

The Effects of Physical Activity on Inappropriate Behaviors of School-Aged Students with
Autism Spectrum Disorders

A Synthesis of the Research Literature

A Synthesis Project

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Abstract

The purpose of this synthesis was to examine the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders. Inappropriate behaviors can include: hitting, biting, screaming, kicking and swearing. In particular the following research questions were examined: What types of inappropriate behaviors are exhibited by students with Autism Spectrum Disorder during physical activity? Does physical activity help to eliminate or reduce inappropriate behaviors of students with Autism Spectrum Disorder during physical activity? Which forms of physical activity have demonstrated the most effective ways to eliminate or reduce inappropriate behaviors of students with Autism Spectrum Disorder? Results indicated that school-aged students with Autism Spectrum Disorder have less stereotypical behaviors when they are in instructional based physical activity settings that are tailored to their specific needs.

Chapter 1 – Introduction

There are a number of different disabilities that school aged children can have. Autism Spectrum Disorder is one of the many they can have. Autism Spectrum Disorder (ASD) is a disorder that effects the development of the brain. It is characterized as restrictive and repetitive behaviors that cause impairments to interacting or engaging with others. School aged children with Autism Spectrum Disorder (ASD) have barriers that make participating in physical activity more challenging (Must et al., 2015). Examples of behaviors that may be exhibited by students include hitting, biting, throwing, swearing or other behaviors like that. There are many forms of physical activity that school aged children with Autism can become involved in. Aquatics is a form of physical activity performed in water that children with (ASD) can participate in successfully (Aleksandrovic et al., 2015). High intensity physical activity is another form of physical activity that can contribute to either inappropriate or appropriate behaviors (Magnusson, Cobham, &McLeod 2012). Dependent upon the child's disabilities, different adaptations are necessary in order to ensure the child's success in physical activity (Antoanela, Cristian, & Adrian 2014). This is because every child with or without autism needs individualized instruction to contribute to physical activity abilities.

Statement of the Problem

As stated previously there are multiple forms of physical activity that children with ASD can participate in Children with ASD and other developmental disabilities face more barriers in physical activity than children without. This makes physical activity both structured and structured more difficult for children with ASD (Must et al., 2015). The behaviors demonstrated tend to be yelling, screaming, physical aggression (biting kicking) (Nicholas et al., 2019). In

terms of physical activity that could become a trigger for students with ASD are activities in the pool like swimming, or activities in the gymnasium like structured sports or jogging, and ball sports (Lee, Porretta 2016).

Research Question (s) (heading)

1. What types of inappropriate behaviors are exhibited by students with Autism Spectrum Disorder during physical activity?
2. Does physical activity help to eliminate or reduce inappropriate behaviors of students with Autism Spectrum Disorder during physical activity?
3. Which forms of physical activity have demonstrated the most effective ways to eliminate or reduce inappropriate behaviors of students with Autism Spectrum Disorder?

Purpose of the Study (heading)

The purpose of this synthesis project is to review the literature on the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders.

Operational Definitions (heading)

1. Autism Spectrum Disorder: Autism spectrum disorder is a disorder that effects the development of the brain. It is characterized as restrictive and repetitive behaviors that cause impairments to interacting or engaging with others.
- 2.) Physical Activity: Forms of movement that students engage in during physical education or recreationally such as running, or throwing.
- 3.) Behavior: The way in which one acts or conducts oneself.

3a.) Inappropriate: Behaviors that have a negative impact on self or other including such things as biting, screaming, hitting.

4.) School-Aged Students: Students who are in grades K-12

Delimitations

- 1.) All article reviews that were written within the past 10 years (2010-2019)
- 2.) All articles related to the effects on physical activity
- 3.) All articles are related to behaviors of children with autism
- 4.) All articles are related to school aged children
- 5.) All articles were peer reviewed and full text

Chapter 2 – Methods

The purpose of this chapter is to review the methods used to review the literature on the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders. The studies collected for this synthesis were located using the EBSCO database from The College at Brockport's Drake Library. Within the EBSCO database the following databases were searched: SPORTDiscus and Academic Search Complete. Within these databases a total number of 10 articles met the criteria for inclusion as part of the critical mass within this literature review. In order for an article to meet the criteria for selection in this synthesis it must have been published between 2009-present, this will provide the synthesis with the most up to date and current information available. Other criteria for selection included scholarly and peer reviewed articles that were full-text. Having scholarly and peer reviewed articles provides more validity within the articles and better overall quality. Other articles or sources selected as part of this literature review provided context about the topic, background information and supplemental information to complete the review. All articles and sources are appropriately cited in the reference section of this paper.

