effect of WESP group on behavioral and social skills decreased, particularly related to antisocial behaviors, as well as, increased social competence behaviors for children with ASD. Positive feedback was recommended to increase motivation of the participants leading to gains in swimming performance.

To conclude, the WSEP enables individuals to develop physical skills within this intervention process and enhances behavioral and social skills for children with ASD. Many children with ASD benefit from watching positive social interactions of others (Pan, 2010). Aquatic therapy provides children with ASD a physically safe and emotional environment where they interact positively with peers (Pan, 2010). The environment provided by the WESP enables individuals to develop physical skills while enhancing behavioral and social skills, which is necessary to/for their development. Specifically, this intervention encouraged children to seek assistance from each other, facilitate interactions during transitions and group games and non-instructional socialization. This promotes this intervention as an effective program for children with ASD to promote social behavior while improving aquatic skills.

Effects of enhanced structure in an aquatics environment for three boys with autism spectrum disorders: A pilot study.

A quantitative study by Pushkarenko, Reid, & Smith (2016) “examined the effects of pictographic activity schedule implementation within a structured aquatic environment for individuals diagnosed with ASD” (Pushkarenko et al. 2016, p. 3). The participants in this study included three boys diagnosed with ASD who ranged in age from 11 to 16 years of age.

Over a 13-week period, consisting of 13 sessions lasting 30-40 minutes, the schedule included warm-up activities, skill instruction and free play. Three intervention methods were used consisting of different *schedules*. Schedules used in this study consisted of pictures or visuals for the participant to view and then perform the task illustrated. Observations using video recording, Childhood Autism Rating Scale and Psychoeducational Profile Revised were used as tools to collect data. Applied behavior analysis was also used to assess the effects of the structured activity schedules on and their effect on inappropriate behaviors for children with ASD. These tools were used to analyze each participants’ item response time.

The results of this study showed that the implementation of activity schedules had a positive influence on behavior as the item response theory (IRT) variable was reduced. Prior to the implementation of schedules, two participants demonstrated reductions in inappropriate behavior while the remaining participants increased in inappropriate behavior. This indicates positive effectiveness for activity schedules for decreasing inappropriate behaviors in children with ASD. The findings of this study are positive with respect to utilizing activity schedules to decrease inappropriate behaviors.

Clinicians' perceptions of the benefits of aquatic therapy for young children with autism: A preliminary study.

Vonder Hulls, Walker and Powell (2016), identified the benefits of aquatic therapy for children with ASD from the perspective of clinicians (Vonder Hulls et al., 2016). Seventy-eight occupational therapists who had used aquatic therapy for at least one month to treat young individuals ages four to ten with autism were selected from all around the U.S. to participate in this study. A Likert-scale survey and interviews were used to focus and identify the benefits of aquatic therapy for children with ASD and a parental perspective of aquatic therapy. 62% of surveys were returned, and of those, 18 of the 78 intended participants provided aquatic therapy services to young children with ASD.

The majority of the therapists perceived a substantial positive effect of aquatic therapy for children with ASD in the following areas: performing swim skills (72%), concentrating (67%), balance (61%), muscle strength (61%), tolerating touch (61%), initiating and maintain eye contact (56%) and demonstrating water safety (56%). Three percent of the therapists felt children performed less self-stimulating behaviors and 89% reported that families had participated in more water activities than previously. The researchers also noted that the therapists mentioned that 100% of the participants loved the aquatic therapy sessions and found them to be enjoyable (Vonder Hulls, Walker and Powell, 2016). The interviews revealed the following: more toleration of supine position, greater upper extremity movement, better bilateral coordination, more gravitational security, increased motor modulation, appropriate input, lip closure, blowing air, body awareness, motivation, transitions, impulse control, risk taking and more.

To summarize, this study showed that the most frequently reported benefits of aquatic therapy from the clinician's perspective, ranged from improved performance in "underlying skills" to increased social participation (Vonder Hulls, Walker and Powell, 2016). The underlying skills consisted of improved strength and balance at body function level, along with the social aspect of communication and play. The study showed an 80% positive change in the children who participated in aquatic therapy, and all reports stated the children with ASD enjoyed aquatic therapy. The clinicians reported the most effective areas reported as: swim skills, paying attention, muscle strength, balance, tolerating touch, eye contact and water safety for children with ASD.

Yoga Therapy

Relaxation response-based yoga improves functioning in young children with autism: A pilot study.

Yoga can be a positive environment and movement strategy for individuals with ASD. To support this, Rosenblatt, Gorantla, Torres, Yarmush, Rao, Park, Denninger, Benson, Fricchione, Bernstein and Levine (2011) investigated how to "develop and objectively assess the therapeutic effect of a novel movement-based complementary and alternative medicine approach for children with ASD" (Rosenblatt et al. 2011, p. 1029). The authors responded to a list-serve that notified parents of children with a diagnosis of ASD that the study was available. Twenty-four parents of children with ASD completed the study. The children (22 males, two females) were between ages of three and 16.5 years old.

Groups consisted of two to five children who received eight treatment sessions lasting approximately 45 minutes. After an initial orientation, all sessions received the

same intervention to create predictability, familiarity and reduce anxiety for the child. The sessions included breathing exercises, yoga postures, music, dance and yoga relaxation.

Data was collected using the BASC-2 scale and an ABC checklist. After statistical analysis, the analysis of the BASC-2 showed improvements in the behavioral symptom index, externalization and atypicality. These results indicate a positive impact from a multimodal relaxation program for children with ASD. This means that yoga can potentially be used as a relaxation program for individuals with ASD. Yoga decreased aggression, anxiety, and depression in most of the participants of this study, but there was no change in hyperactivity, attention problems and somatization for children with ASD.

