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| **Student Name:** Sabina Beckler | | | | | | | | |
| **Question:** In overweight or obese children with disabilities, is exercise effective for weight loss? | | | | | | **Searches: PubMed, CINAHL** | | |
| **Author/Year** | **Purpose/Design/ Subjects** | | **Intervention** | | **Measurements/Outcomes** | | | **Limitations/**  **Comments** | |
| Elmahgoub et al., 2009 | **Purpose:** investigate the effect of combined exercise training on body composition, physical fitness, and lipid profile in overweight adolescents with intellectual disability  **Design:** Matched pair design (randomized block design) – matched for age, gender, and education. N=15 for both the control group and the exercise group. Examiners blinded to intervention. Pre and post measurements were taken.  **Subjects:** 30 adolescents with intelligence quotient (IQ) ranging from 45-70. Age: 14-22. BMI: 23-48. 8 individuals had fragile X syndrome and 14 individuals had autism. | **Intervention group**: 10 week training program with strength and endurance exercises. 3 times per week for 50 minutes each session. Implemented in the school and supervised by 3 PT’s. each session included:   * Warm up: 5 min * Cycling: 10 min * Strengthening of biceps brachii and triceps brachii: 10 min * Stepping: 10 min * Strengthening of quads and hamstrings: 10 min * Cool down: 5 min   Stepping and cycling completed at 60% peak heart rate for first 10 sessions, 70% peak heart rate for sessions 11-20, and 75% peak heart rate after 20 sessions.  Strengthening began at 60% one repetition max and increased to 80%. Between two sets, 60 sec rest period was minded.  **Control Group:** Participated at daily school activities including PE classes. | | **Measurements:**  Body Composition: Height (cm), weight (kg), BMI, waist circumference (cm), and body composition (bio-impedance).  Lipid profile: blood sample after overnight fasting – used to calculate HDL, triglycerides, and total cholesterol.  Physical fitness: maximal cardiopulmonary exercise test (using computer driven cycloergometer), respiratory gas (metalyer 3B), VO2, VCO2, minute ventilation, tidal volume, and respiratory rate. 6 minute walk test, one repetition max (using Holten method), 30 second sit to stand test, hand grip strength, and muscle fatigue resistance (squeeze dynamometer maximally as much as possible) were also measured.  **Outcomes:** Significant decreases in weight, BMI, and waist and fat mass in exercise group. Relative fat-free mass increased significantly in exercise group. Significant decrease in triglycerides, total cholesterol and LDL was observed in exercise group. There was also a significant increase in HDL in the exercise group. Peak VO2, peak power, and 6 minute walk test also significantly differed between the exercise and control group following intervention. Strength and number of sit to stands also increased significantly in the exercise group. | | | Overall this was a pretty well designed study. The pre-intervention measurements were not significantly different between the intervention and control group. The sample size was small so larger RCT need to be completed to confirm these results. There may have been a learning curve to some of the activities that explain the improvements (for example the strengthen measurements). All sessions were supervised by PTs which may not be feasible in our current health care system. | |
| Elmahgoub et al., 2011 | **Purpose:** investigate the effect of combined exercise frequency on body composition, physical fitness, and lipid profile in overweight and obese adolescents with intellectual disability.  **Design:** Matched pair design (randomized block design) – matched for age, gender, and education. 3 groups (N=15 each group). Pre and post measurements were taken at the same time of day and assessors were blinded.  **Subjects:** N=45, overweight or obese adolescents with intellectual disability. Age 14-22, IQ 45-70, BMI 23-48. | **Intervention Group:** training was completed at the PT rooms in the special education schools and was supervised by 3 PTs.  CET3: 10 week training program. 50 minute sessions 3x/wk.   * Warm Up: 5 min * Cycling: 10 min * Strengthening of biceps brachii and triceps brachii: 10 min * Stepping: 10 min * Strengthening of quads and hamstrings: 10 min * Cool down: 5 min   Week 1-3: aerobic and strength training at 60% peak heart rate reserve; week 4-6: 70% peak heart rate reserve; week 7-10: 75% peak heart rate reserve.  CET2: 15 week training program. 50 minute sessions 2x/wk. Sessions identical to CET3.  Week 1-5: aerobic and strength training at 60% peak heart rate reserve; week 6-10: 70% peak heart rate reserve; week 11-15: 75% peak heart rate reserve.  **Control Group:** daily school activities including physical education lessons. | | **Measurements:**  Body Composition: Height (cm), weight (kg), BMI, waist circumference (cm), and body composition (bio-impedance).  Lipid profile: blood sample after overnight fasting – used to calculate HDL, triglycerides, and total cholesterol.  Physical fitness: maximal cardiopulmonary exercise test (using computer driven cycloergometer), respiratory gas (metalyer 3B), VO2, VCO2, minute ventilation, tidal volume, and respiratory rate. 6 minute walk test, one repetition max (using Holten method), 30 second sit to stand test, hand grip strength, and muscle fatigue resistance (squeeze dynamometer maximally as much as possible) were also measured.  **Outcomes:**  Both CET3 and CET2 had significant decreases in weight, BMI, waist circumference, and fat mass whereas fat-free mass increased significantly. There were also significant decrease in total cholesterol and LDL in both the CET3 and CET2 groups. Both CET3 and CET2 had significant improvements in peak VO2/peak power, peak power, 6 minute walk test, peak VO2, relative peak VO2, and peak heart rate. Both exercise groups had significant improvements in muscle fatigue resistance, number of sit to stands, and upper limb strength. Lower limb strength was significantly less in the CET2 group than the CET3 group. | | | Overall this was a well-designed study. Again, the sample size was relatively small. Except for HDL, there were no significant differences between the groups at baseline. The exercise interventions were all performed at a fairly high intensity (even the 60% peak heart rate reserve at the beginning was high but this increased to 75%). The group that trained twice a week trained for a 15 weeks while the group that trained 3 times per week trained for 10 weeks. This could have allowed the CET2 group to “catch-up” during this time period. It is important to note however that overall both groups had similar outcomes so exercising 2x/wk at a relatively high intensity for 50 minutes may be enough to reap the benefits. | |
| Fleming et al., 2008 | **Purpose:** review the literature on overweight and obesity in individuals with intellectual disability as well as obesity treatment research. The article also reports on family based behavioral intervention targeting weight loss in adolescents with down syndrome.  **Design:** Review and expert opinion | **Recommended Interventions Related to Physical Activity:** Family-based interventions can influence the scheduling and planning of daily activities including physical activity. The direct involvement of at least one parent is important. Sports involvement as an adolescent is correlated with meeting national standards as an adult.  Nutrition and Activity Education: Part of the Healthy U program that is focuses on weight loss in adolescents with down syndrome. Physical activity education sessions consist of warm up, walking, stretching, and strengthening via therabands. | | **N/A** | | | There are a lot of limitations to this article. First, it is low level evidence as it is a narrative review and includes expert opinions. There are also many aspects included in this review that are not relevant to the PICO questions. It is, however, important to note that weight loss programs for individuals with intellectual disabilities are being put in place and consider some of the aspects that are included in such programs. | |
| Gillette et al., 2014 | **Purpose:** evaluate the effectiveness of a multidisciplinary tailored intervention to treat obesity among youth with special needs.  **Design:**  **Subjects:** N=76 (only 30 at 6 months). 65% male. Youth between 2 and 19 with special health care needs including autism spectrum disorder, down syndrome, and other developmental disabilities were included. Participants had a BMI greater than the 95th percentile. Participants were referred to the program by specialty providers within the hospital system and primary care physicians in the region. | **Intervention:**  90 minute intake appointment – family and child goal’s assessed. Interviewed families to establish baseline. Oral motor skills, swallowing and oral sensory processing was observed for the child. After the assessment, dietary and behavioral recommendations were developed for each family.  Follow up sessions were designed to be at 1, 2, 3, and 6 months. The final session was 12 months after the initial visit. Visits varied based on family need. Specific difficulties with diet and physical activity of each child were discussed. | | **Measurements:**  Demographics, weight (kg), height (cm), BMIz (z-score), food preference assessment  **Outcomes:** Significant reduction in BMIz between initial appointment and 6 months into treatment. | | | There are several limitations to this study. First, the interventions varied from one patient to the next to meet individual needs; however, specifics about the interventions are not mentioned. The physical activity intervention is very unclear. There were also so many drop outs in this study. Only 30 of the 76 original participants completed the program. That now also makes for a small sample size. | |