In order to gather valuable articles for this synthesis certain keywords and phrases were used when searching the data-base. The first keywords searched were "Autism Spectrum disorder, Behaviors, and Physical Activity" that resulted in 33 number of hits . The words Autism spectrum disorder was used because that is the main component of the synthesis project. The individuals the data is based on is students with ASD. When just that word is searched it resulted in 259 hits. When ASD and physical activity was searched, it resulted in 88 hits. Physical activity is a key word because that is what the students will be doing when the research

was taken place. When Behaviors were into the search, 33 hits were the number of results which was acceptable to find articles.

Articles that were selected for use in this synthesis were scholarly and peer reviewed articles that were full-text. Also when selecting articles for use in this synthesis it was important that each article selected had valuable information related to the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders.

Specific criteria were used in order to be a part of the literature review. All of the articles selected were based on the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders. Participants in the studies reviewed were school aged students who had Autism Spectrum Disorder.

For this synthesis a total number of 10 articles were used to compile data on the topic of the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders.. Articles came from a variety of journals including Palaestra, Journal of Exercise Physiology online Arena, Adapted Physical Activity Quarterly, Journal of Developmental and Physical Disabilities, and Journal of Physical Activity and Health.

The critical mass for this synthesis is comprised of 195 participants. Within the 10 articles used for the literature review there was a total of 26 males identified, and 6 females identified (the rest were not identified as male or females for the studies

Data were analyzed using the following methodologies for the studies under review. Single interventions physical exercise, Likert scale survey, Differential Abilities scale, Semi structured interviews, questionnaires, physical fitness tests, and cognitive written assessments were used for the studies.

Chapter 3

Review of Literature

The purpose of this chapter is to present a review of literature on the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders. In particular the following topics will be reviewed: physical activity programs for students with autism spectrum disorder; barriers to physical activity programs for students with autism spectrum disorder, play based physical activity programs, and instructional physical activity programs for students with autism spectrum disorder.

Physical Activity Programs for Students with Autism Spectrum Disorder

Lee, Porretta (2016) examined the effect of instructional versus free play on the behaviors of males with Autism Spectrum Disorder (ASD). There are multiple types of physical activities and programs for students with ASD. Researchers discuss walking, jogging, ball-playing and aquatics are just a few different forms of physical activity that can be done by children with Autism Spectrum Disorder. This study consisted of 2 participants who were both males. Both of the participants were 8-years old who had ASD with severe stereotypic behaviors. Some of the stereotypic behaviors included: tapping an object, bumping objects at mouth, bouncing, stomping spinning, licking and rubbing. This study took place both in a pool and in a gymnasium, where both free play and instruction occurred in each setting. During the free play sessions both participants had unlimited access to the equipment and no instruction was given at all in either the pool or in the gymnasium. Free play served as a baseline for the data collection both in the pool and in the gymnasium. During instructional play in the pool, the participants were asked to do different swimming skills such as kicking, blowing bubbles and back floats. In the gymnasium during instructional play, the participants were asked to demonstrate different skills

such as jumping. When they performed the skill correctly they were then praised for it. All sessions were videotaped and then coded by two trained coders using timed intervals. During the study there were more occurrences of stereotypic behaviors during free play than during instructional play. This study results concluded that instruction is an important source of decreasing stereotypic behaviors in males with ASD. Having structured environments also can help to reduce the amount of stereotypic behaviors for students with ASD. The results of this study suggest that students with ASD have less amounts of stereotypic behaviors during physical activity when the activity is structured and there are set expectations for the activity.

Instructional Physical Activity Programs for students with Autism Spectrum Disorder

Alternatively, this next study only focused on one type of physical activity setting (instructional physical activity programs) instead of two. Magnusson, Cobham, and McLeod (2012), examined if instructional programs that were individually tailored and high intensity would have a positive effect of the physical fitness and behaviors of school aged children with ASD. For this study there were 6 participants who were between the ages of 9-15 years old. Out of the 6 participants 4 were males and 2 were females who have Autism Spectrum Disorder. These participants had good receptive language, sufficient motors skills, and had good health to endure this study. For this study the parents of the students had to complete an extensive questionnaire regarding their child's health, triggers, physical activity frequencies and behaviors. The parents and child had to have an interview discussing medical and family health history. After the first session which was mostly getting a baseline of height, weight and flexibility, there were a series of 15 more exercise sessions tailored to the physical activity needs of the specific child with ASD. This study concluded that there was an overall improvement of the physical fitness levels of the children. It was also concluded that there was an increase in the amount of

positive behavior as well. The negative behaviors only slightly decreased during this study from beginning of the study to the end of the study. The results from this study suggest that an exercise program that is tailored to the needs of the specific child improves physical fitness and behavioral outcomes for school aged children with ASD. It also suggests that the type of exercise program they are participating in can be beneficial to school aged students with Autism Spectrum Disorder.