Dance

The effect of a traditional dance training program on neuromuscular coordination of individuals with autism.

Greek dance has shown positive effects on fitness and motor development for participants with ASD (Arzoglou, Tsimaras, Kotsikas, Fotiadou, Sidiropoulou, Proios and Bassa, 2013). Arzoglou et al. (2013) researched what the “evaluating effect of a structured program of traditional dances on neuromuscular coordination of individuals with autism” (Arzoglou et al. 2013, p. 563). This study consisted of ten participants with ASD who were divided into two groups (intervention group and control group).

Data collection for this study was gathered by the use of the *Körperkoordinationstest für Kinder (KTK)*, to assess different types of neuromuscular coordination for the entire body. This quantitative test assessed the participants’ pre- and post-intervention. The program was eight weeks long with three sessions of Greek dances

a week lasting 35-45 minutes. The sessions consisted of a five-minute warm-up, five-minute rhythm exercise and 15-25 minutes of dance.

Statistical analysis using SPSS software revealed that participation in a program with Greek traditional dance improved the children with ASD's neuromuscular coordination. This concludes that dance is a potentially effective activity for improving kinetic development of individuals with ASD. An increase in performance in all parameters was assessed, showing exercise in the form of traditional dance is important for improvements in the kinetic development of individuals with ASD (CITE). The control group showed no changes in performance regarding muscular coordination therefore supporting tradition Greek dancing for children with ASD. The positive effects of traditional dance can lead to an overall effect on personality, along with social and emotional interaction caused by participation in this dance activity (CITE).

“We dance and find each other”: Effects of dance/movement therapy on negative symptoms in autism spectrum disorder.

Another study that supports dance for children with ASD involves “examining the effect of this therapy on negative symptoms in participants with ASD” (Hildebrandt, Koch and Fuchs 2016, p.1). The participants in this study included 78 people with ASD between the ages of fourteen and sixty-five. A total of 78 participants were included in this study and were separated into a control group and a therapy group.

The control group did not vary from their routines, while the therapy group received ten, 60-minute sessions once a week. The group receiving therapy sessions consisted of mirroring exercises and one verbal element. The sessions were ten minutes of Chace-circle, twenty minutes of dyadic mirroring, twenty minutes of Baum-circle and

ten minutes of verbal processing. The verbal data was not collected nor analyzed.

Demographic data was assessed in the beginning of the study and data was collected using the Scale for the Assessment of Negative Symptoms. This assessment has 24 items divided into five sections: blunted affect, alogia, abulia, anhedonia and diminished attention.

After statistical analysis, the results of this study showed that the Scale for the Assessment of Negative Symptoms (SANS) total scores ranged from 2-83 on a scale from 0-120, indicating “normal” to “severely ill” results. This study showed encouraging results related to the benefits of dance therapy. In this specific case, dance therapy increased self-awareness and empathy in the participants with ASD (CITE). There was an improvement in emotional expression during dyadic mirroring as well.

The factors assessed in this study utilizing the various measurements revealed an increase in participation, play and social interaction with other children. There are no previous studies with similar outcomes to this study, creating a base for more research to be done. This study adds insight to quantitative evidence and research for children with ASD in relation to dance therapy.

Chapter 4- Discussion

The purpose of this chapter is to synthesize results found in relation to movement therapies for individuals with autism. The advantages and disadvantages of each movement therapy will become apparent by answering the original research questions:

1. What movement therapies are available for individuals with autism?
2. What are the most effective movement therapies for preschool children, elementary children, and secondary children?
3. Does gender make a difference in the effectiveness of movement therapies?
4. What are the barriers/facilitators of the different types of movement therapies?
5. What are some recommendations for educators regarding best practices for working with school age children with autism?

R.Q. 1 What Movement Therapies are Available for Individuals with Autism?

After data was analyzed, results surfaced in relation to which movement therapies are available for individuals with ASD. The main results presented four main therapies: dance therapy, yoga therapy, aquatic therapy and music therapy. These four therapies are considered the most frequently implemented movement therapies used in schools, at-home, intervention programs and therapy sessions. Some movement therapies may be specific to age, creating less available therapies for individuals with ASD.

The four therapies itemized above are just a small list of the therapies offered. Other therapies not discussed that individuals with ASD can participate in are physical

therapy (PT), occupational therapy (OT), equestrian therapy, fitness and early intervention programs. The movement therapies available depend on the individual's geographic location, services, and the individual's severity of ASD. For example, if children live in a geographical location with limited resources parents may not be able to participate in certain movement therapies. Parents/guardians should assess their surroundings and explore the different movement therapies available for their child in their specific area.

R.Q. 2 What are the Most Effective Movement Therapies for Pre-School Children, Elementary Children and Secondary Children?

There are a variety of movement therapies utilized around the world, some are individualized while others are specifically related to age. The movement therapies need to be developmentally appropriate based on age, skills/abilities and IEP requirements of the child. Music therapy, yoga therapy and aquatic therapy have shown the most effective for specific age groups.

Pre-school age children with ASD are considered the most difficult to work with due to the supports needed for their development. The supports pre-school children may need are diverse learning theories, relationship-based approaches and opportunities for reciprocal interactions, affective sharing, turn taking and joint attention. Music therapy has been a recurrent movement therapy for individuals with ASD who have severe difficulties with social engagement. The intention of music therapy is to foster the child's motivation to interact and relate to others. Music therapy can also be used therapeutically as a tool for engagement, providing opportunities for children to interact non-verbally compared with play interactions. According to Thompson, McFerran & Gold (2013),

family-centered music therapy (FCMT) improves the quality of social and parent-child interactions that positively have an impact for preschool aged children. FCMT provides a motivating social environment for pre-school aged children.

