Examining the Relationship Between Parent and Child Health in Young Children with Developmental Disabilities

by
Gregory Alexander Heinonen

A THESIS

submitted to

Oregon State University

Honors College

in partial fulfillment of
the requirements for the
degree of

Honors Baccalaureate of Science in Public Health
(Honors Scholar)

Presented May 23, 2017
Commencement June 2019

AN ABSTRACT OF THE THESIS OF

Gregory Heinonen for the degree of Honors Baccalaureate of Science in Public Health presented May 23, 2017. Title: Examining the Relationship Between Parent and Child Health in Young Children with Developmental Disabilities

Abstract approved:_____

Megan MacDonald

Childhood obesity is an extensively research topic as it effects a large number of individuals and has serious consequences on those effected. Current statistics estimate roughly 17% of the youth population is now obese. However, the spread of these cases is not equally distributed. Certain populations are at increased risk for becoming obese or overweight, including certain ethnic groups, individuals with low socioeconomic status, and lastly, the focus of this research, children with developmental disabilities.

Previous studies have showed children with developmental disabilities face increased rates of overweight and obesity compared to their peers without disabilities. Furthermore, additional research has highlighted the direct influence that parental factors, most prominently parental weight status, can have on typically developing children. However, little research has shown the effect that parental weight status has on the health of children with developmental disabilities. Because of the increased dependence on parents, it is possible that these effects are magnified in children with developmental disabilities. The purpose of this research is to strengthen findings from previous research correlating the health of parents and their children and to examine the influence that parental weight status has on the weight status of young children with a range of developmental disabilities.

Significant correlations were observed between parent and child weight ($p = 0.002$) and child weight and household income ($p = .03$). When child overweight was indicated as the dependent variable, linear regression analysis revealed a significant relationship with parent overweight ($p=.001$) after controlling for household income ($p=.007$) and gender of the child participant. These results corroborate what previous studies of typically developing children and their parents have found which is that increased parent weight status correlates with an observed increased weight status of their children. Due to the serious negative consequences that childhood obesity can have, early identification and subsequent intervention for children at increased risk for being overweight/ obese is imperative in decreasing the immediate and long term negative health consequences.

Key Words: developmental disabilities, childhood obesity, parent and child health
Corresponding e-mail address: heinoneng@gmail.com

Examining the Relationship Between Parent and Child Health in Young Children with Developmental Disabilities

by
Gregory Alexander Heinonen

A THESIS

submitted to

Oregon State University

Honors College

in partial fulfillment of
the requirements for the
degree of

Honors Baccalaureate of Science in Public Health
(Honors Scholar)

Presented May 23, 2017
Commencement June 2019

Honors Baccalaureate of Science in Public Health project of Gregory Alexander Heinonen presented on May 23, 2017.

APPROVED:

_____

Megan MacDonald, Mentor, representing Kinesiology

_____

Byung Mo Ku, Committee Member, representing Kinesiology

_____

Sam Logan, Committee Member, representing Kinesiology

_____

Toni Doolen, Dean, Oregon State University Honors College

I understand that my project will become part of the permanent collection of Oregon State University, Honors College. My signature below authorizes release of my project to any reader upon request.

_____

Gregory Alexander Heinonen, Author

Table of Contents

Introduction

Childhood obesity (defined as a Body Mass Index at or above the 95th percentile for a given age and gender) is an extensively researched topic as it impacts a large number of individuals and has dramatic consequences on those affected (Caprio, et al., 2008). Current statistics estimate roughly 17% of the youth population is now obese (Ogden, Carroll & Kit, 2014). Additionally, this number has tripled over the past three decades (cdc.gov). However, the spread of these cases is not equally distributed. Certain populations are at increased risk of becoming obese or overweight, including certain ethnic groups, individuals with low socioeconomic status, and lastly, the focus of this research, children with developmental disabilities (Caprio et al., 2008).

The increased prevalence of overweight and obesity in children with intellectual and developmental disabilities has been widely studied and the significance of their condition on the development of increased weight status has been well established. For instance, a sample of children with chronic conditions including asthma, diabetes, attention deficit hyperactive disorder, significant developmental delay, and autism were found to have a higher prevalence of obesity compared to typically developing and healthy children (Chen, Kin, Houtrow & Newacheck, 2010). A study examining the prevalence of obesity of each of the aforementioned conditions found autism spectrum disorder to be the highest as 23.4% of the sample was obese. Children with generalized "learning disability" were found to have a prevalence of obesity of 19.3%. (Chen, et al., 2010). Rimmer et al. [2010] studied the prevalence of obesity in children specifically with autism spectrum disorder or Down

syndrome. Results showed that children with ASD and DS are two to three times more likely to be overweight or obese than typically developing children. (Rimmer, Yamaki, Lowry, Wang & Vogel, 2010).