Clapham et al., (2018) conducted a study which evaluated the effectiveness of an extended surf intervention program which took place over 6 years for a duration of 8 weeks during summers for children with ASD. There was only one participant for this study and it was a 12-year-old male with ASD. This participant was also diagnosed with Pervasive developmental disorder -Not otherwise specified. For this study there was a pre and post fitness test administered. The Brockport Physical Fitness test was used for this study. The same series of tests were administered to the participant for 6 consecutive summers. The test that were used for this study tested were grip strength, sit and reach, curl ups, push-ups, pacer test and Body Mass Index (BMI). The mother of the participant was also part of this study in answering open ended questions based on how she viewed the participant and the results of the study. This study concluded that the participant showed improvements in the participant's behaviors, his confidence levels, and balancing skills. The mother reported that his preferred form of exercise was swimming and she liked that this surfing program was more than just swimming for her son. each year at the end of the surfing intervention. This study did show that from one year to the next, the results of the pre-test did not always increase (in some years it was lower than previously or some years it stayed the same). In the results of the pre-test to the post- test in the same summer, there were more occurrences of an increase in score. It can be concluded, based

on the results from this study, that a surfing intervention program is effective in improving fitness in a school aged child with ASD when it is consistent for the child during a duration of time. When there is a time when the program is not occurring the gains from this form of exercise will start to decrease. It was also reported that there were behavioral improvements as a result to this intervention program.

Similarly, Nakutin and Gutierre (2019) examined the effects of physical activity on academic engagement and executive functioning in children with ASD. The participants for this study were three students (2 male and 1 female) that were ages 6 and 7 years old with ASD. In order to participate in this study, the students need to be able to complete moderate exercise and have reported low academic engagement from their teacher in the classroom. To collect data for this study the students were observed in their classroom for 15 minutes using 15 second time samples. A checklist was created by the researchers as a way to measure the physical activity treatment. The Behavioral Observation of Students in Schools was used as a way to observe their behaviors. Not all of the participants were given the condition of physical exercise for this study at the same time. One participant would receive the condition and then once comfortable the next participant would receive the intervention, followed by the last student in a staggered fashion. The results from this study found that overall that there was an increase in the total amount of academic engagement time as a result of participation in the physical activity intervention. Physical activity was not found to have an effect on the executive functioning in the participants which would be the behavior exhibited by the participants. Although the physical activity increases the amount of academic engagement time for all of the participants, it did not correlate directly with the cognitive side of the behaviors such as the executive functioning in children with ASD.

Lee, Vargo, and Porretta (2018) conducted a study that examined the effects of two types of physical activities on stereotypic behaviors and task engagement on children with ASD. The two types of physical activities used in this study were locomotor movements and object manipulation. The participants for this study were three males that were all diagnosed with ASD. The participants were between the ages of 3-6 years' old who had some similar stereotypic behaviors. For this study a preference assessment was conducted to each of the students to determine what items the individuals engaged with. A functional analysis was used to identify the stereotypic behaviors exhibited by the participants of this study. Physical activity intervention was used as a way to test both the locomotor and object manipulation conditions. Lastly a questionnaire with a Likert Scale was given as a way to evaluate the findings of this study. This study concluded that all of the participants engaged in lower percentages of stereotypic behaviors after participating in locomotor activities compared to when participating in object manipulation activities. This is comparing the post-assessment to the pre-assessment of each condition (locomotor activities, or object manipulation activities). This study found that there was an increase of stereotypic behaviors during the object manipulation sessions in the post sessions compared to the pre-physical activity sessions. The data showed that when behaviors decreased more during locomotor activities over object manipulation sessions.

In addition, MacDonald, Lord, and Ulrich (2013) investigated whether the functional motor skills in children with ASD would have better social communicative skills. For this study there was a total of 35 participants who were between the ages of 6-15 years old. All of the students in this study had Autism Spectrum Disorder. For this study there were 25 male participants and 10 female participants. The Test of Gross Motor Development (TGMD-2) was used to test the motor skill development for both locomotor skills and object-control skills. The

Intelligence scales were used to test the participants IQ levels. To measure the participants social skills the teachers completed Rating scales and Social Skills Improvement System. The findings from this study do not fully portray the hypothesis of the study stating that the children with better motor skills have better social skills.