Yoga therapy is a relaxation response for individuals with ASD. Yoga therapy can be modified for all ages of individuals to fit their specific needs. Yoga therapy can also be implemented in multiple environments making yoga universal. Yoga therapy has shown encouraging findings relating to elementary children with ASD to their growth and development. Specifically, yoga therapy displays positive effects for treating behavioral difficulties in elementary school children. According to Rosenblatt, et al. (2011), yoga may reduce anxiety, aggression, attention problems, depression and hyperactivity while providing a positive impact on behavioral and cognitive symptoms for children with ASD.

The aquatic setting provides secondary children with ASD an opportunity to explore as it tends to increase distractibility and unpredictability while including multisensory components that may affect behavior. Aquatic therapy has demonstrated improvements in fitness, skill development and an increase in social functioning (Pushkarenko, Reid & Smith, 2016). Specifically, aquatic therapy was recommended for secondary children with ASD because of the impact on activity schedules (Pushkarenko, Reid & Smith, 2016). Implementation of activity schedules demonstrated reductions in inappropriate behavior and increased on-task behavior (Pushkarenko, Reid & Smith, 2016). The behaviors reduced consisted of rocking, spinning and echolalia through the active participation in the aquatics program. The findings from this study lend support to previous research relating to the implementation of activity schedules.

R.Q. 3 Effect/Impact of Gender?

“In the last twenty years, the prevalence of autism has grown significantly, 1 in 88 children up to 8 years displays some kind of form of autism. In comparison, the prevalence is higher in boys (1:54) than girls (1:252)” (Arzoglou, et. al. 2013, pg. 563).

Gender has a major effect/impact on children with ASD, particularly males. Dance therapy has shown improvements in increased eye contact, verbalization, self-awareness and empathy for male participants. According to Hildebrandt, Koch & Fuchs (2016), males also increased emotion, expression and on-task behaviors after the dance therapy intervention. The male participants decreased inappropriate behavior due to the amount of instruction during the dance therapy session. The female participants were opposite, they decreased in emotion, expression and on-task behaviors.

“The therapeutic use of water activities or swimming in children with ASDs is believed to facilitate language development and self-concept, and to improve adaptive behavior and provide an appropriate setting for early educational intervention” (Pan, 2010, p. 11). Pan (2010), worked with 16 male participants in a 10-week water exercise program. The participants showed improvements in both academic behavior and swimming skills. Academic behaviors consisted of antisocial/aggression, hostile/irritable, defiant/disruptive and social competence. Swimming skills consisted of improvements in water orientation skills, breathing skills, floating skills, stroke skills, and entry and exit skills. The male participants in the aquatic program decreased antisocial behavior problems, but did not increase social competence behaviors through the use of implemented instructional strategies. The instructional strategies consisted of facilitating

interactions during transitions, group games or activities, consistent schedules and routines and non-instructional socialization.

R.Q. 4 What are the Barriers/Facilitators to the Different Types of Movement Therapies?

The different movement therapies available for children with ASD are limited to barriers categorized with ASD as well as the facilitators of the multiple movement therapies that promote success. Barriers for children with ASD differ from typically developing peers because of repetitive movements (Pushkarenko, Reid & Smith, 2016), sensory overload (Rosenblatt, et. al. 2011; Porretta & Sainato, 2017), and communication skills (Thompson, McFerran & Gold, 2013). “Music with lyrics may have created a less structured learning environment, making it difficult for children with ASD to understand what they needed to do appropriately.” (Porretta & Sainato, 2017, p. 229). The behaviors in individuals with ASD create a bigger challenge for teachers, paraprofessionals and others (Thompson, McFerran & Gold, 2013).

In another study by Rosenblatt et al., 2011, sensory awareness was a key characteristic in individuals with ASD in response to the different types of therapies, specifically yoga therapy. The age of a child, mobility skills and medications may also cause limitations to the child’s success when participating in movement therapy. It is important barriers are eliminated to ensure the child develops appropriately.

The facilitators of the movement therapies that promote success for children with ASD include family participation (Vondur Hulls, Walker & Powell, 2006; Thompson, McFerran & Gold, 2013), identical routines/techniques (Arzoglou, et. al. 2013) and

utilizing musical elements in the appropriate setting (Porretta & Sainato, 2017; Lim & Draper, 2011). Specific adaptations to the type of movement therapy and instructional supports may also be a key facilitator when promoting a child's success.

R.Q. 5 Recommendations for Educators and Others Who Work with a Child with ASD?

It is essential that children with ASD are integrated in therapy sessions, physical education classrooms and education classrooms, ensuring the child has proper accommodations and adaptations to be successful in any type of environment. Recommendations for educators, and others who work with a child with ASD include using activity schedules (Pushkarenko, Red & Smith, 2016), performing tasks in sequential order (Lim & Draper, 2011), modifying instruction (Porretta & Sainato, 2017; Arzoglou et. al., 2013) and modifying equipment (Fragala-Pinkham, Haley & O'Neil, 2011; Porretta & Sainato, 2017). Other recommendations consist of visual aids: posters, pictures, and demonstrations along with physical guidance if needed.

Chapter 5- Conclusion

This chapter will offer some conclusions to the question of the most effective movement therapies for school age children with ASD as well as some future recommendations in regard to the effective movement therapies for children with ASD.

Conclusion

Research indicates that dance therapy, music therapy, yoga therapy and aquatic therapy have advantages and disadvantages in treating children with ASD. There are multiple types and levels of autism. Each therapy described in this paper has potential benefits for children with ASD. The effectiveness of each therapy is determined by the appropriateness of the therapy for the individual and the quality of the intervention by the teacher or therapist. Research shows multiple movement therapies can be used successfully for individuals with ASD but not every individual will experience the same benefits. Individuals with ASD are all different, creating a variety of positive and negative reactions to the different types of movement therapies.

