Published in final edited form as:

West J Nurs Res. 2017 August ; 39(8): 1008–1027. doi:10.1177/0193945917697664.

Treatment of Obesity among Youth with Intellectual and Developmental Disabilities: An Emerging Role for Telenursing

Elizabeth Anne Bennett, MA, Rachel Kolko, PhD, Lichun Chia, PhD, RN, Jennifer Padden Elliott, PharmD, and Melissa Ann Kalarchian, PharmD

Abstract

Childhood obesity is a serious health issue, associated with medical comorbidity and psychosocial impairment that can persist into adulthood. In the United States, youth with intellectual and developmental disabilities are more likely to be obese than youth without disabilities. A large body of evidence supports the efficacy of family-based treatment of childhood obesity, including diet, physical activity, and behavior modification, but few interventions have been developed and evaluated specifically for this population. We highlight studies on treatment of obesity among youth with intellectual and developmental disabilities, including both residential/educational settings as well as outpatient/hospital settings. All interventions were delivered in-person, and further development of promising approaches and delivery via telenursing may increase access by youth and families. Nursing scientists can assume an important role in overcoming barriers to care for this vulnerable and underserved population.

Keywords

Childhood obesity; intellectual disability; developmental disability; intervention; telehealth

In the United States, rates of obesity in children have more than doubled over the past 30 years (Ogden, Carroll, Kit, & Flegal, 2012; Ogden, Carroll, Kit, & Flegal, 2014). For youth between 2 and 19 years of age, the prevalence of obesity was 17% in 2011 and 2014 (Ogden et al., 2016). Obesity is a result of an energy imbalance in which excess calories are consumed and too few are expended over time, influenced by various genetic, environmental, and behavioral factors (Fiese & Jones, 2012; Kellou, Sandalinas, Copin, & Simon, 2014). Youth with obesity are more likely to have risk factors for cardiovascular disease, namely high blood pressure or high cholesterol (Dong, Wang, Wang, & Ma, 2015; Saner, Simonetti, Wühl, Mullis, & Janner, 2016), and as children with obesity grow into adolescence, they are at greater risk for prediabetes and diabetes (Centers for Disease Control and Prevention, 2011). Additionally, youth with obesity are at risk for related health problems including sleep apnea and joint problems, as well as psychological challenges, namely poor self-esteem and stigmatization (Bazzano et al., 2016; Cornette, 2008; Halfon, Larson, & Slusser, 2013). The psychological toll of childhood obesity is substantial, and obesity has been reciprocally linked to anxiety and depression (Kalarchian & Marcus, 2012;

Luppino et al., 2010; Puder & Munsch, 2010; Pulgarón, 2013; Vander Wal & Mitchell, 2011). Stigma linked to childhood obesity intensifies if obesity persists into adulthood, with obesity factoring into discriminatory practices in employment (Agerström & Rooth, 2011) and bias in health care settings (Puhl & Heuer, 2009). Taken together, the impact of these medical and psychosocial implications of childhood obesity should not be taken lightly.

Since the late 1970s, family-based approaches to treatment of childhood obesity have predominated (Epstein, Paluch, Roemmich, & Beecher, 2007; Sung-Chan, Sung, Zhao, & Brownson, 2013), and research findings support their short and longer-term efficacy (Berge & Everts, 2011; Epstein, Myers, Raynor, & Saelens, 1998; Hoelscher, Kirk, Ritchie, & Cunningham-Sabo, 2013; Jelalian & Saelens, 1999; Kalarchian et al., 2009). Family-based approaches include a focus on education, diet, physical activity, and behavior modification, targeting both child and parent for behavior change. Parental involvement is associated with weight loss and children, and studies suggest that use of a wide range of behavior change techniques improves weight outcomes (McLean, Griffin, Toney, & Hardeman, 2003). Furthermore, there is support for working exclusively with the parent for child weight management. Research has shown that involving parents only was superior to targeting parents and children (Golan & Crow, 2004; Golan, Kaufman, & Shahar, 2006), whereas other studies have yielded comparable results for approaches that do and do not include children (Boutelle, Cafri, & Crow, 2011; Janicke et al., 2008).

Despite evidence suggesting increased prevalence of obesity among people with disabilities (Mikulovic et al., 2011; Weil et al., 2002), surprisingly little attention has been paid to treatment of obesity among youth with disabilities (Maïano, Normand, Aimé, & Bégarie, 2014). Furthermore, some genetic conditions, such as Down syndrome and Prader-Willi syndrome, include overeating and weight gain as associated characteristics (Must et al., 2014). In the present report, we review select interventions targeting weight and healthy eating among youth with disabilities. Disabilities are broadly conceptualized to include a range of physical, mental, and behavioral impairments, which we refer to collectively as intellectual and developmental disabilities.

The studies reviewed here suggest that evidence-based strategies can be adapted to address eating and weight among youth with developmental disabilities. Moreover, given challenges of attending in-person and potential burden travel for families, we assert that these tailored interventions can be effectively delivered to parents via telehealth. An approach increasing in acceptance and popularity, telehealth is the use of telecommunications (including telephone, Internet, text-messaging, and video conferencing technologies) to provide medical information and care. We contend that there is an emerging role for telenursing in treatment of obesity in this vulnerable and underserved population.

Obesity among Youth with Intellectual and Developmental Disabilities

Some researchers have called attention to a dearth of studies investigating obesity among children with disabilities (Fleming et al., 2008; Grondhuis & Aman, 2014; Phillips et al., 2014; Slevin, Truesdale-Kennedy, McConkey, Livingstone, & Fleming, 2014). Nonetheless, population-level prevalence data suggest that obesity levels within this population are higher

than in youth without intellectual and developmental disabilities. For example, using a nationally representative sample of 9,619 youth in the United States, a recent study found the prevalence of obesity among adolescents with autism and other learning and behavioral disabilities to be 20.4% compared to 13.1% among youth without these disabilities, a significant difference even after controlling for sociodemographic factors and birthweight (Phillips et al., 2014). Obesity was highest among the autism subgroup, and adolescents with either a developmental disability or obesity had a higher prevalence of common neurological, dermatological, gastrointestinal, and respiratory conditions/symptoms than adolescents without. Another nationally representative sample found prevalence of obesity in children with intellectual disabilities to be nearly twice the prevalence for those without, 28.9% as compared to 15.5% (Segal et al., 2016). After adjusting for age, sex, race/ethnicity and poverty level, the prevalence remained significantly greater among children with intellectual disabilities. These studies suggest elevated rates of obesity among children and adolescents with disabilities relative to the general population. A recent systematic review and meta-analysis documented that adolescents with intellectual disabilities are 1.8 times more at risk for obesity than adolescents without, noting variations as a function of geographical region, recruitment setting, additional diagnoses, and definition of obesity (Mañano, Hue, Morin, & Moullec, 2016).