| Grondhuis et al., 2014 | **Purpose:** discuss obesity-related health risks, possible weight management options, recommendations for weight maintenance or loss, and future research.  **Design:** narrative review  **Subjects: n/a** | **Medical Conditions related to obesity:** Asthma, sleep apnea, orthopedic complications, chronic inflammation, accelerated bone maturation, non-alcoholic fatty liver disease, elevated LDL, hypertension, type 2 diabetes mellitus, and psychological ramifications.  **Assessing body weight:** BMI highly correlated with percentage body fat.  **Risk Factors for Obesity:** dietary intake, activity levels, economic circumstances, race  **Prevalence of obesity in youth with disabilities:** elevated weight in children with intellectual or developmental disabilities possibly because:   * Psychotropic medication * Inherited syndromes (Prader-Willi syndrome) * Physical limitations * Eating habits   **Intervention Options:**  Changing eating habits  Altering caloric expenditure   * Limit TV and sedentary game systems * More vigorous exercise including sports * Walking * Playing in parks   Other Options   * Pharmacotherapy * Hormonal therapy * Bariatric surgery | | **N/A** | | | This is a narrative review and therefore has many of the expected limitations. The process by which information was gathered is not outlined. It is also not clear how the included information was determined to be the best evidence. Most sections were well supported with evidence. Limited information was provided on specific exercise interventions. | |
| Haney et al., 2014 | **Purpose:** examine the effect of a structured afterschool program at a park on obesity-related health outcomes in children with disabilities.  **Design:** quasi-experimental pilot study with a convenience sample. Pre-post comparison via general linear models analysis.  **Subjects:** N=52, mean age 13.7, children/adolescents with developmental and/or intellectual disabilities, | **Intervention**  Fit-2-Play – takes place every afternoon from 2pm until 6 pm. It has two main parts:   1. Sports, Play and Active Recreation for Kids (Sparks) 2. EmpowerMe4Life – American heart association education curriculum promoting heart-healthy lifestyles   Coaches introduced different physical activities for at least 1 hour each afternoon. Health and wellness sessions were conducted on Fridays in place of the homework hour. | | **Measurements**  Height, weight, waist/hip/midarm circumference, fitness tests, 9 item health and wellness knowledge assessment, BMIz, sit and reach test for flexibility, sit up test, right angle push-up, 400 m run, PACER rest.  **Outcomes:** BMIz scores did not significantly change over the study period. All participants improved in physical fitness tests and health and wellness knowledge. | | | This study had some flaws in how measurements were taken. All parks field staff were trained on appropriate anthropometric, BP, and physical fitness data collection. Data were uploaded to a shared database. This allows for a lot of measurement error. It would also have been nice to have more information about the physical activity that individuals engaged in during the program. I would love to see more research on this topic. | |
| Hinckson et al., 2013 | **Purpose:** Determine the effectiveness of a program in managing weight, through changes in physical activity and nutrition behaviors in overweight and obese children with intellectual disability or autism.  **Design:** quasi-experimental design. Pre/post tests and 24 weeks post program measurements taken again. Some data collected via semi structured interviews.  **Subjects:** 17 children (and at least 1 family member), mean age 14, 7 females and 10 males, | **Intervention:** 18 sessions of physical activity, healthy eating, and motivational skills. The program was facilitated by a community pediatric PT and dietician with support from teachers. Sessions were held twice a week over 10 weeks for a total of 20 sessions. Each session included a 1 hour family physical activity component followed by an active session with students only (also 1 hour) while parents attended information sessions on nutrition and motivation. Two pool sessions were included. There were a total of 18 physical activity sessions and 2 pool sessions. Nutrition included information on food portion size, food labeling, food groups, eating out, supermarket tour, food festival, modeling, and goal setting. | | **Measurements:**  Physical activity and nutrition questionnaire, 6 minute walk test, height, weight, BMI, circumference (waist), qualitative measures – semi structured interviews.  **Outcomes:**  Most quantitative data is unclear or trivial with exception to the 6 minute walk test at 24 weeks in which participants walked 51 meters further. Parents reported children were eating less confectionary and chocolates following the intervention. Three themes emerged in the interviews: health gains, social gains, and program that fits. Parents reported more awareness of healthy food choices and improvements in physical health as seen in reduced hospitalizations and school absences. | | | There were a lot of unclear areas in this study. The qualitative data gathered was very subjective and I would like to have had more information on how these interviews were structured. There was also a two week break in the middle of the intervention which may have influenced the outcomes. I am curious how intensity was measured in this study. Would this intervention have been more successful if the physical activity was more closely monitored and intensity controlled? | |
| Maiano et al, 2014 | **Purpose:** review the effects of lifestyle interventions targeting changes in body weight and composition, healthy lifestyle, and secondary health conditions in youth with intellectual disability.  **Design:** systematic review – most included studies used a cohort pre-test and post-test design with or without control of group  **Subjects:** sample size ranged from 1 to 45 (median 15), age ranged from 7 to 22, most youth involved were boys who were overweight or obese and had a diagnosis of mild to moderate intellectual disability. | **Interventions:**  Most of the interventions focused exclusively on physical activity while some used physical activity with health education and behavior modifications. Interventions lasted from 10 weeks to 48 weeks (median 15). The total number of sessions was 30-48 (median 36) and were held from 2 to 5 days per week (median 3). Sessions lasted from 25 to 120 minutes (median 50). | | **Outcomes:**  All but one of the studies observed a reduction or statistically significant reduction in weight after the intervention. Findings from the physical activity interventions reveal that all but one of the studies show statistically significant reduction in weight after the intervention. One study had a 3 year follow up with still showed a reduction in weight. All but two of the studies observed a decrease in BMI but the physical activity interventions showed mixed results in BMI reduction. Two studies focusing on physical activity interventions reported statistically significant decreases in waist circumference after the intervention but 1 study found no differences. Only one of the reviewed studies examined lifestyle intervention and found a decrease in hospitalizations and school absences. | | | Most of the studies included had a weak overall quality rating. This indicates an increased risk of bias. There is significant evidence to support physical activity interventions for weight loss in individuals with intellectual disability. More research needs to be completed with larger RCTs and evidence is lacking in lasting effects of these interventions. | |
| McPherson et al., 2014 | **Purpose:** review current evidence on interventions designed to facilitate weight management and/or weight related behaviors such as physical activity or healthy eating habits in children with physical disabilities.  **Design:** Scoping Literature Review – included case studies, quasi- or non-experimental designs, and RCTs.  **Subject:** parents and/or children were targeted, most studies targeted children with CP, birth to 22 years of age | **Interventions:** Most interventions took place at community settings such as schools and recreational centers. Some were completed within the home. 35% of the studies were conducted in a clinical setting (hospitals or rehabilitation centers).  Exercises included aquatics, cycling, strength training, other aerobics, treadmill walking, active video games, etc. Interventions were between 4 weeks and 18 months. | | **Outcomes:** 18 of the 34 included studies observed significant changes in the measured primary outcomes. All of the studies that showed some evidence of intervention efficacy were related to physical activity. | | | This article does a poor job outlining specific findings of the included studies. For example, it’s not clear what the primary outcomes of the interventions with a physical activity component are or if these were changed. There are many low level evidence studies included in the review. The review did, however, include a large variety of studies giving the reader a better understanding of the current gaps in evidence as well as the available literature on the topic. | |