Future Research

Due to limited research, future research is needed in order to understand the range of movement therapies available for individuals with ASD, as well as the effects each movement therapy may have on a child.

Future research needs to focus on increasing the number of participants in a study, the different levels of severity in ASD and on the movement therapies available. Many of the studies used for research consist of small sample sizes of less than 20 participants.

Encouraging individuals with ASD to participate in research may increase results and provide reliable and useful information on the effects of the different therapies. The severity of ASD is important and needs to be discussed in research because children with ASD are all different. One child may have a higher functioning level of ASD while another child may be non-verbal with severe behavioral issues, creating diverse reactions to the movement therapies.

Overall, the multiple movement therapies discussed in the research have limited research to substantiate their use. Research needs to focus on yoga therapy, dance therapy, music therapy and aquatic therapy in order to ensure these therapies are truly effective for individuals with ASD. It is still unclear which movement therapy is most effective for individuals with ASD but additional research will bring us closer to an answer.

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* =Critical Mass Articles

Article Grid

Theme	Author	Title	Source	Purpose	Methods/ Procedures	Analysis	Recommendations- Research Notes
Music	Dieringer, S., Porretta, D. & Sainato, D.	Music and On-task Behaviors in Preschool Children with Autism Spectrum Disorder	Dieringer, S., Porretta, D. & Sainato, D. (2017). "Music and on-task behaviors in preschool children with autism spectrum disorder." <i>Adapted Physical Activity Quarterly</i> , 34, 217-234. Doi:10.1123.2015-0033.	The purpose of this study was to determine the effect of music (music with lyrics versus music with lyrics plus instruction) relative to on-task behaviors in preschool children with ASD in a gross motor setting.	5 participants in this study, 4 males and 1 female who were diagnosed with ASD using the DSM-IV and a history of off task behaviors, along with parental consent. The participants were observed 3-5 sessions to ensure off task behaviors and to show presence of significant motor delays. The study took place at a private integrated preschool in the lunchroom where there was only poly spots, beanbags, a sound system and a video camera. Baseline data of instruction only was used, IV of presenting music with lyrics or music with lyrics plus instruction and the DV was the on-task behaviors consisting of a	A interobserver agreement (IOA) was needed in order for 80% of the agreement to be met. IOA requires agreement to be obtained when both observers agree the target behavior has been met. The overall IOA was 93% for all participants. Verbal prompts varied from 2-19 across all sessions and the mean number was 10. Visual analysis of graphed data was used, both within and between conditions analyses were conducted. Data reports used frequencies and percentages. Participant 1	<p>"Future research should focus on generalizing on-task behaviors to other settings (inclusive-group or segregated-group physical-activity classes or when children are with their typically developing peers)."</p> <p>"Future research should investigate how music with lyrics plus instruction can be used to facilitate the learning of fundamental motor skills by young children with ASD."</p> <p>Research Questions: R2, R3, R4, R5</p>

				<p>movement (running), visual attention, appropriate use of equipment, transitions between activities and physical activity engagement within 5 seconds. Participants individually attended four 10-minute sessions per week, but no more than 13 sessions. Music was played at the same volume level during each session, songs were placed on shuffle and all songs were selected from “Greg and Steve’s Kids in Motion.” Data was recorded daily, along with the video recordings of each session and was recorded on a preestablished data sheet. The ALT-PE was used to code the dependent variable and each</p>	<p>and 5 engaged in multiple on-task behaviors during music with lyrics (15%, 9%, 68%, 65%), participants 2, 3, and 4 engaged in a mean of 0% of on-task behaviors. All participants demonstrated higher mean percentages of on-task behaviors during music with lyrics plus instruction when compared to baseline data. The overall findings in this study supported the premise that music is effective in increasing mean percentages of on-task behaviors for young children with ASD.</p>	
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					session was divided into ten-second intervals on the ALT-PE coding sheet.		
Music	Lim, H. & Draper, E.	The Effects of Music Therapy Incorporated with Applied Behavior Analysis Verbal Behavior Approach for Children with Autism Spectrum Disorders.	Lim, H. & Draper, E. (2011). The effects of music therapy incorporated with applied behavior analysis verbal behavior approach for children with autism spectrum disorders. <i>Journal of Music Therapy</i> , 48(4), 532-550.	The purpose of this study is to compare a common form of ABA VB approach and music incorporated ABA VB method in the speech production of children with ASD.	This study incorporated twenty-two 3-5-year-old preschoolers who were verbal or preverbal, and met the diagnostic criteria for ASD (17 boys, 5 girls). The independent variable were the types of training condition: music, speech and no training, verbal operant: mand, tact, echoic and intraverbal. The dependent variable was the verbal operant production measured by the Verbal Production Scale (pre/post). Target words and phrases were categorized into four operants: mand, tact, echoic, and intraverbal. Each group had their	Paired sample T-tests were conducted to evaluate the effects of the training condition which was music vs. speech vs. no-training on specific target words. VPES had a mean score of 34.45 and an SD of 14.77 for music training compared to speech training which had a mean score of 32.91 and a SD of 15.53. There was no significant difference between music and speech training, results proved music and speech training had a significant effect on the verbal operant	<p>“Future studies could classify the training conditions by the participants groups.”</p> <p>“Future studies should also examine the training effects on production of newly learned verbal operants and transfer of verbal operants.”</p> <p>Research Questions: R3</p>