Maintaining a healthy weight may be particularly challenging for youth with intellectual and developmental disabilities youth whose capacity for self-management may be limited relative to those without disabilities. For example, less structured environments can pose challenges, as they may require a level of autonomy and decision making skills that exceed developmental capabilities of youth in this population, particularly if they lack self-efficacy for healthy eating and physical activity (Curtin et al., 2013) or if their disability is associated with impaired satiety (e.g., Prader-Willi syndrome; Cassidy, 1997). Deficits in self-determination skills among adolescents and young adults with developmental disabilities may also adversely affect health-related choices (McGuire & McDonnell, 2008).

Youth with intellectual disabilities may be less likely to engage in physical activity (Salaun & Berthouze-Aranda, 2012) and may also have less access to environments in which physical activity is encouraged (Chen, Kim, Houtrow, & Newacheck, 2010). Furthermore, characteristics of certain developmental disabilities--namely poor motor control, need for supervision, poor social skills, and difficulty learning--have been linked to less time spent engaged in physical activity (Must, Phillips, Curtin, & Bandini, 2015). In a study comparing 38 adolescents with intellectual disabilities to 60 without, fewer adolescents with disabilities reported that they have someone with whom to engage in physical activity and fewer believed that activity would be good for their health, whereas more perceived that physical activities were too hard to learn and more reported a dislike of individual physical activities, relative to adolescents without (Stanish et al., 2016).

Many youth with intellectual and developmental disabilities experience medication-related weight gain, which can also contribute to the onset or exacerbation of obesity. Psychotropic medications such as antipsychotics, antidepressants, and anticonvulsants are often prescribed to treat comorbid psychiatric and behavioral disorders. Psychotropic medications are rarely weight neutral, often altering appetite, changing food preferences, or slowing metabolism

(Correll, 2007). For example, clozapine, an atypical antipsychotic used to treat aggression, depression, and anxiety, poses risk for weight gain (Gressier, Porcelli, Calati, & Serretti, 2016). Other commonly prescribed atypical antipsychotics include olanzapine and quetiapine, and both are also associated with risk of weight gain (Martínez-Ortega et al., 2013). Antidepressant (Serretti & Mandelli, 2010) and anticonvulsant medications (Tanamachi et al., 2015; Wirrell, 2003) have been associated with weight gain as well.

Finally, caregivers play a key role in managing child eating and weight, and the challenge of “comparative severity” may be a factor in approaches to weight management among youth with disabilities (Grondhuis & Aman, 2014). That is, when already tackling the behavioral challenges of autism in the context of family life, for example, parents may be relatively less likely to consider obesity a priority area. Moreover, some parents may be unaware of the serious, long-term consequences of obesity and may feel guilt over preventing a child with a disability from enjoying a pleasurable food (Rimmer, Rowland, & Yamaki, 2007).

Clearly, youth with intellectual and developmental disabilities constitute a distinctive subgroup of the obese population. Some unique considerations may be specific to the disability, such as the physical, behavioral, and/or mental impairments associated with the condition; potential need for increased environmental supports to facilitate healthy eating and activity; and medication related weight gain. Others factors, such as diet, physical activity, behavior modification, and parenting are important in treating all youth with obesity, but become even more salient for youth with intellectual and developmental disabilities.

Treatment of Obesity among Youth with Disabilities

The complexities of disability may interact with and compound the challenges of addressing obesity in youth (Grondhuis & Aman, 2014; Rimmer, Yamaki, Davis, Wang, & Vogel, 2011). For example, Modell (2002) calls for more focused supervision and teaching when engaging children with intellectual disabilities in a behavioral intervention due to reduced intellectual and communication abilities. Although the literature is limited for youth with disabilities, a systematic review suggests that a combination of techniques (e.g., nutrition education, diet, physical activity) may be most effective in targeting weight loss for youth with intellectual disabilities (Mañano et al., 2014).

Below, we describe exemplar interventions that have been developed and evaluated specifically for managing weight and eating among youth with intellectual and developmental disabilities. Given the dearth of published literature in this population, we aim to highlight examples of effective interventions to stimulate further research. Our inclusion criteria were that the intervention incorporated diet (as opposed to physical activity only) and was delivered to a population of youth with intellectual or developmental disabilities. We describe studies conducted in residential/educational settings before presenting interventions delivered in outpatient/hospital settings (see Table 1 for overview of studies).

Children and adolescents with developmental disabilities who live in residential schools and group homes may be at particular risk of overeating and weight gain if the environment does not adequately support healthy eating. Hubbard and colleagues (2015) investigated the impact of a Smarter Lunchroom intervention, rooted in behavioral economics, for 43 youth aged 11 to 22 with obesity and developmental disabilities living in a residential school. The 7-month study incorporated specific modifications for this population, including explaining the menu items using pictures and preparing the cafeteria environment using stories which describe situations in advance to improve behavioral response. The intervention also capitalized on the cafeteria environment to encourage changes through “nudging,” which encourages autonomy and choice among participants, rather than a forced menu change. For example, fruits were made easy to access and arranged attractively on the serving line, whereas peanut butter and jelly sandwiches were hidden and available only after consideration of the entrees offered on the menu. From pre- to post-intervention, children chose more whole grains and fruit while opting for fewer refined grains. These preliminary data suggest the efficacy of this approach for improving food selection and consumption choices for children with developmental disabilities. However, the effect of individual components of the intervention and the intervention impact on child weight status remains unknown.

While Hubbard et al. (2015) intervened in a residential school, Gephart and Loman (2013) evaluated strategies for weight management delivered to 40 youth aged 8 to 20 with developmental disabilities living in group homes in a Midwestern educational/residential center. In a pre- to post-design, 48 staff caregivers were provided with weight management education, a communication tool for youth weight indices, weight and physical activity goals, dietary orders, and monthly follow-up communication. Youth were categorized based on body mass index (BMI) percentile (underweight [$<5\%$], healthy weight [$5\text{--}84\%$], overweight [$85\text{--}94\%$], and obese [95%]), and results suggested that the intervention strategies were useful for weight management over a 4-month period. At post-intervention, more than 80% of the youth achieved their weight goal, with an overall decrease in weight status. However, this decrease was driven primarily from change in the healthy weight category, in which 96% of children met their goal to maintain their body mass index (BMI) percentile over the course of the study; this group also showed the largest overall decrease in BMI. Although an improvement in daily fruit consumption and vegetable consumption was documented, the investigators noted that parents and caregivers provided high-calorie snacks. Thus, results suggest that more intensive interventions may be needed for youth with developmental disabilities who are already obese, and highlights the need for educating both parents and caregivers.