Aleksandrovic et al., (2015), looked at the effects of an aquatic activity on physical fitness skills in children with ASD. This study used a systematic review on how aquatics can be an instructional physical activity program for children with ASD. This study concluded that aquatic skills and aquatic programs that are 10 weeks long can be effective in improving the skills and physical activity in children with ASD.

Play Based Physical Activity Programs for students with Autism Spectrum Disorder

Bingham et al., (2012) examined whether children with special needs achieve the recommended physical activity guidelines and to determine if physical activity levels were different amount different disabilities. There were 29 participants in this study that were diagnosed with either Autism, Behavioral and Emotional Disorders, or other Health Impaired. The participants for this study were 27 males and 2 females that were between the ages of 8-17 years old. For this study, physical activity was measured every 5 seconds for 7 days using an ActiGraph Accelerometer worn on the participants hip. Only 16 of the 29 participants actually wore the accelerometer for this study. The System for Observing Children's Activity and Relationships during play was used to examine the participant during play. The results from this study showed that out of 29 participants with different disabilities, only 3 met the physical activity requirement and none of the students with ASD met the criteria. For the interactions (behavior) portion of this study, the participants with Autism did not have interactions with other

people during play. The results concluded the participants with Autism tended to play sedentary games and did not interact much with their peers during recess.

Additionally, Ikononi, and Mema (2018) conducted a study to examine the identification of the activities and interest of children with ASD. There were 10 participants in this study between the ages of 6-9 years old. There were 7 male participants and 3 female participants in this study. To collect data for this study researchers used semi-structured interview with open-ended questions to the parents of the participants with ASD. The results suggests that children with ASD are limited in their activities and their interests. They are more likely to play with something that is inside of their house than if it is an outside activity. Children with ASD find it difficult to follow out instructions of the task they are given therefore they do not follow through with this the instructions. Behaviors of the child plays a role in what activities are selected. If they are moving or crying or seeing something that they want, the activity could change. The data showed that children with ASD were not likely to get involved in an activity or engage with other people. If it involves other people they are not likely to participate in the activity.

In addition, MacDonald, Hatfield, and Twardzik (2017), conducted a research study that aimed to examine the behaviors of children with and without ASD in 2 different play settings. There were 18 participants for this study (9 with ASD and 9 who were typically developing children). There was a total of 15 males and 3 females that participated. There were four rating scales that were used for the parents of the participants; child behaviors of engagement of parent, child sustained attention, child aggressive behaviors, and mutuality/connectedness. All of the scales used were 7-point scales where 1 is very low and 7 is very high. A two-person coding team coded all of the results from this study. The results suggested that children never displayed a very low attention for either play setting. The results of this study indicate that children with

Autism Spectrum Disorder performed more like their peers without Autism Spectrum Disorder in a social-play setting rather than a motor-based play setting. The participants with ASD performed less like their peers when they were in a motor-based-behavior play setting.

Barriers to Physical Activity Programs for Students with Autism Spectrum Disorder

Alternatively, Memari et al., (2015) examined the patterns and the barriers of participation of children with ASD in daily physical and play activities. There was a total of 83 participants for this study (52 males and 31 females). The participants for this research study were between the ages of 6-15 years old. Physical activity involvement during down time was measured using a modified checklist from the Godin-Shephard Leisure Time Questionnaire. This was an oral checklist that was asked over a 7-day period. Since the participants had a hard time with the self-report, parents or caregivers responded for the participants. The teachers were also asked how often the participants engaged in physical activity during the school day. The parents also had to rate how often their child engaged in any regular physical activity where they work up a sweat. The rating scale consisted of the following: often, sometimes, or never/rarely. To assess the barriers of physical activity of children with ASD, the parents or guardians of the participants were asked to specify the barriers to participation in leisure physical activities that they felt their child with ASD faced. The results show that only 10 of the students (12%) were active. This also means that 88% of the students with ASD were shown inactive all together. Only 6% of the participants stated that they “often” participate in physical activity. There were a significant number of barriers that the parents of the participants mentioned. Financial burden and lack of opportunities for their children with ASD were two of the leading barriers to physical activity programs for students with ASD. With opportunities being a barrier for physical activity,

it was stated that low-income families struggle to have access to local parks and transportation and social support.