				<p>own separate group of words they used in this study for the individuals being examined. Each music therapy session consisted of 5 trials for each assigned verbal operant. The songs chosen included 30 of the operant words, where each lyric included target words or phrases and each line ended with a target word. Pre-and post data were collected in regards to the production of the target words. A verbal production evaluation scale (VPES) measured the production of the target words according to the four components and the total score was used for the pre-and post-test scores. The posttest was designed to measure the individuals verbal production in</p>	<p>production compared to no-training. T-statistic was conducted to examine the level of pure echolalia effected the level of verbal operant production, results show the individuals scored higher on echolalia production then verbal operant production. An ANCOVA was generated to provide results on the significant effect on the treatment condition of the participants during the pretest and posttest. Overall, results indicate both music and speech trainings are effective for production of the four ABA verbal</p>	
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					functional communication. The individuals received both music and speech trainings 3 days a week for 2 weeks.	operants. “The findings suggest that music can be incorporated into the ABA VB training method and that musical stimuli can be successfully used to enhance verbal production in children with ASD.”	
Music	Thompson, G., McFerran, K. & Gold, C.	Family-centered music therapy to promote social engagement in young children with severe autism spectrum disorder: a randomized controlled study	Thompson, G., McFerran, K. & Gold, C. (2013) Family-centered music therapy to promote social engagement in young children with severe autism spectrum disorder: a randomized controlled study. <i>Child: care, health and development</i> , 40, 6, 840-852. Doi: 10.1111/cch.12121	The aim of this study was to investigate the impacts of family-centered music therapy on social engagement abilities.	This study was a randomized controlled study with a sample size of 24 participants including pre-and post-intervention data. With the mean difference post intervention of 100 words said and 125 words understood with a two-sided 5% significant level and the power of 80%. Children were recruited for the study following the proper criteria of (1) diagnosis of ASD (2) aged between 3-6 (3)	The data analysis consisted of utilizing Minitab 16, specifically two-sample t-tests that were assuming equal variance based on raw scores. For the effect size of the group, this study used Cohen’s d, evaluating a one-sample t-test. The qualitative data was carried out through a phenomenological approach, focusing on	<p>“The significant improvement in the quality of their child’s social interactions reported by parents suggests that active involvement in music making may provide opportunities to develop important interaction skills.”</p> <p>“FCMT may provide a motivating social environment for the children, fostering interactions between child and parent that potentially continue beyond the session.</p> <p>Research Questions: R2, R4</p>

				<p>limited to no verbal communication (4) attending family-centered intervention program. Multiple approaches were taken in order to collect data through parent-rated measures, observations, and parent interviews. The quantitative data collected in this study was through four different parent rated assessments (1) Vineland Social-Emotional Early Childhood Scales (2) The Social Responsiveness Scale Preschool Version for 3-Year-Olds (3) The MacArthur-Bates Communicative Development Inventories, Words and Gestures (4) The Parent-Child Relationship Inventory. The qualitative</p>	<p>descriptions of change. The findings concluded that there were no significant differences between the groups at baseline for age, diagnosis, sibling involvement, English skills and hours of care. The effects of social engagement showed a statistically significant effect of FCMT for the VSEEC, and parents seen an improvement in their child's social interactions at home and in the community. There was a significant improvement in interpersonal engagement within FCMT sessions. But there was no significant</p>	
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				<p>methods used to collect data were semi-structured interviews, questions focusing on parent's perceptions of any changes in the parent-child relationship. The participants received 16 weeks of FCMT sessions in their own homes and sessions were scheduled once a week. The music therapy sessions utilized songs, improvisation, and movement to music to address five different aspects of social communication including shared attention, focus on faces, turn taking, response to joint attention and initiation of joint attention.</p>	<p>difference for SRS-PS meaning social responsiveness stayed the same. The effects on speech had increased in parent-reported speech and language but no significant effects of treatment. This study had also found the effects on parent-child relationship showed no significant effect of treatment but positive effects can be seen. Overall this study indicates that parents had seen improvements in their child's social interactions with others including, imitation skills, sharing, co-operating, playing with others and</p>	
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						communicative behaviors in social contexts.	
Swim	Fragala-Pinkham, M., Haley, S. & O'Neil, M.	Group swimming and aquatic exercise programme for children with autism spectrum disorders: A pilot study	Fragala-Pinkham, M., Haley, S. & O'Neil, M. (2011). Group swimming and aquatic exercise programme for children with autism spectrum disorders: A pilot study. <i>Developmental Neurorehabilitation</i> , 14(4): 230-241. Doi: 10.3109/17518423.2011.575438	The purpose of this study was to evaluate the effectiveness of a 14-week aquatic programme for children with autism spectrum disorder (ASD).	The participants in this study were recruited through flyers sent to local schools. The inclusion criteria was, diagnosed with ASD, 6-12 years old, able to participate in aquatics, no other interventions, no constant monitoring and are able to follow directions. The parents needed to sign a written informed consent and needed to fill out and eligibility form along with a demographic form. 12 individuals were selected to participate in this study, 7 were in an intervention group and 5 were in the control group. This study consisted of a 14-week intervention where each participant was tested individually.	The intervention consisted of 20-30-minute aerobic activities, 5-10minutes of muscular strength and endurance and 5 minutes of cool down activities. The program consisted of lower body and trunk strengthening using multiple aquatic equipment. The training intensity was set at 50-70% of max HR, the plan of this study was to perform 20 minutes of moderate to vigorous exercise 2 times a week. The data analysis used was the chi-square or t-tests for the	Research Questions: R1, R2, R5, R4 "Significant improvement in swimming skills was found for the intervention group; however, no between-group differences were found for any outcomes." "In the future, another option may be to use a timed swimming test to see if children can swim greater distances in a set time." "Future research is needed with a larger sample size and a focus on exercise intensity to provide to support the effectiveness of aquatic exercise for improving swimming skills and fitness."