Other investigators have focused on interventions delivered in an outpatient setting. Gillette and colleagues (2014) developed a hospital-based Special Needs Weight Management Clinic in which children and their families took part in a multidisciplinary treatment approach. Seventy-six children with special needs (e.g., autism, intellectual disabilities, Down syndrome, Prader-Willi syndrome) aged 2 to 19 and their families met with an interdisciplinary treatment team, including a clinical child psychologist, nurse practitioner, dietitian, and occupational therapist, for an intake session and 5 follow-up sessions over a 12-month period. After the baseline assessment, the treatment team collaborated to develop

behavioral and dietary recommendations tailored to each child and family. The program led to an increase in the variety of foods consumed by the child, as well as an increase of fruits and vegetables, as reported by parents. At the 6-month assessment, the intervention also resulted in a decrease in body mass index z-score (BMIz). There was, however, substantial withdrawal from the study over the first 6 months, with families often citing time or travel constraints as reasons for missing follow-up appointments. Thus, this study documents the promise of a tailored approach delivered on an outpatient basis while also highlighting potential challenges of clinic-based treatment.

Curtin and colleagues (2013) also conducted a study in an outpatient setting. Participants were 21 youth and young adults with Down syndrome (ages 13 – 26) who lived at home but hoped to transition to independent living. In a controlled design, families were randomized to a 6-month nutrition and activity education with or without parent behavioral intervention. The 16-session program was based in family-based behavioral intervention modified to address the unique cognitive needs of participants. The education component consisted of a nutrition program designed by a dietitian, which utilized pictures to enable diet planning and “coins” to facilitate understanding of discretionary calories. A physical therapist also evaluated the participants’ ability to complete required physical exercises, which were described for participants using illustrations and simple text. Parents assigned to the education with behavioral intervention condition also received instruction on behavior monitoring, positive reinforcement, goal setting, and modeling. At 6 months, mean body weight in the group receiving education plus behavioral intervention for parents was 3.2 kilograms lower than in the group that did not include parents, with differences sustained through 1-year follow-up. Positive changes in vegetable intake and activity were also observed. Strengths of this study include the randomized design documenting the importance of parent training and support over and above diet and physical activity education alone for youth and young adults with Down syndrome.

Considered together, these studies suggest that for youth with disabilities the living environment and caregivers become particularly salient in overcoming the challenges to managing eating and weight. All interventions made specific adaptations to ensure intervention was accessible to children with developmental disabilities. These included ensuring that protocols are easy to follow and understand; structuring the living environment to support healthy diet and lifestyle changes; and providing nutrition education for parents or caregivers. Indeed, individuals who lack training in weight management may be receptive to adaptations for youth with intellectual and developmental disabilities. For example, family-based behavioral obesity intervention has been recently adapted for pilot delivery among youth on second-generation antipsychotic medications with medically-induced weight gain, a substantial proportion of whom had developmental disabilities (Nicol et al., 2016). Preliminary results suggest that the adaptations made to the content and delivery of the intervention not only positively impacted weight, but also were rated with high satisfaction by participants.

It should be noted that the studies highlighted in Table 1 included relatively small, heterogeneous samples, and included non-randomized, uncontrolled designs. Thus, additional research using large, diversified samples in randomized, controlled studies is

warranted to further evaluate adaptations to intervention content and delivery methods for behavioral treatment to address obesity in youth with intellectual and developmental disabilities. Moreover, many of the extant studies have been conducted in research settings, and the intensity of family-based behavioral intervention (often delivered in-person, weekly over a period of several months) and associated training may not be feasible or sustainable in routine care settings. Therefore, it is critical to identify models through which practitioners can deliver obesity intervention and families of youth with disabilities can engage in such intervention. Expert committee guidelines outline the strong promise of pediatric primary care as a setting for obesity services, and nurses are well positioned to deliver the recommended screening and intervention approaches (Barton & US Preventive Services Task Force, 2010; Oude Luttikhuis et al., 2009; Spear et al., 2007).

The Role of Nursing in Addressing Obesity

Nurses have been called to the front lines for prevention and treatment of childhood obesity (Berkowitz & Borchard, 2009) and can play an important role in advancing evidence-based care of youth with intellectual and developmental disabilities. Nurses are key healthcare providers for children in outpatient, inpatient, and residential settings, which can support continuity of care. Maintaining continuity of care is particularly important when considering the role of the nurse in establishing relational continuity, which provides the patient with a sense of predictability and consistency (Haggerty et al., 2003). In addition to guidelines for all pediatric primary care providers (Barton & US Preventive Services Task Force, 2010; Oude Luttikhuis et al., 2009; Spear et al., 2007), nurses are encouraged to provide early identification, intervention, and continuity of care for youth with overweight or obesity (National Association of Pediatric Nurse Practitioners, 2009, 2015).

Despite these clear guidelines, however, studies of obesity service delivery indicate that evidence-based guidelines are rarely implemented, and that primary care providers report barriers broadly related to training and implementation processes. For example, providers report concerns regarding inadequate skill levels for addressing obesity or lack of treatment options (Flower, Perrin, Viadro, & Ammerman, 2007; Holt et al., 2011; Klein et al., 2010; Rausch, Perito, & Hametz, 2011; Spivack, Swietlik, Alessandrini, & Faith, 2010), need for greater training in weight-related counseling (Bleich, Bennett, Gudzone, & Cooper, 2012), and nutrition (Adams, Kohlmeier, & Zeisel, 2010) as well as with tools for identifying and treating obesity (Block, DeSalvo, & Fisher, 2003; Forman-Hoffman, Little, & Wahls, 2006; Jay et al., 2008; Vetter, Herring, Sood, Shah, & Kalet, 2008), and concerns with the amount of time associated with intervention delivery (Story et al., 2002). Notably, studies that involve training primary care providers to deliver a specific set of obesity-related recommendations suggest that focusing on a subset of care strategies may be deliverable and impactful in primary care settings (Jay et al., 2010).