Similarly, Must et al., (2015) examined the barriers to physical activity in children with ASD. This study aimed to show the relationship to physical activity and the amount of screen time the child had. There were 111 participants in this study (58 typically developing children and 53 children with Autism Spectrum Disorder). The gender of the participants was not specified in this research study. To assess the barriers to physical activity, parents of the participants completed a questionnaire regarding perceived barriers for their child. There were three categories of barriers that the study focused on including: child/family barriers, Social barriers, and community barriers. The parents were also asked to answer a questionnaire in regards to how often their child is in front of a screen such as a television, video games, or computer time (including homework on computer). The results demonstrated from this research study show that there was a meaningful difference in the number of child/family, social and community barriers to physical activity between children with ASD and typically developing children. Every barrier category and sub topic that was reported had a higher number of parents of children with ASD than parents of children who are typically developing. There were 51% of parents of children with ASD that stated 6 or more barriers to physical activity. Parents of children who are typically developing did not report even close to that number of barriers to physical activity for their children. There was 85% of parents of children that had Autism Spectrum Disorder who reported at least 2 child/family barriers to physical activity. For the parents with children with ASD, it is reported that for child/family barriers, poor motor skills, behaviors of the child, learning problems, and need for supervision all came up as main barriers

from this study. There were a couple similarities that were found which included family time constraints, lack of transportation, and neighborhood safety.

Summary

The purpose of this chapter was to present a review of literature on the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders.

The literature that was reviewed gave insight into physical activity programs for students with ASD both that had instructional based and play based programs. The research articles that were reviewed also gave insight into the different barriers that students with Autism Spectrum disorder face in regards to being physically active.

Chapter 4

Results, Discussion, and Recommendations for Future Research

The purpose of this chapter is to present the results of the review of literature on the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders and how these results align with the research questions which guided this synthesis project. In addition, recommendations for future research as it relates to this topic presented.

The results of the review of literature revealed that overall school-aged students with Autism Spectrum Disorder display less stereotypic behaviors when their physical activity is more instructional based than if it is play based physical activity. School-aged students with ASD are also less likely to display stereotypic behaviors if the physical activity they are participating in is a preferred type of physical activity. For example, if the child prefers locomotor activities over object control activities, the child will display more stereotypic behaviors during the object control activities. Deficits in motor skills, sedentary behavior and obesity, social and behavior deficit, parental concerns and lack of opportunities of programs are all barriers to physical activity for children with ASD.

Discussion

Interpretations

As part of this literature review, several research questions were posed. The first research question, what types of inappropriate behaviors are exhibited by students with Autism Spectrum Disorder during physical activity? This question investigated what stereotypic behaviors we displayed the most during physical activity. Hitting, biting, throwing, and swearing were the

most common forms of stereotypic behaviors displayed by individuals with Autism Spectrum Disorder (Must et al., 2015). These research questions focus on inappropriate behaviors and are in line with the findings from the research articles. The second research question, does physical activity help to eliminate or reduce inappropriate behaviors of students with Autism Spectrum Disorder during physical activity? From the research articles used in this project a common finding was that if the form of physical activity is preferred by the specific individual, there is a reduced or eliminated amount of inappropriate behaviors from the student (Lee, Vargo, and Porretta 2018). This was a commonality found in multiple research articles. In an activity that is less preferred contrary to the findings from the preferred activity, there is more inappropriate behaviors displayed by the student with ASD. The third research question stated, which forms of physical activity have demonstrated the most effective ways to eliminate or reduce inappropriate behaviors of students with Autism Spectrum Disorder? This was a common question for this synthesis project. School-aged children with ASD are less likely to display inappropriate or stereotypic behaviors if the type of physical activity is instructional based rather than play based. This finding is across the setting of where the physical activity is taking place both in the gymnasium or in the pool.

Implications

The conclusions from this synthesis project agree with previous research in the effects of physical activity on the behaviors of school-aged students with ASD. The conclusions from this research adds to previous research because it focuses in on the type of physical activity. This research compared instructional based play and free based play for physical activity for students with ASD. The research concludes that the amount of inappropriate or stereotypic behaviors are decreased when the physical activity is instructional rather than play. This might be surprising to

some physical educators who see stereotypic behaviors in their students with ASD during physical education. The findings from this research confirm the findings from previously existing theories. Physical activity can decrease the inappropriate behaviors in school-aged children with Autism Spectrum Disorder. The type of physical activity is a big factor in decreasing the frequency of inappropriate behaviors.

Recommendations for Future Research

In reviewing the data base on the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders, the following limitations were noted in regarding the studies under review. There duration of interventions were too short of periods, when taking baseline data, the researchers do not know what the participants did prior to coming in for the study, the differences between the participant was not controlled. Based on these limitations and other insights related to the literature the following recommendations for future research should be considered:

1. A research study that is conducted over a entire year where the participants are not starting and stopping the intervention.
2. Controlling what the participants are participating in prior to coming in for the baseline data (having them all do the same activity prior).
3. Have participants with all of the same background such as economical background, physical ability, behaviors, interests, learning styles.