				<p>There were two measures of swimming skills that were collected, one being the parents completing the Swimming Classification Scale Pre-and Post-test. The second measurement used was the YMCA Water Skills Checklist consisting of 10-12 water skills, which was completed during the first and last week of classes. This study was testing cardiorespiratory endurance and muscle endurance using the Brockport Physical Fitness Test. Also, measuring the participants mobility skills using the Multidimensional Pediatric Evaluation of Disability Inventory Mobility Scale</p>	<p>demographic information. Between-group differences utilized the t-tests and the Swimming Classification Scale used the Mann-Whitney U-test for ordinal rank data. Paired t-tests were used to determine within group change in the YMCA checklist. Response percentages were calculated for the results of the satisfaction questionnaires. The results of this study had shown no significant difference at baseline between the two groups for the demographic data. The results showed a significant difference on the curl-ups</p>	
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					<p>(M-PEDI). Satisfaction for the program was measured using a questionnaire which was completed at the end of week 14 by the children and parents in the study.</p>	<p>with the control group scoring higher. After the 14-weeks no significant between-group differences were found but within-group differences were found in the Swimming Classification Skills (.66) and the mobility skills (.18). Significant differences were found as well for the within-group (intervention group) on the YMCA checklist $p=.001$ and the Swimming Classification Scale $p=.02$. All of the participants in this study improved on one or more levels in the SCS. The satisfaction questionnaire reported improvements</p>
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						and enjoyment for both parents and participants.	
Swim	Pan, C.	Effects of water exercise swimming program on aquatic skills and social behaviors in children with autism spectrum disorders.	Pan, C. (2010). Effects of water exercise swimming program on aquatic skills and social behaviors in children with autism spectrum disorders. <i>The National Autistic Society</i> , 9-28; 339496. Doi: 10.1177/13623613093394996	The purpose of this study was to determine the effectiveness of a 10-week water exercise swimming program (WESP) on the aquatic skills and social behaviors of 16 boys with autism spectrum disorders.	In this study each participant was assessed three times, once at entry (baseline), second after 10-weeks and a third time after another 10 weeks. Overall, the study was 21 weeks, 10 weeks WESP, 10 weeks control and 1 week for transition. The participants of this study were selected through the Diagnostic and Statistical Manual of Mental Disorders consisting of (1) mild ASD or Asperger syndrome (2) ages 2-9 (3) follows instructions (4) parental commitment. The water exercise program consisted of 20 sessions over the 10 week period working on social	The data analysis primary concern was to compare the children's performance under WSEP treatments and under regular treatments. Using a two-way ANOVA, the T1 versus T2 was calculated. The second analysis performed was examining the treatment effect for T2 versus T3 by utilizing a paired t-test. The third analysis was examining the difference between T2 and T2 in group A by a paired t-test. The results of this study had shown there were no differences	"Future research is warranted to establish the applicability of the current findings to individuals of both genders and at different stages of the life cycle through replication studies."

				<p>and floor warm-up activities, one-to-two small group instruction, whole group games and cool-down activities. Th aquatic skills and social behavior rating were collected three times through the study, entry for baseline data, after 1o weeks and a third time after another 10 weeks. The aquatics skills were measured using the HAAR checklist which is divided into five different stages (1) mental adjustment (2) introduction to water (3) rotations (4) balance and control (5) independent movement in water. Social behaviors were rated by the participants school teacher using the SSBS-2. The SSBS-2 assess social</p>	<p>between groups and the entry assessments for the effectiveness of WSEP on aquatic skills. Overall, results had shown the WSEP improved the aquatic skills in four out of five stages. It had also decreased the total antisocial behavior problems in the participants. The majority of the scores the results showed were not different between the two groups of children. The WSEP showed sustainability for at least 10 weeks by the non-statistically significant difference between T2 and T3. Participant number 7 of</p>	
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					competence and antisocial behaviors. Each score was converted into a t-score and a percentile.	group A had made the most progress on the aquatics skills improving from a 40.63 to a 93.75. The WSEP enables individuals to develop physical skills within this intervention process and enhances behavioral and social skills for the future.	
Swim	Pushkarenko, K., Reid, G., Smith, V.	Effects of enhanced structure in an aquatics environment for three boys with autism spectrum disorders: A pilot study	Pushkarenko, K., Reid, G., Smith, V. (2016). Effects of enhanced structure in an aquatics environment for three boys with autism spectrum disorders: A pilot study. <i>Journal on Developmental Disabilities</i> , 22, 2	The purpose of the pilot study was to examine the effects of pictographic activity schedule implementation within a structured aquatic environment for individuals diagnosed with autism spectrum disorder (ASD).	The participants of this study included 3 boys diagnosed with autism ranging from 11-16 years old. The criteria for the participants to be accepted was to have observations for consistent behaviors, formal assessment with CARS, and a formal assessment with the PEP-R. This study occurred in an aquatic training pool where the individuals	All sessions in this study were video recorded. The data which were collected for the independent and dependent variable were coded using a version of ALT-PE systematic observation where behaviors were scored in 6-second intervals. The baseline mean percentage for the individuals were 11.2%,	R4