Similarly, the following study analyzed a sample of children between 2-18 with developmental delay for overall health as determined by weight status. Analyses showed that 24% of the children with developmental disabilities were overweight and 15% were obese (39% of the sample was above normal weight) whereas the percentage of obesity and overweight was 17% and 6% respectively for typically developing children in the same age group. (Curtin, Anderson, Must & Bandini, 2010).

In a study examining the prevalence of overweight and obesity in young children with and without developmental delay between the ages of 2 and 5, researchers conducted a comparative longitudinal birth cohort study using the UK's Millennium Cohort Study data and various statistical analyses. Results indicated that by age 3, children with developmental delay are 30% more likely to be obese and overweight compared to typically developing peers. (Emerson, 2009).

Further analysis has shown that the prevalence of obesity in children is 6.8% higher in children with ASD compared to typically developing children (30.4% and 23.6% respectively) (Curtin, et. al., 2010).

More broadly, a number of studies have examined the determinants of becoming obese as a child. This knowledge is particularly helpful when considering possible interventions one may be able to take to reduce the increasing prevalence of obesity in children. The following study identified various risk factors for childhood

overweight and obesity in typically developing children between birth and 9.5 years. Authors found 5 independent risk factors (parental overweight, child temperament, tantrums over food, parental concerns over thinness, and hours of sleep) each with varying influences on increased weight status. Of the five factors, parental overweight was found to have the greatest influence on child health (Agras, Hammer, Mcnicholas & Kraemer, 2004). A similar study identified the most influential factors for childhood obesity as socio-economic status, dietary intake, and overall activity. The authors of this study found parental overweight to be a strong risk factor for childhood obesity as well. Both the genetic and environmental influences were taken into account for the purposes of this study. Authors estimated that genetic influences accounted for 25-90% of the child-parent differences in fat mass with home and school environment accounting for the remaining percentage (Danielzik, Czerwinski-Mast, Langnäse, Dilba & Müller, 2004). Both the aforementioned studies found the strongest indicator for childhood obesity in typically developing children to be the health and behaviors of parents. Similar results were found in a study by Mikulovic et al. [2010] which examined the prevalence of obesity and overweight though in this case just those in children with developmental disability. This observational study used data from 410 children with intellectual disabilities living in France. Results concluded that children with ID were significantly more likely to be obese than typically developing children and risk of obesity increased with age. This study was unique in that it established a connection between childhood obesity and parental weight status in a population of children and adolescents with a disability. Results indicated that 29.4% of children with ID who had at least one overweight parent were

overweight or obese themselves (9.4% were obese) whereas just 15% of children with no overweight parent were overweight or obese (1.7% were obese). However, due to the lack of literature on the subject, further research is required to strengthen these results – the goal of this research. (Mikulovic et al., 2011).

Due to the nature of the parent-child relationship, parents have the ability to influence the weight status of their child through both genetic components and environmental influences and exposure. However, due to the rapid changes that occur early on in life, the environmental and genetic effects on weights status are believed to differ based on age. The following study of twin and adoption data found the relative proportions of genetic and environmental influences on childhood obesity. The main findings pointed to environmental and genetic influence having their greatest effect at different times between childhood and adolescence. Environmental influence has the greatest effect during mid-childhood and began to taper towards adolescent. A parent's genetic influence manifests in the opposite direction and shows the greatest influence during adolescence after independence is gained and previously shared activities specifically related to exercise and eating become less frequent (Silventoinen, Rokholm, Kaprio & Sørensen, 2009). It is believed that the environmental and genetic influences are interdependent on one another and affect each other as well as the health of both parent and child. Individuals with genetic propensity of overweight and obesity are likely to select environments for both themselves and their children that promote an unhealthy lifestyle through activity levels and dietary choices leading to the development of increased weight status. Furthermore, the combination of genetic predisposition for obesity in combination

with parents' inability to adequately control caloric intake of themselves and thereby their child, puts children of obese parents at high risk for overweight or obesity themselves. Childhood is the primary stage at which many dietary preferences and eating styles are learned. If these preferences are learned in unhealthy eating environments, ineffective and unhealthy eating habits can be established, putting children at risk for substantial weight gain (Birch & Davison, 2001).