Recent efforts with nursing trainees indicate that brief training can enhance their knowledge and skill in delivering screening and brief intervention for obesity among youth and families (Kolko et al., 2017). Given that nurses receive limited training in addressing behaviors among youth with disabilities, this could be incorporated into obesity-related training for nurses. For instance, monitoring, positive reinforcement, goal setting, and parenting

approaches may be discussed in the context of youth with disabilities and may be helpful for addressing weight management in this population. In addition, given that training approaches are efficacious in live (i.e., in-person) and web-based approaches (Kolko et al., 2017), incorporating technology may increase the reach and scalability of training, and offers trainees cost-effective opportunities to review and re-engage with training materials (Miller, Sorensen, Selzer, & Brigham, 2006; Sholomskas et al., 2005).

Intervention Delivery via Telehealth

Telehealth may prove to be a cost-effective way to deliver interventions to this underserved population of youth and families. The Internet has been effectively utilized to deliver weight loss (Tate, Wing, & Winett, 2001) and maintenance interventions (Wing, Tate, Gorin, Raynor, & Fava, 2006), achieving comparable outcomes at a lower cost (Meenan et al., 2009). Email or text messages have also been demonstrated to be beneficial for weight-loss (Shapiro et al., 2012), and have shown to be a successful medium for delivering care to an adolescent population as well (Sharifi et al., 2013; Smith, Kerr, Howie, & Straker, 2015). For example, a telehealth intervention utilizing a mobile ambulatory clinic has shown promise for an urban youth population (Slusser, Whitley, Izadpanah, Kim, & Ponturo, 2015). Indeed, a recent meta-analysis suggests the efficacy of telehealth interventions across a variety of technologies for the treatment of childhood obesity (Turner, Spruijt-Metz, Wen, & Hingle, 2015).

Emerging research suggests that telehealth treatment of obesity may extend to youth with intellectual and developmental disabilities. For example, in a pilot study investigating the efficacy of weight loss diets for adolescents with developmental disabilities, tablet computers were successfully employed to track dietary intake and physical activity, as well as to allow for video chat sessions with a registered dietitian (Ptomey et al., 2015). Patients and their parents video chatted with a registered dietitian weekly for two months, with 80% attendance. In addition, patients utilized their tablet computers to track dietary intake 83% of the time, with an overall improvement in diet quality. In terms of the patients' experience engaging with technology, 95% reported that the tablet was enjoyable and easy to use, although parents reported that only 42% of youth were able to utilize the tablet without assistance. However, additional studies in this area are lacking.

Nurses can play an important role in delivery of interventions via telehealth. Telenursing, a subtype of telehealth, is emerging field in which nurses provide care to patients over telecommunication devices (Kumar, 2011). Telenursing has been effectively utilized across a variety of technological mediums and treatment programs, and it positively influences the patient's perception of accessibility to care as well as speed of access (Hagan, Morin, & Lépine, 2000). In a program to prevent weight-related diseases through the use of short messaging services (SMS), telenursing users demonstrated greater knowledge of the subject material than non-telenursing users (Pangan et al., 2011). In a separate study assessing user perceptions of a telenursing service, users reported appreciating the clarity of nurses' responses to questions (Hagan et al., 2000). Users also saved an average of 5 hours of time in accessing the nurses via telephone as opposed to going in-person to their primary care provider. Given the importance of time, cost, and accessibility in determining whether

patients pursue and sustain care of chronic conditions such as obesity (Gillette et al., 2014; Kim et al., 2010), telenursing offers promising benefits in this regard. To maintain the continuum of care under the same treatment team, while alleviating stressors associated with travel to the treatment location, is a potentially significant benefit.

Challenges to using telehealth in this vulnerable and underserved population are similar to those associated with the implementation of technology in general. Barriers may include issues related to accessing the Internet and using computers, as well as concerns about maintaining privacy of health care information. For efficient and effective use of telehealth for intervention delivery, nurses must develop and maintain their own comfort level and ability to use telehealth while maintaining good rapport with patients (Dowell, Stubbe, Scott-Dowell, Macdonald, & Dew, 2013). Longer-term challenges for sustained use of telehealth can be multifaceted, including nurses' concerns regarding increased workload. For patients to stay engaged in self-management, they must perceive that telehealth is useful to them. Therefore, technologies will need to be developed that can address keeping both providers and patients engaged in using telehealth over time (Or et al., 2011).

Depending on the type of intellectual or developmental disability, parents and caregivers will need to evaluate the potential benefits relative to the risks of implementing family-based weight management interventions via telehealth. For example, parents may experience opposition from their child, including physical aggression, requiring a more intensive level of support and training from a certified behavior analyst. Thus intervention protocols will need to include appropriate screening of families and access to an interdisciplinary treatment team.

Summary and Future Directions

Despite evidence that youth with intellectual and developmental disabilities are at increased risk for overweight and obesity compared to youth without disabilities, relatively few interventions have been developed and evaluated for managing weight and eating in this population. In order to stimulate future work, we have highlighted available research, stressing the importance of creating a healthy environment among youth whose capacity for self-management may be limited. We suggest that telenursing holds promise for increasing access among parents and caregivers who may find participation in-person sessions to be burdensome when caring for a child with a disability. Nonetheless, telehealth also includes challenges and barriers. Developing partnerships among key stakeholders including nurses, families, and policy makers will be critical to developing effective training and treatment protocols. Creative approaches are needed for delivery of childhood obesity prevention and treatment (Pratt, Stevens, & Daniels, 2008), and novel interventions may need to be tailored to the disability population, as different physical, mental, and behavioral impairments may require specific intervention strategies. Interdisciplinary interventions that show evidence of feasibility and preliminary efficacy for weight management among youth with intellectual and developmental disabilities should be evaluated by nurse scientists in prospective, randomized, controlled studies including diverse samples.