Summary

The purpose of this literature review was to determine the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders. Delimiting

variables were used to do an exhaustive data-based search which yielded 11 number of articles. These articles were then systematically used to determine the effects of physical activity on inappropriate behaviors of school-aged students with Autism Spectrum Disorders. Research revealed that instruction based physical activity that is preferred for school-aged students with Autism Spectrum Disorder will decrease the amount of inappropriate or stereotypic behaviors

References

- Aleksandrovic, M., Jorgic, B., Block, M., & Jovanovic, L. (2015). The Effects of Aquatic Activities on Physical Fitness and Aquatic Skills in Children with Autism Spectrum Disorders: A Systematic Review. / Efekti Aktivnosti U Vodi Na Fizički Fitnes I Plivačke Sposobnosti Kod Dece Sa Peremećajima Iz Autističnog Spektra: Sistematsko Pregledno Istraživanje. *Facta Universitatis: Series Physical Education & Sport*, 13(3), 351–362.
- Antoanela, O., Cristian, P., & Adrian, G. (2014). Physical Activity at Children with Autism. *Ovidius University Annals, Series Physical Education & Sport/Science, Movement & Health*, 531–537.
- Bingham, D. D., Boddy, L. M., Ridgers, N. D., & Stratton, G. (2015). The Physical Activity Levels and Play Behaviours of Children with Special Needs: An Exploratory Cross-sectional Study. *Archives of Exercise in Health & Disease*, 5(1/2), 359–365.
- Bridges, D., McClain, Z., Bridges, E., Seo Hee Lee, & Frankl, D. (2015). Perceptions of Asian Parents of Children with Disabilities in Western Usa: Implications for Adapted Physical Education Services. *Palaestra*, 29(4), 20–20.
- Clapham, E. D., Minsuk Shim, Lamont, L. S., & Armitano, C. (2018). A Case Report Illustrating the Implementation of a Therapeutic Surfing Intervention for an Adolescent with Autism. *Palaestra*, 32(2), 49–53.
- Ikonomi, E., & Mema, F. (2018). Children and autism. *Arena: Journal of Physical Activities*, 96–104.
- Jihyun Lee, & Porretta, D. L. (2016). The Effect of Instruction on Stereotypic Behaviors of Boys with Autism Spectrum Disorder: A Pilot Study. *Palaestra*, 30(1), 18–22.

- Lee, J., Vargo, K. K., & Porretta, D. L. (2018). An Evaluation of the Effects of Antecedent Exercise Type on Stereotypic Behaviors. *Journal of Developmental & Physical Disabilities*, 30(3), 409–426. <https://doi.org/10.1007/s10882-0189593-1>
- MacDonald, M., Hatfield, B., & Twardzik, E. (2017). Child Behaviors of Young Children With Autism Spectrum Disorder Across Play Settings. *Adapted Physical Activity Quarterly*, 34(1), 19–32.
- MacDonald, M., Lord, C., & Ulrich, D. A. (2013). The Relationship of Motor Skills and Social Communicative Skills in School-Aged Children With Autism Spectrum Disorder. *Adapted Physical Activity Quarterly*, 30(3), 271–282.
- Magnusson, J. E., Cobham, C., & McLeod, R. (2012). Beneficial Effects of Clinical Exercise Rehabilitation for Children and Adolescents with Autism Spectrum Disorder (ASD). *Journal of Exercise Physiology Online*, 15(2), 71–79.
- Memari, A. H., Panahi, N., Ranjbar, E., Moshayedi, P., Shafiei, M., Kordi, R., & Ziaee, V. (2015). Children with Autism Spectrum Disorder and Patterns of Participation in Daily Physical and Play Activities. *Neurology Research International*, 2015, 1–7. <https://doi.org/10.1155/2015/531906>
- Must, A., Phillips, S., Curtin, C., & Bandini, L. G. (2015). Barriers to Physical Activity in Children With Autism Spectrum Disorders: Relationship to Physical Activity and Screen Time. *Journal of Physical Activity & Health*, 12(4), 529–534.
- Nakutin, S. N., Gutierrez, G., & Campbell, J. (2019). Effect of Physical Activity on Academic Engagement and Executive Functioning in Children With ASD. *School Psychology Review*, 48(2), 177–184. <https://doi.org/10.17105/SPR-2017-0124.V4>

Nichols, C., Block, M. E., Bishop, J. C., & McIntire, B. (2019). Physical Activity for Young Adults with ASD: Barriers and Solutions for Caregivers. *Palaestra*, 33(1), 52–57.