| O’Neil et al., 2012 | **Purpose:**  share experiences in the design, implementation, and evaluation of health promotion programs in the community setting for children with special health care needs.  **Design:** Expert Opinion - commentary  **Subjects:** children and youth with special health care needs | **Interventions:**  Individual and family level:  Strengthen skills and competencies to improve body function and structure, activity and participation, and family-focused interventions  Organizational and community level: promote partnerships and program development in the community  Policy: advocacy for local, regional, state, and national policies to support community-based programs.  **Examples:**   * Adapted Ice Skating Program * Cultural Arts Discovery Program * The Kids Fitness Program – community based after school program to promote increased physical activity, fitness, and healthy eating in school-aged youth who were overweight or obese. 3 sessions/wk for 45-50 minutes/session. | | **Outcomes:**  The Kids Fitness Program   * Strength, aerobic measures, and BMI improved. | | | This is low level evidence but a great perspective on community based programs. Limitations include a lack of evidence and examples of programs and research to support community based programs. Of the described programs, there were only limited details given and it was hard to determine the exact outcomes of each program. | |
| Pitetti et al., 2006 | **Purpose:** evaluate a 9 month treadmill walking program on exercise capacity and BMI for adolescents with severe autism.  **Design:** Cohort study  **Subjects:** 10 youth (6 males and 4 females) with severe autism. Age 14-19. | **Intervention:** the majority of the time within the regular activity classes (at least 15+ minutes every Monday/Wednesday/Friday) consisted of treadmill walking. On the days when activity classes were not held (Tuesday/Thursday) participants were taken to the gym and given the opportunity to walk on the treadmill. Participants were also given the opportunity to walk on the treadmill in the evenings after school.  Treadmill protocol: initial frequency 2x/wk for first 2 weeks, 3x/wk for weeks 2-4, 4x/wk weeks 4-6, 5x/wk >6wks. Duration began at 8 minutes and gradually increased by 1-2 minutes every few weeks until 20 minutes/session was achieved. Speed and grade gradually increased as well.  **Control Group:** continued to participate in their regular physical education curriculum. 30 minutes of “leisure activity”, 3 times per week at the campus gymnasium. These sessions took place under the guidance of a staff member. Activities included basketball, jump rope, roller skating, scooter-board activities, throwing/catching, tennis, and cycling. | | **Measurements:** caloric expenditure – based on walking speed and American college of sports medicine equations. Daily logs of treadmill use were kept by residential staff. Body weight was measured weekly. BMI was calculated. Height and weight were measured.  **Outcomes:**  Significant decrease in BMI was observed in the treadmill walking group. This was not observed in the control group. A non-significant reduction in weight was observed in both groups. | | | The sample size was very small in this study. Some of the weight loss observed in both groups could be attributed to the physical education class. The availability of the treadmill to individuals after school could have allowed some participants to engage in much higher amounts of physical activity. This was not discussed. | |
| Rowland et al., 2015 | **Purpose:** discuss the scope of pediatric physical therapy practice in health promotion and fitness for youth with disabilities.  **Design:** review  **Subjects:** youth with disabilities | **Interventions:**  PT examination and evaluation components:   * Interview with open ended questions about exercise and physical activity * Provide family with personalized guidance and information to reinforce healthy active behaviors * Provide support to families to help them find community resources. * Come to closure when the PT session ends   2008 Physical Activity Guidelines for Americans   * Youth should participate in a minimum of 60 minutes of moderate to vigorous physical activity each day including aerobic, strengthening, and bone strengthening. * Vigorous exercise should be performed at least 3x/wk * Younger children can perform these exercise sessions in bouts and not all at once   Flexibility is an important component of fitness for youth with disabilities. Muscle tightness and contractures are common in this population.   * Dynamic stretching for warm up * Static stretching recommended at the end of an exercise session * May need equipment for prolonged stretching   Cerebral Palsy  Strength training   * 2-3x/wk * 1-3 sets of 6-15 repetitions * Free weight, machines, or isokinetic exercise machines * Improve 30%-50% in 8-12 wks   Aerobic training   * If possible, perform aerobic capacity test for baseline * 194 bpm can be used as maximum heart rate if progressive aerobic capacity test isn’t possible * Training heart rate of 107-126 is recommended initially for youth who are deconditioned. Heart rate of 126-155 is recommended for youth who are more fit.   Down Syndrome  Strength Training   * 2-3x/wk * 1-3 sets of 8-12 reps * Resistance bands, free weights, machines, or exercise machines   Aerobic training   * If possible, perform an aerobic capacity test to determine maximum heart rate * Youth with DS have a lower max HR (usually 170-180)   Spina Bifida  Strength training   * Train active muscle groups * 2-3x/wk * 1-3 sets of 8-12 reps * Free bands, machines, isokinetic exercise machines   Aerobic training   * For youth with SB who are ambulatory, a home-based progressive treadmill training program may improve walking endurance and aerobic capacity * Youth who use wheelchairs for mobility can improve health, fitness, and function   Duchenne Muscular Dystrophy  Strength Training   * Low resistance programs and functional strengthening   Aerobic training   * Low to moderate, non-fatiguing physical activity * Cycling or assisted cycling may be a good option   Autism Spectrum Disorder  Strength training   * Use PRE as outlined in the guidelines from the 2009 National Strength and Conditioning Association Position Paper   Aerobic training   * Moderate to vigorous physical activity may reduce stereotypical behaviors in addition to having positive health benefits | | **Potential Measurements and Screening Tools:**  Body Composition   * Increased risk for obesity * Dual energy x-ray absorptiometry is the reference standard * Skin fold measures may be used * BMI should be interpreted with caution * Waist circumference and height   Aerobic capacity   * Brockport PACER 20m and 16m * Shuttle Run Test * Shuttle Ride Test 10m WC shuttle   Exercise Tolerance and Endurance   * Brockport-Target Aerobic Movement Test * Working HR * Energy Expenditure Index * 6 minute cycling test   Functional Strength/ Muscular Endurance   * Lateral step ups * Sit to stand * ½ kneel to stand * Modified curl-ups and isometric pushup * WC ramp test   Strength   * Determine weight for repetition max * Break or make test using a dynamometer   Power/Agility/Balance   * Bruininks-Oseretsky Test of Motor Proficiency * Muscle Power Sprint Test * 10x5 Meter Sprint Test * WC muscle power sprint test * Pediatric berg balance scale * Functional reach test * Community balance and mobility scale   Habitual Physical Activity   * Physical activity questionnaire for children * Physical activity questionnaire for adolescents * Previous day physical activity recall * Three day physical activity recall * Physical activity logs * Pedometers * Accelerometers   Activity – submaximal aerobic capacity   * 6 minute walk test * ½ or 1 mile walk/run tests * 6 or 12 minute WC propulsion test * 40m WC push   Participation   * Children’s assessment of participation and enjoyment * Canadian occupation performance measure completed by child or by parent | | | This is an outstanding article that details PT involvement in the promotion of fitness in youth with disabilities. The potential measurements and screening tools are very helpful and there are additional notes including studies which have used these measures in the target population. The PT interventions are broken down by diagnosis but also address safety concerns and considerations. The section on community based programs and sports involvement further supports the need for a resource guide that can be made available to parents in pediatric clinics in the area. | |
| Salaun et al., 2014 | **Purpose:** investigate the relationship between self-perception variables and morphological variables and their changes after a 9 month adapted physical activity program.  **Design:** Quasi-experimental design  **Subjects:** 23 adolescents with intellectual disability. All subjects were obese. 14 girls and 9 boys completed the entire study (7 dropped out). The mean age was 15.13. | **Intervention** over 9 months  First 10 weeks: 2 continuous aerobic sessions per week for 30 minutes each session at 30-40% VO2max.  Middle 10 weeks: 1 continuous aerobic session (30 minutes at 30-40% VO2max) and 1 prolonged aerobic session (50 minutes at 35-45% VO2max).  