				<p>participated in a weekly aquatics program prior to the study. The study had take place over a 13-week period, each session consisted of one swimming lesson lasting 30-40 minutes.</p> <p>These sessions included warm-up activities, skill instruction, and free play to end the session. Three intervention materials were used within the environment, colored pictures placed in order on a piece of paper. The first schedule, included pictures on the individual's schedules, the second consisted of an extension to the warm-up activities noted on a larger schedule and the third was set up in the form of a work system. A/B/A was used to assess the</p>	<p>12.2% and 10.0%, while over the duration of the intervention values had dropped to 5.1%, 3.1% and 3.0%. However the individuals engaged in appropriate behavior 8.5%, 2.3% and one individual showed none. Over the course of the intervention the pictures produced a reduced mean of 23.6%, 12.9% and 13.9%. Overall the results had shown the implementation of activity schedules positively influenced behavior as the IRT was reduced. Two of the participants demonstrated reductions in inappropriate</p>	
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					effects of the structured activity schedules on inappropriate behavior. Pre-baseline assessments were based on the experience of schedule-use in their regular classes. The baseline data of the aquatics lesson was a teacher performing a single demonstration along with a verbal instruction. The intervention was the 3 different types of schedules which were used throughout the course of the study.	behavior compared to the third participant who increased inappropriate behavior.	
Swim	Vonder Hulls, D., Walker, L. & Powell, J.	Clinicians' Perceptions of the Benefits of Aquatic Therapy for Young Children with Autism: A Preliminary Study	Vonder Hulls, D., Walker, L. & Powell, J. (2006). Clinicians' Perceptions of the Benefits of Aquatic Therapy for Young Children with Autism: A Preliminary	The purpose of this study was to identify clinicians' perceptions of the benefits of aquatic therapy for young children with autism.	The population of this study was occupational therapists who have used aquatic therapy for at least one month to treat young individuals ages 4-10 with autism. 78 potential participants were	Only 48 out of 78 of the surveys were returned.30/28 aquatic therapists who did answer the survey did not treat children with autism between the ages of 4-10.	<p>“The most frequently reported benefits from the perspective of the clinicians ranged from improved performance in underlying skills at the body function level to increased social participation in water activities as a family.”</p> <p>“This preliminary study provides a foundation for further research on the effectiveness of aquatic therapy for children with autism by helping identify the outcomes of interest for those research efforts.”</p>

			<p>Study. <i>Physical & Occupational Therapy in Pediatrics</i>, 26(1/2). Doi: 10.1300/joo6v26n01_03</p>	<p>selected from around the U.S. This study had developed a mailing survey based on a literature review and interviews with local therapists. The interviews were focused on identifying benefits of aquatic therapy for children with ASD and parent perspectives of aquatic therapy. The survey consisted of 3 different sections, section 1 was determining the eligibility for the survey. Section 2 was four open ended questions relating to the ages of children, length, duration, and frequency of aquatic therapy sessions. The third section consisted of 24 questions relating to the therapists perceived outcomes of aquatic therapy.</p>	<p>Only 18 aquatic therapists provided aquatic therapy services to young children with ASD. According to the survey the median length of the sessions was 45 minutes, range was 30 minutes to an hour. The median of the aquatic therapy sessions performed per month was only 4, the range was 1 to 8 sessions. The duration of the therapy sessions varied greatly among the therapists, the shortest duration was 3 months and the longest was 2 years. The majority of the therapists concluded a substantial increase in 7 different outcomes;</p>	
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					<p>The respondents answered the first 21 questions using a 5 point Likert scale to rate change in performance.</p>	<p>performing swim skills (72%), concentrating (67%), balance (61%), muscle strength (61%), tolerating touch (61%), initiating and maintain eye contact (56%) and demonstrating water safety (56%). *3% of the therapists had felt children performed less self-stimulating behaviors and 89% reported that families had participated in more water activities and 100% loved the aquatic therapy sessions. In the open-ended questions, the following were showing substantial increase: toleration of supine position, upper extremity</p>
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						movement, bilateral coordination, gravitational security, motor modulation, appropriate input, lip closure, blowing air, body awareness, motivation, transitions, impulse control, risk taking, and more.	
Yoga	Rosenblatt, L., Gorantla, S., Torres, J., Yarmush, R., Rao, S., Park, E., Denninger, J., Benson, H., Fricchione, G., Bernstein, B. & Levine, J.	Relaxation Response-Based Yoga Improves Functioning in Young Children with Autism: A Pilot Study	Rosenblatt, L., Gorantla, S., Torres, J., Yarmush, R., Rao, S., Park, E., Denninger, J., Benson, H., Fricchione, G., Bernstein, B. & Levine, J. (2011). Relaxation Response-Based Yoga Improves Functioning in Young Children with Autism: A Pilot Study. <i>The Journal of Alternative and Complementary Medicine</i> , 17(11),1029-	The purpose of this study is to develop and objectively assess the therapeutic effect of a novel movement-based complementary and alternative medicine approach for children with ASD.	The participants of this study were enrolled after being referred from being diagnosed with ASD ages 3-13 and responses to a list serve notifying parents of children with a diagnosis of ASD. Of the 33 participants chosen only 24 had completed the study. The participants were between ages 3.6 and 16.5 years, consisting of 22 males and 2 females. Written	The BASC-2 scale was used for measurement which has nine subscales that examine, aggressions, anxiety, attention problems, atypicality, conduct problems, depression, hyperactivity, somatization and withdrawal. Another measurement used was the ABC checklist.	<p>“In future studies, we hope to examine whether modifying these components of the intervention would render it more accessible to younger and older patients with ASD.”</p> <p>“The results of this pilot study suggest a positive impact of a multimodal relaxation program on behavioral and cognitive symptoms in BASC-2.”</p> <p>“Future studies should therefore be designed to identify whether specific treatment factor account for such individual differences in the response.”</p> <p>Research Question: R4</p>