Author	Title	Source	Purpose	Methods & Procedures	Analysis	Findings	Discussion/ Recommendations Research Notes – 27 Commonalities/Differences
Bridges, McClain, Bridges, Lee, Frankl	Perceptions of Asian Parents of Children With Disabilities in Western USA: Implications for Adapted Physical Education Services	Palestra	Describe perceptions of disability	Research review	Research Review	Research review	Research Review
Aleksandrovic, Jorgic, Block, Jovanovic	The Effects of Aquatic Activities on Physical Fitness and Aquatic Skills in Children With Autism Spectrum Disorders	Physical education and sport	To provide insight on how aquatics benefits children with ASD	Literature review	Literature review	Literature review	Literature review
Must, Phillips, Curtin, Bandini	Barriers to Physical Activity in Children With Autism Spectrum Disorders:	Journal of physical activity and health	To compare the parent-reported barriers to PA with ASD and for kids without ASD	111 parents of children with and without ASD that are between the ages of 3-11 completed 2	Parents of children with and without ASD completed a questionnaire with their	Presence of numerous barriers to pa in children with ASD and at levels far greater than	Poor motor skills, behavior and learning problems were among the biggest barriers parents of children with ASD reported. We see this as a commonality for children with ASD on why

	Relationship to Physical Activity and Screen Time			questionnaires based on their perceived thoughts on barriers to PA and Screen time	perceived barriers for their child	TD children. Parents reported more barriers for students with ASD than parents of kids without ASD	they are performing lower on motor skill assessments than students without ASD.
Lee, Porretta	The Effect of Instruction on Stereotypic Behaviors of Boys with Autism Spectrum Disorder	Palaestra	Effects of instructional versus free play on stereotypic behaviors.	2 participants with ASD were in free play and instructional simulated situations and it was videotaped and coded	Sessions were videotaped and were coded and then calculated	Instruction is a salient stimulus in decreasing Stereotypic Behavior and individualized and structured instructional environments can reduce SB	Stereotypic behavior was decreased by both participants in the pool compared to in the gymnasium. It is stated that water may have a suppressing effect on behaviors.
MacDonald, Hatfield, Twardzik	Child Behaviors of Young Children with Autism Spectrum Disorder Across Play Settings	Adapted Physical Activity Quarterly	Examine salient children behaviors of young children with and without ASD in 2 distinctly different play settings (traditional social play setting, and motor behavior based)	Children with and without ASD participated in cognitive assessments, and parents or caregivers completed demographic surveys.	First described analyses and bivariate correlations were conducted, then independent tests were conducted.	Statistics revealed that social-play and motor-behaviors settings, children and dyads exhibited a range of behaviors for all scales except negativity	Children with ASD performed worse than their peers in motor behavior play. This was suggested because of the links between motor skills and ASD.

						towards parents	
Lee, Vargo, Porretta	An Evaluation of the Effects of Antecedent Exercise Type On Stereotypic Behaviors	Journal of Developmental and physical disabilities	Examine the effects of two types of physical activities on stereotypic behaviors and task engagement of young children with ASD	3 participants, 3 males with ASD participated in preference assessments and functional analysis.	Preference assessment was conducted to find what item they liked the most. Physical activity intervention included eight locomotor sessions and eight object manipulation sessions.	Participants engaged in lower number of stereotypic behaviors following locomotor activities compared to post physical activity.	There was an increase in levels of stereotypic behavior during post physical activity sessions. It is discussed that this is due to the more which is the more desirable activity (locomotor activities or object miniupulation.
Magnusson, Cobham, McLeod	Beneficial Effects of Clinical Exercise Rehabilitation for Children and Adolescents with Autism Spectrum Disorder	Journal of Exercise Physiology online	Investigate if an individually tailored, high internist exercise program would have a positive effect on the physical fitness and behaviors of children with ASD	6 students with ASD, 4 males, 2 females, completed physical exercise tests as well as interviews and their parents completed questionnaires	Parent or guardian questionnaire based on their child with ASD. Interviews about the child with ASD, and Physical exercise test was administered.	High- intensity exercise programs for kids with ASD is a more effective way to improve behaviors of ASD and health variables.	The article discusses the relationship of physical activity and how it may help to enhance positive behaviors and prevent the occurrence of problematic behaviors for children with ASD.
Nakutin, Gutierrez	Effect of Physical Activity on	School Psychology news review	Investigate 3 research questions”	3 participants with ASD, 2 males and 1	Observation for baseline of data, 1	An increase in percentage of total AET	Exercise increased as academic engagement in students with ASD in an