References

- Adams KM, Kohlmeier M, Zeisel SH. Nutrition education in U.S. medical schools: Latest update of a national survey. *Academic Medicine*. 2010; 85(9):1537–1542. [PubMed: 20736683]
- Agerström J, Rooth DO. The role of automatic obesity stereotypes in real hiring discrimination. *Journal of Applied Psychology*. 2011; 96(4):790–805. [PubMed: 21280934]
- Barton M, US Preventive Services Task Force. Screening for obesity in children and adolescents: US Preventive Services Task Force recommendation statement. *Pediatrics*. 2010; 125(2):361. [PubMed: 20083515]
- Bazzano LA, Hu T, Bertisch SM, Yao L, Harville EW, Gustat J, Redline S. Childhood obesity patterns and relation to middle-age sleep apnoea risk: The Bogalusa Heart Study. *Pediatric Obesity*. 2016; 11(6):535–542. [PubMed: 26780975]
- Berge JM, Everts JC. Family-based interventions targeting childhood obesity: A meta-analysis. *Childhood Obesity*. 2011; 7(2):110–121. [PubMed: 26182126]
- Berkowitz B, Borchard M. Advocating for the prevention of childhood obesity: A call to action for nursing. *OJIN: The Online Journal of Issues in Nursing*. 2009; 14(1):1–7.
- Bleich SN, Bennett WL, Gudzone KA, Cooper LA. Impact of physician BMI on obesity care and beliefs. *Obesity (Silver Spring, Md.)*. 2012; 20(5):999–1005.
- Block JP, DeSalvo KB, Fisher WP. Are physicians equipped to address the obesity epidemic? Knowledge and attitudes of internal medicine residents. *Preventive Medicine*. 2003; 36(6):669–675. [PubMed: 12744909]
- Boutelle KN, Cafri G, Crow SJ. Parent-only treatment for childhood obesity: A randomized controlled trial. *Obesity (Silver Spring)*. 2011; 19(3):574–580. [PubMed: 20966907]
- Cassidy SB. Prader-Willi syndrome. *Journal of Medical Genetics*. 1997; 34(11):917–923. [PubMed: 9391886]
- Centers for Disease Control and Prevention. National diabetes fact sheet: National estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2011. p. 201
- Chen AY, Kim SE, Houtrow AJ, Newacheck PW. Prevalence of obesity among children with chronic conditions. *Obesity*. 2010; 18:210–213. [PubMed: 19521350]
- Cornette R. The emotional impact of obesity on children. *Worldviews on Evidence-Based Nursing*. 2008; 5(3):136–141. [PubMed: 19076912]
- Correll CU. Weight gain and metabolic effects of mood stabilizers and antipsychotics in pediatric bipolar disorder: A systematic review and pooled analysis of short-term trials. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2007; 46(6):687–700. [PubMed: 17513981]
- Curtin C, Bandini LG, Must A, Gleason J, Lividini K, Phillips S, Fleming RK. Parent support improves weight loss in adolescents and young adults with Down Syndrome. *The Journal of Pediatrics*. 2013; 163(5):1402–1408. e1401. [PubMed: 23968742]
- Dong B, Wang Z, Wang H-J, Ma J. The association between resting heart rate and blood pressure among children and adolescents with different waist circumferences. *European Journal of Pediatrics*. 2015; 174(2):191–197. [PubMed: 25023871]
- Dowell A, Stubbe M, Scott-Dowell K, Macdonald L, Dew K. Talking with the alien: Interaction with computers in the GP consultation. *Australian Journal of Primary Health*. 2013; 19(4):275–282. [PubMed: 24070141]
- Epstein LH, Myers MD, Raynor HA, Saelens BE. Treatment of pediatric obesity. *Pediatrics*. 1998; 101(Supplement 2):554–570. [PubMed: 12224662]
- Epstein LH, Paluch RA, Roemmich JN, Beecher MD. Family-based obesity treatment, then and now: Twenty-five years of pediatric obesity treatment. *Health Psychology*. 2007; 26(4):381–391. [PubMed: 17605557]
- Fiese BH, Jones BL. Food and family: A socio-ecological perspective for child development. *Advances in Child Development and Behavior*. 2012; 42:307–337. [PubMed: 22675910]

- Fleming RK, Stokes EA, Curtin C, Bandini LG, Gleason J, Scampini R, Hamad C. Behavioral health in developmental disabilities: A comprehensive program of nutrition, exercise, and weight reduction. *International Journal of Behavioral and Consultation Therapy*. 2008; 4(3):287–296. [PubMed: 20354592]
- Flower KB, Perrin EM, Viadro CI, Ammerman AS. Using body mass index to identify overweight children: Barriers and facilitators in primary care. *Ambulatory Pediatrics*. 2007; 7(1):38–44. [PubMed: 17261481]
- Forman-Hoffman V, Little A, Wahls T. Barriers to obesity management: A pilot study of primary care clinicians. *BMC Family Practice*. 2006; 7:35. [PubMed: 16756673]
- Gephart EF, Loman DG. Use of prevention and prevention plus weight management guidelines for youth with developmental disabilities living in group homes. *Journal of Pediatric Health Care*. 2013; 27(2):98–108. [PubMed: 23414975]
- Gillette MLD, Stough CO, Beck AR, Maliszewski G, Best CM, Gerling JK, Summar S. Outcomes of a weight management clinic for children with special needs. *Journal of Developmental and Behavioral Pediatrics*. 2014; 35:266–273. [PubMed: 24799265]
- Golan M, Crow S. Targeting parents exclusively in the treatment of childhood obesity: Long-term results. *Obesity Research*. 2004; 12(2):357–361. [PubMed: 14981230]
- Golan M, Kaufman V, Shahar DR. Childhood obesity treatment: Targeting parents exclusively v. parents and children. *British Journal of Nutrition*. 2006; 95(5):1008–1015. [PubMed: 16611394]
- Gressier F, Porcelli S, Calati R, Serretti A. Pharmacogenetics of clozapine response and induced weight gain: A comprehensive review and meta-analysis. *European Neuropsychopharmacology*. 2016; 26(2):163–185. [PubMed: 26792444]
- Grondhuis SN, Aman MG. Overweight and obesity in youth with developmental disabilities: A call to action. *Journal of Intellectual Disability Research*. 2014; 58(9):787–799. [PubMed: 24020517]
- Hagan L, Morin D, Lépine R. Evaluation of telenursing outcomes: Satisfaction, self-care practices, and cost savings. *Public Health Nursing*. 2000; 17(4):305–313. [PubMed: 10943779]
- Haggerty JL, Reid RJ, Freeman GK, Starfield BH, Adair CE, McKendry R. Continuity of care: A multidisciplinary review. *British Medical Journal*. 2003; 327(7425):1219–1221. [PubMed: 14630762]
- Halfon N, Larson K, Slusser W. Associations between obesity and comorbid mental health, developmental, and physical health conditions in a nationally representative sample of US children aged 10 to 17. *Academic Pediatrics*. 2013; 13(1):6–13. [PubMed: 23200634]
- Hoelscher DM, Kirk S, Ritchie L, Cunningham-Sabo L. Position of the Academy of Nutrition and Dietetics: Interventions for the prevention and treatment of pediatric overweight and obesity. *Journal of the Academy of Nutrition and Dietetics*. 2013; 113(10):1375–1394. [PubMed: 24054714]
- Holt N, Schetzina KE, Dalton WT, Tudiver F, Fulton-Robinson H, Wu T. Primary care practice addressing child overweight and obesity: A survey of primary care physicians at four clinics in Southern Appalachia. *Southern Medical Journal*. 2011; 104(1):14–19. [PubMed: 21119559]
- Hubbard KL, Bandini LG, Foltz SC, Wansink B, Eliasziw M, Must A. Impact of a Smarter Lunchroom intervention on food selection and consumption among adolescents and young adults with intellectual and developmental disabilities in a residential school setting. *Public Health Nutrition*. 2015; 18(2):361–371. [PubMed: 24636533]
- Janicke DM, Sallinen BJ, Perri MG, Lutes LD, Huerta M, Silverstein JH, Brumback B. Comparison of parent-only vs family-based interventions for overweight children in underserved rural settings: Outcomes from project STORY. *Archives of Pediatrics & Adolescent Medicine*. 2008; 162(12):1119–1125. [PubMed: 19047538]
- Jay M, Gillespie C, Ark T, Richter R, McMacken M, Zabar S, Kalet A. Do internists, pediatricians, and psychiatrists feel competent in obesity care?: Using a needs assessment to drive curriculum design. *Journal of General Internal Medicine*. 2008; 23(7):1066–1070. [PubMed: 18612746]
- Jay M, Schlair S, Caldwell R, Kalet A, Sherman S, Gillespie C. From the patient's perspective: The impact of training on resident physician's obesity counseling. *Journal of General Internal Medicine*. 2010; 25(5):415–422. [PubMed: 20217268]