			1035. Doi: 10.1089/acm.20 10.0834		<p>consent forms were needed form all parents of the participants and the treatments groups consisted of only 2-5 children. This study consisted of right treatment sessions lasting roughly 45 minutes, there was an initial orientation and a pretesting session. Along with a final summary and post-testing session. Each session had the same format to create predictability, familiarity and reduce anxiety. The sessions went in a sequence order consisting of breathing exercises, yoga postures, music and dance and yoga relaxation. This study had used pinwheels and bubbles to help the participants experience their</p>	<p>The results of these two measurements were analyzed using the paired t-test between pre- and post test scores. A Bonferroni correction was used to examine nonplanned analysis and to maintain and error rate. The results of the BASC-2 showed improvements in BSI, externalization and atypicality. The overall subscales for the ABC scale had no changes. The BASC-2 scales considered alone, latency-age showed greater post-treatment changes then the combined ABC plus BASC-2 scores. For the entire study</p>	
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					breath. By week 8, most children were able to perform 18 different postures.	results showed only the BASC-2 BSI composite scales post-treatment change in the expected direction.	
Dance	Arzoglou, D., Tsimaras, V., Kotsikas, G., Fotiadou, E., Sidiropoulou, M., Proios, M. & Bassa, E.	The effect of a traditional dance training program on neuromuscular coordination of individuals with autism.	Arzoglou, D., Tsimaras, V., Kotsikas, G., Sidiropoulou, M., Proios, M. & Bassa, E. (2013). The effect of a traditional dance training program on neuromuscular coordination of individuals with autism. <i>Journal of Physical Education and Sport</i> , 13(4), 563-569. Doi: 10.7752/jpes.2013.04088.	The purpose of this study was to evaluate the effect of a structured program of traditional dances on neuromuscular coordination of individuals with autism.	This study consisted of 10 participants who are enrolled in special education in the local schools. The participants were divided into 2 groups, one intervention and one control group. All the participants in this study were healthy, didn't have sensory or orthopedic problems and can understand visual and verbal instructions. There were no significant differences between age, height, BM or BMI between the two groups. The neuromuscular coordination was assessed using the	The data analysis used for the data collected was SPSS 20. The calculation of averages and standard deviation were used along with and ANOVA of 2x2. The significance of differences was tested with the post-hoc and the level of significance was $p < .05$. The results of this study had shown no significant effect of the balance when walking backwards, a significant interaction between IV and both	Research Question: R3 "In this study, the improved neuromuscular coordination of individuals with autism showed that if an intervention program focused on improving motor control, people with autism are able to respond successfully, finding that confirms similar findings from previous studies."

				<p>KTK which is a quantitative test used to diagnosis neuromuscular coordination for the entire body. Specifically, walking backwards, jumping on one foot, jumping sideways, sideways movement and repositioning was evaluated using this type of instrument. In between the tests the participants were allowed and 3-5 minute break. The measurements were taken before and after the implementation of the intervention program, consisting of traditional Greek dances. The program was eight weeks long with 3 sessions a week for 35-45 minutes each session. The sessions consisted of a 5-minute</p>	<p>groups. The post-hoc analysis had shown a significant difference was found in balance when walking backwards for IG but not CG. There was no significant difference for the one leg but there was for lateral movement reposition. The IG group had a significant improvement in overall score compared to the score of the initial measurements while, CG had no significant differences. Overall Greek traditional dances have improved the participants neuromuscular coordination, dance is an important factor for improving</p>	
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					warm-up, 5 minute rhythm exercise, main part was 15-25 minutes and there was a break between dances for 5 minutes and at the end the participants could dance freely for 5 minutes.	kinetic development of individuals with ASD.	
Dance	Hildebrandt, M., Koch, S. & Fuchs, T.	“We dance and find each other”: Effects of dance/movement therapy on negative symptoms in autisms spectrum disorder.	Hildebrandt, M., Koch, S. & Fuchs, T. (2016). “We dance and find each other”: Effects of dance/movement therapy on negative symptoms in autisms spectrum disorder. <i>Behavioral Sciences</i> , 6, 24, doi: 10.3390/bs6040024	The aim of this study at hand is to examine the effect of this therapy on NS in participants with ASD. A double-blind, two factorial design comprising the factors group and time was applied.	The participants of this study were recruited from three rehab facilities, the inclusion criteria were German as native language, between 14-65 years old and diagnosed with ASD. A total of 78 participants were included in this study, participants in the treatment group received 10 weekly sessions, lasting roughly 60 minutes each of dance therapy and the participants in the control group continued with their individual routine. The sessions consisted of mirroring	The data collected was measured and analyzed through ANOVA, which was applied to test the differences in the change of SANS-scores with group as between-subject factor and time. RM-ANOVAS were used for the SANS total score and for each subscore. The results of this study had shown SANS total scores ranged from 2-83 on a scale from 0-120 indicating	<p>“This study at hand provides encouraging results and coincides with the benefits of dance movement therapy as described in some case studies, for example, the increase of empathy and self-awareness in children with ASD.”</p> <p>“The effect found in this study was significant at the 0.10 level, however, we observed an overall trend toward a stronger symptom reduction in almost all subtypes of NS and a small, yet clinically substantial effect size, equaling 15.27% of symptom reduction in overall NS.”</p>

				<p>exercises and one verbal element. The sessions were 10 minutes of Chace-circle, 15-20 minutes of dyadic mirroring, 20 minutes of Baum-circle and 10-15 minutes of verbal processing. The verbal data was not collected nor analyzed. Demographic data was assessed in the beginning of the study and data was collected using the Scale for the Assessment of Negative Symptoms. This assessment has 24 items divided into 5 sections, blunted affect, alogia, abulia, anhedonia and diminished attention.</p>	<p>“normal” to “severely ill.” There were no significant baseline differences between groups. The measures of time and group through ANOVA of the total SANS score had shown a significant interaction on the significant level of .01. Overall negative symptoms were greater in the treatment group, yet effect was only significant at the .01 level.</p>	
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