	Academic Engagement and Executive functioning in Children with ASD		Does PA improve academic engagement in school settings in children with ASD, Does PA improve EF for children with ASD, Do school staff members perceive PA to be a safe and effective intervention	female ages 6-7 were observed in the gym during physical education	individual began PA intervention while the others were not changed. Visual analysis was used to decipher the graphs of the study.	across three participants. Pa was increased of active engagement time in all three participants.	elementary school setting. This particular study focused on finding that Physical activity as an intervention to increase desirable behaviors and it was supported.
Antoanela, Cristian, Adrian	Physical Activity At Children With Autism	Series physical education and Sport/Science, Movement and Health	Describe important aspects of specific behaviors related to physical activity and therapeutic intervention	Literature Review	Literature Review	Literature Review	Literature Review
Nicholas, Bishop, Block, McIntire	Physical Activity for Young Adults with ASD: Barriers and	Palaestra	To Discuss barriers and solutions for caregivers of young adults with ASD	Journal Article	Journal Article	Journal Article	Journal Article

	Solutions for Caregivers						
Ikonomi, Mema	Children and Autism	ARENA	To look into activities of interest children with ASD ages 6-9 years old have.	Interviews were conducted for 10 parents of children with ASD	Semi Structured interviews with open ended questions. Parents were prompted to talk freely about their thoughts on their child's play.	Children with ASD are limited in their activities and interests. They do not play imagination type activities for their play.	A child's interest with or without ASD can be factored by what they are exposed to. This plays a major role in this study based on what they have exposure to.
Bingham, Boddy, Ridgers, Stratton	The Physical Activity Levels and Play Behaviours of Children with Special Needs	Archives of Exercise in Health and Disease	Examine whether children with special needs achieve current physical activity guidelines and identify whether habitual physical activity, recess physical activity and play behaviors differed	29 children, 27 boys and 2 girls with either Autism or other disabilities were observed over a span of 7 days.	Physical activity was measured for 7 days using accelerometry. Direct observation was also used (System for Observing Children's Activity and Relationships during Play.	Most of the children in this study did not meet the mandated minutes from the UK guidelines. Children with Behavioral or emotional needs had more minutes than children with Autism.	Children with and without ASD or other disabilities are not reaching their mandated minutes of physical activity. Multiple studies have been completed about MVPA minutes. As mentioned in this article previous studies show that students with disabilities were receiving more minutes of physical activity than they were finding in this specific study.

			between special needs.				
Clapham, Shim, Lamont, Armitano	A Case Report Illustrating the Implementation of a Therapeutic Surfing Intervention for an Adolescent with Autism	Palaestra	Assess the effectiveness of an 8-week summer surf program for children with ASD to research the physiological benefits.	12 year old male with ASD every summer for 6 years	Evaluated physiological and behavioral variables such as muscle strength and endurance, personal behaviors	He improved his behavior (social emotional) and his physical abilities.	Surf therapy or many therapies or activities similar come to an end. There is a regression that occurs for the participant that causes a set back when it starts back up again. I would like to see a similar study completed when there isn't a time lapse in between.

MacDonald, Lord, Ulrich	The Relationship of Motor Skills and Social Communicative Skills in School-Aged Children With Autism Spectrum Disorder	Adapted Physical Activity Quarterly	Determine whether the functional motor skills, of children with ASD predict success in standardized social communicative skills.	35 Students with Autism in a typically developing classroom between the ages of 6-15 were assessed using standardized tests.	The students were assessed using the TGMD-2, the social skills improvement system rating scales, and the Generalized Linear Model.	Results suggest that children with ASD are performing worse on Social communicative tests.	It was discussed that having all of the participants with a higher IQ score was a big part of the outcome of this study. The researchers believe that having a variety of levels of IQ scores would make this a more reliable study.
Memari, A. H., Panahi, N., Ranjbar, E., Moshayedi, P., Shafiei, M., Kordi, R.,... Ziaee, V	Children with Autism Spectrum Disorder and Patterns of Participation in Daily Physical and Play Activities	Neurology Research International	Patterns and barriers to daily physical activity for children with ASD	83 parents of children with ASD between the ages of 6-15.	Questionnaires and checklists were used to assess the amount of physical activity the students were getting. They were then compared to a norm test.	Only 10 of the 83 children with ASD were physically active.	The socioeconomic status of the family has a significant impact on the levels of physical activity the child is participating in.