- Jelalian E, Saelens BE. Empirically supported treatments in pediatric psychology: Pediatric obesity. *Journal of Pediatric Psychology*. 1999; 24(3):223–248. [PubMed: 10379137]
- Kalarchian MA, Levine MD, Arslanian SA, Ewing LJ, Houck PR, Cheng Y, Marcus MD. Family-based treatment of severe pediatric obesity: Randomized, controlled trial. *Pediatrics*. 2009; 124(4):1060. [PubMed: 19786444]
- Kalarchian MA, Marcus MD. Psychiatric comorbidity of childhood obesity. *International Review of Psychiatry*. 2012; 24(3):241–246. [PubMed: 22724645]
- Kellou N, Sandalinas F, Copin N, Simon C. Prevention of unhealthy weight in children by promoting physical activity using a socio-ecological approach: What can we learn from intervention studies? *Diabetes & Metabolism Journal*. 2014; 40(4):258–271.
- Kim Y, Pike J, Adams H, Cross D, Doyle C, Foreyt J. Telephone intervention promoting weight-related health behaviors. *Preventive Medicine*. 2010; 50(3):112–117. [PubMed: 20006642]
- Klein JD, Sesselberg TS, Johnson MS, O'Connor KG, Cook S, Coon M, Washington R. Adoption of body mass index guidelines for screening and counseling in pediatric practice. *Pediatrics*. 2010; 125(2):265–272. [PubMed: 20083518]
- Kolko RP, Kass AE, Hayes JF, Levine MD, Garbutt JM, Proctor EK, Wilfley DE. Provider training to screen and initiate evidence-based pediatric obesity treatment in routine practice settings: A randomized pilot trial. *Journal of Pediatric Health Care*. 2017; 31(1):16–28. [PubMed: 26873293]
- Kumar, S. Telenursing: An audit. In: Kumar, S., Snooks, H., editors. *Telenursing*. Health Informatics; 2011.
- Luppino FS, de Wit LM, Bouvy PF, Stijnen T, Cuijpers P, Penninx BW, Zitman FG. Overweight, obesity, and depression: A systematic review and meta-analysis of longitudinal studies. *Archives of General Psychiatry*. 2010; 67(3):220–229. [PubMed: 20194822]
- Maïano C, Hue O, Morin AJS, Moullec G. Prevalence of overweight and obesity among children and adolescents with intellectual disabilities: A systematic review and meta-analysis. *Obesity Reviews*. 2016; 17(7):599–611. [PubMed: 27171466]
- Maïano C, Normand CL, Aimé A, Bégarie J. Lifestyle interventions targeting changes in body weight and composition among youth with an intellectual disability: A systematic review. *Research in Developmental Disabilities*. 2014; 35(8):1914–1926. [PubMed: 24830882]
- Martínez-Ortega JM, Funes-Godoy S, Díaz-Atienza F, Gutiérrez-Rojas L, Pérez-Costillas L, Gurpegui M. Weight gain and increase of body mass index among children and adolescents treated with antipsychotics: A critical review. *European Child & Adolescent Psychiatry*. 2013; 22(8):457–479. [PubMed: 23503976]
- McGuire J, McDonnell J. Relationships between recreation and self-determination for adolescents and young adults with disabilities. *Career Development for Exceptional Individuals*. 2008; 31:154–163.
- McLean N, Griffin S, Toney K, Hardeman W. Family involvement in weight control, weight maintenance and weight-loss interventions: A systematic review of randomized trials. *International Journal of Obesity and Related Metabolic Disorders*. 2003; 27(9):987–1005. [PubMed: 12917703]
- Meenan RT, Stevens VJ, Funk K, Bauck A, Jerome GJ, Lien LF, Svetkey LP. Development and implementation cost analysis of telephone- and internet-based interventions for the maintenance of weight loss. *International Journal of Technology Assessment in Health Care*. 2009; 25(3):400–410. [PubMed: 19619360]
- Mikulovic J, Marcellini A, Compte R, Duchateau G, Vanhelst J, Fardy PS, Bui-Xuan G. Prevalence of overweight in adolescents with intellectual deficiency: Differences in socio-educative context, physical activity and dietary habits. *Appetite*. 2011; 56:403–407. [PubMed: 21146573]
- Miller WR, Sorensen JL, Selzer JA, Brigham GS. Disseminating evidence-based practices in substance abuse treatment: A review with suggestions. *Journal of Substance Abuse Treatment*. 2006; 31(1):25–39. [PubMed: 16814008]
- Modell SJ, Valdez LA. Beyond bowling: Transition planning for students with disabilities. *Teaching Exceptional Children*. 2002; 34(6):46–52.
- Must A, Curtin C, Hubbard K, Sikich L, Bedford J, Bandini L. Obesity prevention for children with developmental disabilities. *Current Obesity Reports*. 2014; 3(2):156–170. [PubMed: 25530916]