Children with developmental disabilities face many of the similar risk factors to obesity as typically developing children but also experience additional challenges as a direct result of their disability. Children with developmental disabilities often have lower levels of fat-free mass and subsequent decreased energy requirements. Since the caloric needs of these children are lower, they face issues with satiety especially in environments rich in energy-dense food choices which are often present in households with overweight or obese parents . Previous studies have found children with developmental disabilities are equally or more likely to consume high nutrient food compared to typically developing children who already have high rates of sugar-sweetened dietary choices. This is a specific challenge to children with developmental disabilities as many are particularly "picky eaters" (specifically those with ASD).

Moreover, children with developmental disabilities engage in physical activity significantly less frequently than typically developing children in part due to the challenges associated with motor skill difficulties resulting from their disability. Barriers to physical activity for children with developmental disabilities include lack of accessible programs, lack of child interest, motor challenges, and behavioral

difficulties. Significant barriers to physical activity for children with ASD include the need for supervision (more often than peers), and fewer peers than children without ASD (Rimmer, Rowland, Yamaki, 2007).

As mentioned previously, parents play a key role in influencing eating and physical activity patterns in children in this population. Substantial evidence promotes the importance of family meals in obesity prevention. Additional associations have been established between family stress, maternal depression, and poor family cohesion. Families of children have increased familial stress which could be a possible contributor to the increased rates of obesity in this population. Finally, an additional contributor to increased weight status could be the various psychotropic medications often prescribed to children with DD and ASD (30-60% of children) (Rimmer, Rowland, et al., 2007)

All of the aforementioned studies clearly highlighted the increased need for direct interventions for children with developmental disabilities. The dramatically increased prevalence of obesity is caused by physical inactivity, dietary factors, sedentary behavior, and most significantly familial factors - the primary cause for concern when considering the health of this population. The familial influences take into account eating and physical activity patterns of the family within the context of the family environment. The special needs of children with DD can pose specific challenges for parents specifically in regards to eating and meal times. Since many children are dependent on their parents for food, and since children who are dependent on parents for food are more likely to obese, it is likely that children with

DD are more likely to have increased weight status for that reason (Must, et al., 2014).

Furthermore, established literature has shown increased rates of obesity in children with developmental disabilities and the direct influence that parental factors, most prominently parent weight status, can have on typically developing children. However, little research has shown the effect that parental weight status has on the health of children with developmental disabilities. Because of the increased dependence on parents, the effects these children face are likely to be exacerbated in this population. McGillivray et al. examined many of the possible ways parents influenced the weight status, specifically the presence of obesity, in children with disabilities. Results indicated that possible parental influences on child weight status were socioeconomic status, perception and attitudes towards their children's weight and physical activity, levels of activity in both parents and children, and parental BMI. Despite these correlations, substantial evidence and firm conclusions cannot be reached. Because of this, authors indicated that further research must be done on the subject to establish stronger evidence (Mcgillivray, Mcvilly, Skouteris & Boganin, 2013).

The inequalities in weight status for certain demographic groups are well established, specifically for individuals with developmental disabilities. Additionally, previous research has confirmed the presence of both genetic and environmental effects on the health of typically developing weight status and the influence that parents have on determining the health of their children. However, as noted above, a lack of research specifically related to the influence parent health has on children with

developmental disabilities exists and must be further studied to reduce the significant consequences associated with increased weight status in young children. The purpose of this research is to strengthen these findings and to examine the influence of parental weight status on the health of young children with developmental disabilities

Methods:

Young children with developmental disabilities between the ages of 2 – 4 years (n=113, *M* = 36.81 months, *SD* = 4.87) were recruited to participate in this study through their early intervention programs in a Pacific Northwest region of the United States. Parents of children in these programs responded to flyers made available to them through their intervention program providers. Research assistants screened the parent or caregiver of the child to assess inclusionary criteria: (a) between 2 and 4 years (at the time of entry), (b) documented developmental delay or disability (including but not limited to, autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder (ADHD), and speech and language disorders), (c) services received through an Individualized Family Service Plan (IFSP), (d) ambulatory and not deaf or blind, and (e) living with the primary caregiver for at least 1 year. The primary caregiver was, for the most part, the mother of the child (*n* = 93, 82.3%). Most of the participants were male (*n* = 86, 76.1%), had a speech or language delay (*n* = 67, 59.3%), and were Caucasian (*n* = 75, 66.4%).

Procedures.