Last 10 weeks: 1 continuous aerobic session (45 min) and 1 higher intensity intermittent session (1 hour) | | **Measurements**  Data were collected at the beginning and the end.  Self-perception:   * Very-short form of the physical self-inventory adapted for adolescents with intellectual disability * 9 gender-specific silhouette drawing instrument * Obesity awareness – using objective silhouette   Anthropometric measures   * Weight (kg) * Height (cm) * BMI * Waist circumference * Body composition – bioelectrical impedance   **Outcomes:**  Significant reduction in waist circumference and % body fat was noted. Body image dissatisfaction decreased significantly. | | | There were additional outcomes but the ones listed most closely relate to the PICO question at hand. 7 individuals dropped out of the study and the sample size was relatively small. This study also supports obesity education as many of the individuals in the study were not aware of their condition. | |
| Short et al., 2012 | **Purpose:** highlight the current lack of knowledge about the role of physical activity and the need to develop exercise strategies targeting the reduction of cardiometabolic risk and improving quality of life in youth with spina bifida.  **Design:** Review article  **Subjects:** youth with spina bifida | **Interventions:**  Exercise 2-3x/wk. 300 minutes of moderate to vigorous physical activity weekly. Sports participation should be encouraged. Aerobic and strengthening exercises should be implemented. Treadmill walking has been found to improve peak aerobic capacity and walking economy. High-intensity interval training may be effective in improving aerobic capacity and fasting lipid profile. | | **Measurements:**  Calculating BMI may underestimate the number of individuals with spina bifida who are obese. | | | This review had several limitations. First, the interventions were not clearly described for many of the included studies. Secondly, although obesity and body composition were addressed narratively in the beginning, this information was not explored further or supported by studies examining obesity. | |
| Srinivasan et al., 2014 | **Purpose:** describe the mechanisms by which autism-specific impairments contribute to obesity and review evidence on exercise interventions to improve physical fitness, address obesity and reduce autism-specific impairments in children and adolescents with ASD.  **Design:** narrative review  **Subjects:** children and adolescents with autism spectrum disorder. Studies were also included in which subjects with other pediatric developmental disabilities participated. | **Interventions:**  Hydrotherapy, whole body movement to music, obstacle course, ball games, follow-the-leader game, strength exercises, treadmill training, aquatic program, stationary cycling, resistance training, sprint training, high intensity interval training, and plyometrics.  **Exercise Recommendations:**  Aerobic training   * 3-5x/wk * Moderate to vigorous intensity * 30-60 minutes over bouts * Types of exercise: jogging, walk/run intervals, cycling, swimming, treatdmill walking, exergames (Wii, dance dance revolution)   Resistance training   * 1-2x/wk * 8-15 reps, 1-3 sets * Types of exercise: less than 10 years – jumping, climbing, throwing; 10+ years – free weights, TheraBand, body weight resistance, and machines with caution and supervision.   Flexibility   * 1-2x/wk * 1 hour * Muscle strentching, therapeutic horseback riding, aquatic exercises, yoga, tai-chi | | **Outcomes:**  There were a variety of outcomes described. First, two studies looked specifically at weight reduction and BMI. Decrease in BMI for the experimental groups from baseline to postintervention were noted. There were also improvements in cardiovascular function, time to complete half a mile walk/run, improvements in swimming skills, increases in balance, agility, power, and strength in many of the described studies.  **Recommended Measures:**  Obesity   * BMI * Waist circumference * Skinfold thickness   Cardiovascular fitness   * 6 minute walk test * Cycle ergometer * Treadmill * 1 mile walk/run * Shuttle run test * Heart rate * Minute ventilation * Rate of perceived exertion   Muscular fitness   * Sit ups * Push ups * Flexed arm hang-up * Standing long jump * Dynamometer for limb muscles * 1 repetition max | | | Overall this is a lower level evidence paper as it is a narrative review. The charts outlining included studies are very complete. There is limited evidence to support physical activity and exercise intervention to treat obesity in children and adolescents with autism. I found the most helpful section for screening to be Table 3. Table 4 also outlined the recommended exercises for children and adolescents with ASD based on available literature. | |

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