- Must A, Phillips S, Curtin C, Bandini LG. Barriers to physical activity in children with autism spectrum disorders: Relationship to physical activity and screen time. *Journal of Physical Activity & Health*. 2015; 12(4):529–534. [PubMed: 25920014]
- National Association of Pediatric Nurse Practitioners. NAPNAP position statement on the identification and prevention of overweight and obesity in the pediatric population. *Journal of Pediatric Health Care*. 2009; 23(6):A15–A16. [PubMed: 19882803]
- National Association of Pediatric Nurse Practitioners. NAPNAP position statement on the identification and prevention of overweight and obesity in the pediatric population. *Journal of Pediatric Health Care*. 2015; 29 (A13-A15).
- Nicol GE, Kolko RP, Mills M, Gunnarsdottir T, Yingling MD, Schweiger JA, Wilfley D. Behavioral weight loss treatment in antipsychotic treated youth. *Scandinavian Journal of Child and Adolescent Psychiatry and Psychology*. 2016; 4(2):96–104. [PubMed: 27347489]
- Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body mass index among US children and adolescents, 1999–2010. *JAMA*. 2012; 307(5):483–490. [PubMed: 22253364]
- Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States. *JAMA*. 2014; 311(8):806–814. [PubMed: 24570244]
- Ogden CL, Carroll MD, Lawman HG, Fryar CD, Kruszon-Moran D, Kit BK, Flegal KM. Trends in obesity prevalence among children and adolescents in the United States, 1988–1994 through 2013–2014. *JAMA*. 2016; 315(21):2292–2299. [PubMed: 27272581]
- Or CKL, Karsh B-T, Severtson DJ, Burke LJ, Brown RL, Brennan PF. Factors affecting home care patients' acceptance of a web-based interactive self-management technology. *Journal of the American Medical Informatics Association*. 2011; 18(1):51–59. [PubMed: 21131605]
- Oude Luttikhuis H, Baur L, Jansen H, Shrewsbury VA, O'Malley C, Stolk RP, Summerbell CD. Interventions for treating obesity in children. *Cochrane Database of Systematic Reviews*. 2009; (1)
- Pangan IK, Pangilinan GA, Pangilinan M, Pangilinan R, Pangilinan R, Par CJ, Paragas E. Telenursing through SMS (short messaging service): Its effect on knowledge and adherence. *International Journal of Public Health Research*. 2011:115–120.
- Phillips KL, Schieve LA, Visser S, Boulet S, Sharma AJ, Kogan MD, Yeargin-Allsopp M. Prevalence and impact of unhealthy weight in a national sample of US adolescents with autism and other learning and behavioral disabilities. *Maternal and Child Health Journal*. 2014; 18(8):1964–1975. [PubMed: 24553796]
- Pratt CA, Stevens J, Daniels S. Childhood obesity prevention and treatment recommendations for future research. *American Journal of Preventive Medicine*. 2008; 35(3):249–252. [PubMed: 18617353]
- Ptomey LT, Sullivan DK, Lee J, Goetz JR, Gibson C, Donnelly JE. The use of technology for delivering a weight loss program for adolescents with intellectual and developmental disabilities. *Journal of the Academy of Nutrition and Dietetics*. 2015; 115(1):112–118. [PubMed: 25441960]
- Puder JJ, Munsch S. Psychological correlates of childhood obesity. *International Journal of Obesity*. 2010; 34:S37–S43. [PubMed: 21151145]
- Puhl RM, Heuer CA. The stigma of obesity: A review and update. *Obesity*. 2009; 17(5):941–964. [PubMed: 19165161]
- Pulgarón ER. Childhood obesity: A review of increased risk for physical and psychological comorbidities. *Clinical Therapeutics*. 2013; 35(1):A18–A32. [PubMed: 23328273]
- Rausch JC, Perito ER, Hametz P. Obesity prevention, screening, and treatment: Practices of pediatric providers since the 2007 expert committee recommendations. *Clinical Pediatrics*. 2011; 50(5):434–441. [PubMed: 21525090]
- Rimmer JH, Rowland JL, Yamaki K. Obesity and secondary conditions in adolescents with disabilities: Addressing the needs of an underserved population. *Journal of Adolescent Health*. 2007; 41:224–229. [PubMed: 17707291]
- Rimmer JH, Yamaki K, Davis BM, Wang E, Vogel LC. Obesity and overweight prevalence among adolescents with disabilities. *Preventing Chronic Disease*. 2011; 8(2):A41. [PubMed: 21324255]

- Salaun L, Berthouze-Aranda SE. Physical fitness and fatness in adolescents with intellectual disabilities. *Journal of Applied Research in Intellectual Disabilities*. 2012; 25:231–239. [PubMed: 22489034]
- Saner C, Simonetti GD, Wühl E, Mullis PE, Janner M. Circadian and ultradian cardiovascular rhythmicity in obese children. *European Journal of Pediatrics*. 2016; 175(8):1031–1038. [PubMed: 27240757]
- Segal M, Eliasziw M, Phillips S, Bandini L, Curtin C, Kral T, Must A. Intellectual disability is associated with increased risk for obesity in a nationally representative sample of U.S. children. *Disability and Health Journal*. 2016; 9:392–398. [PubMed: 26785808]
- Serretti A, Mandelli L. Antidepressants and body weight: A comprehensive review and meta-analysis. *Journal of Clinical Psychiatry*. 2010; 71:1259–1272. [PubMed: 21062615]
- Shapiro JR, Koro T, Neal Doran N, Thompson S, Sallis JF, Calfas K, Patrick K. Text4Diet: A randomized controlled study using text messaging for weight loss behaviors. *Preventive Medicine*. 2012; 55:412–417. [PubMed: 22944150]
- Sharifi M, Dryden EM, Horan CM, Price S, Marshall R, Hacker K, Taveras EM. Leveraging text messaging and mobile technology to support pediatric obesity-related behavior change: A qualitative study using parent focus groups and interviews. *Journal of Medical Internet Research*. 2013; 15(12):e272. [PubMed: 24317406]
- Sholomskas DE, Syracuse-Siewert G, Rounsaville BJ, Ball SA, Nuro KF, Carroll KM. We don't train in vain: A dissemination trial of three strategies of training clinicians in cognitive-behavioral therapy. *Journal of Consulting and Clinical Psychology*. 2005; 73(1):106–115. [PubMed: 15709837]
- Slevin E, Truesdale-Kennedy M, McConkey R, Livingstone B, Fleming P. Obesity and overweight in intellectual and non-intellectually disabled children. *Journal of Intellectual Disability Research*. 2014; 58(3):211–220. [PubMed: 22957929]
- Slusser W, Whitley M, Izadpanah N, Kim SL, Ponturo D. Multidisciplinary pediatric obesity clinic via telemedicine within the Los Angeles metropolitan area: Lessons learned. *Clinical Pediatrics*. 2015; 55:251–259. [PubMed: 26187610]
- Smith KL, Kerr DA, Howie EK, Straker LM. Do overweight adolescents adhere to dietary intervention messages? Twelve-month detailed dietary outcomes from Curtin University's Activity, Food and Attitudes Program. *Nutrients*. 2015; 7(6):4363–4382. [PubMed: 26043035]
- Spear BA, Barlow SE, Ervin C, Ludwig DS, Saelens BE, Schetzina KE, Taveras EM. Recommendations for treatment of child and adolescent overweight and obesity. *Pediatrics*. 2007; 120(Supplement 4):S254. [PubMed: 18055654]
- Spivack JG, Swietlik M, Alessandrini E, Faith MS. Primary care providers' knowledge, practices, and perceived barriers to the treatment and prevention of childhood obesity. *Obesity*. 2010; 18(7): 1341–1347. [PubMed: 19910934]
- Stanish HI, Curtin C, Must A, Phillips S, Maslin M, Bandini LG. Physical activity enjoyment, perceived barriers, and beliefs among adolescents with and without intellectual disabilities. *Journal of Physical Activity & Health*. 2016; 13(1):102–110. [PubMed: 25830443]
- Story MT, Neumark-Stzainer DR, Sherwood NE, Holt K, Sofka D, Trowbridge FL, Barlow SE. Management of child and adolescent obesity: Attitudes, barriers, skills, and training needs among health care professionals. *Pediatrics*. 2002; 110(Supplement 1):210. [PubMed: 12093997]
- Sung-Chan P, Sung YW, Zhao X, Brownson RC. Family-based models for childhood-obesity intervention: A systematic review of randomized controlled trials. *Obesity Reviews*. 2013; 14(4): 265–278. [PubMed: 23136914]
- Tanamachi Y, Saruwatari J, Noai M, Kamihashi R, Soraoka H, Yoshimori Y, Nakagawa K. Possible association between moderate intellectual disability and weight gain in valproic acid-treated patients with epilepsy. *Neuropsychiatric Disease and Treatment*. 2015; 11:1007. [PubMed: 25897238]
- Tate DF, Wing RR, Winett RA. Using Internet technology to deliver a behavioral weight loss program. *JAMA*. 2001; 285(9):1172–1177. [PubMed: 11231746]

- Turner T, Spruijt-Metz D, Wen CKF, Hingle MD. Prevention and treatment of pediatric obesity using mobile and wireless technologies: A systematic review. *Pediatric Obesity*. 2015; 10(6):403–409. [PubMed: 25641770]
- Vander Wal JS, Mitchell ER. Psychological complications of pediatric obesity. *Pediatric Clinics of North America*. 2011; 58(6):1393–1401. [PubMed: 22093858]
- Vetter ML, Herring SJ, Sood M, Shah NR, Kalet AL. What do resident physicians know about nutrition? An evaluation of attitudes, self-perceived proficiency and knowledge. *Journal of the American College of Nutrition*. 2008; 27(2):287–298. [PubMed: 18689561]
- Weil E, Wachterman M, McCarthy EP, Davis RB, O'Day B, Iezzoni LI, Wee CC. Obesity among adults with disabling conditions. *JAMA*. 2002; 288(10):1265–1268. [PubMed: 12215134]
- Wing RR, Tate DF, Gorin AA, Raynor HA, Fava JL. A self-regulation program for maintenance of weight loss. *New England Journal of Medicine*. 2006; 355(15):1563–1571. [PubMed: 17035649]
- Wirrell EC. Valproic acid-associated weight gain in older children and teens with epilepsy. *Pediatric Neurology*. 2003; 28:126–129. [PubMed: 12699863]

Select intervention studies for treatment of weight and eating among youth within intellectual and developmental disabilities.

Table 1

Year	Authors	Treatment Target	Sample	Setting	Methods	Main Outcome
2015	Hubbard et al.	Employing a Smarter Lunchroom intervention rooted in behavioral economics; focus on nudge approaches.	Youth (N = 43) ages 11–22 with intellectual and developmental disabilities	Private residential school (Massachusetts) for children with developmental disabilities	Three-month quasi-experimental, pre-post design utilizing environmental changes to affect dietary change.	Fruit and whole grains consumption increased by $M = .18$ and $M = .38$ servings respectively, suggesting the importance of nudge approaches for improving food choices in this population.
2013	Gephart & Loman	Implementing Prevention and Prevention Plus strategies for weight management; focus on caregiver education.	Youth (N = 40) ages 8–20 with developmental disabilities and various medical impairments	Ten community group homes in the Midwestern United States	Caregiver staff educated in prevention strategies; also utilized weight management tool to monitor youths weight, exercise, and diet needs.	Significant decrease in mean BMI across age and gender; more than 80% of youth participants achieved weight goal.
2014	Gillette et al.	Evaluating the effectiveness of the Special Needs Weight Management Clinic, a multidisciplinary program attended by youth and their families.	Youth (N = 76) ages 2–19 with developmental disabilities	The Special Needs Weight Management Clinic based in a Midwest children's hospital	Youth were enrolled in the clinic for one year; interdisciplinary team developed individualized recommendations for each youth and family with follow-up occurring throughout.	Overall reduction in BMIz over initial six months of measurement ($M = 2.43$ to $M = 2.36$), though study experienced substantial attrition; significant increases in fruit, gram, and vegetable consumption.
2013	Curtin et al.	Comparing the efficacy of nutrition and activity education (NAE) to NAE plus behavioral intervention (BI).	Youth (N = 21) ages 13–26 with Down syndrome	University of Massachusetts Medical School	Youth and parents were enrolled in a 6-month intervention, either NAE alone or NAE + BI.	Overall patient weight loss was less than predicted, but the group with NAE + BI weighed $M = 3.2$ kg less than the group with NAE alone, suggesting the importance of BI in this population. Mean group differences were sustained at 1 year follow-up.

Note. NAE = nutrition and activity education; BI = behavioral intervention.