This project is part of a larger study (The Oregon Parent Project) concerned with better understanding toddlers and preschoolers with behavioral and

developmental concerns and aims to investigate the changes in child development observed during early childhood. With this in mind, a research question was developed that would allow the use of the existing dataset with information regarding the health of families with young children with developmental disabilities. After a research question was established, initial review of the data was done to examine the possible variables of interest that could be used. The following variables were selected due to their relevance to weight status and the influence of each on child and parental health. Subsequent secondary analysis of the data was done to answer the question: What is the relationship between parent and child health in young children with developmental disabilities?

Measures:

Demographic questionnaire:

A brief demographic questionnaire was administered and included relevant variables such as child age, gender, race/ethnicity, special education and related service utilization, and parent/ caregiver age, education, and income via an in-home interview with research assistants. Additionally, disability status as reported by the parent/caregiver of the child participant was included in this survey as well. From these variables, child age, gender, race/ethnicity, and disability status were selected to include in the analysis (See Table 1).

Motor skills:

Participant's motor skills were tested via the Test of Gross Motor Development – 2 (Ulrich, 2000). The research assistants administering these tests were appropriately trained on the methods. This test reliably measures motor skills of children both with

and without disabilities (Berkeley, Zittel, Pitney & Nichols 2001; Staples & Reid 2010). Although originally created for children between 3 and 10 it has been shown to produce valid results in children as young as 2. Measures include the essential skills as required for active play including locomotion skills (running, galloping, hopping, sliding, and jumping) and object-control skills (overhand throwing, striking, kicking, and catching). Each skill was scored dichotomously (0 = not present, 1 = present) as evaluated for key movement patterns for each activity. The subsequent summation of all skills was considered the *Raw Gross Motor Skill* score which would be used in analysis to represent overall motor skill competency. The variables "Locomotor skills" and "Object Control" were ultimately selected as variables of interest to be included in analysis.

Weight Status:

Based on in-home video recordings of parent/ child play, research assistants, blind to the study purpose, rated the child and parent weight status based on a 9-point scale (1 = underweight; 9 = overweight). Analysis showed interrater reliability coefficients to be at or above kappa = .70 thus these values are included in the analysis of this study.

Table 1: Sample Characteristics	
Variable	N (%)
Gender	
Male	86 (76.1)
Female	27 (23.4)
Age	29-46 months (mean=36.81, SD=4.87)
Diagnosis (*parental report)*	
Developmental Delay	9 (7.9)
Speech/Language Delay	67 (59.3)
Autism Spectrum Disorder	11 (9.7)
Other	24 (21.2)
Ethnicity	
White-Caucasian	75 (66.4)
Hispanic-Latino	6 (5.3)
Asian	2 (1.8)
Other	1 (0.8)
Bi-Racial	29 (25.7)
Income	
<$4,999	3 (2.7)
$5,000-$9,999	12 (10.6)
$10,000-$14,999	15 (13.3)
$15,000- $19,999	8 (7.1)
$20,000- $24,999	3 (2.7)
$25,000- $29,999	11 (9.7)
$30,000- $39,999	14 (12.4)
$40,000- $49,999	13 (11.5)
$50,000- $59,999	5 (4.4)
$60,000- $69,999	13 (11.5)
$70,000- $79,999	5 (4.4)
$80,000- $89,999	3 (2.7)
$90,000 +	8 (7.1)

Data Analysis:

Pearson correlations were conducted to view the initial relations between parent and child weight status independently and as each variable relates to known contributors to weight status of children such as age and motor skills, gender, household income, and ethnicity. Linear regression analyses were conducted with child weight status as the dependent variable and the covariates of, income and child participant gender. Each of these traits are known to influence weight status as evidenced by previous research and were therefore considered in this study. This was confirmed through correlations conducted in this research. Other variables included in the data set such as parent education and age were not included in analysis as they showed no significant correlation to participant weight status and are not known to influence child weight status.

Results:

Pearson correlation tests indicate significant correlations between a number of the variables selected for analysis in this study. The variables "parent overweight" and "child overweight" were found to be positively correlated ($r = .296, p < .01$). Theoretical variables such as gender and age (in months) were included in correlation tests as well as both are known to influence child weight status – however, no significant correlations were observed in analysis. Table 2 displays descriptives of the key weight status variables that were included in analyses (see Table 2). Table 3 indicates a relationship between child race/ethnicity and weight status however the variable "race/ethnicity" was arbitrarily assigned a numerical value in coding and is therefore not a significant output. When child overweight was indicated as the dependent variable, linear regression analysis revealed a significant relationship with

parent overweight (p=.001) after controlling for household income (p=.007) and gender of the child participant. These results corroborate what previous studies of typically developing children and their parents have found which is that increased parent weight status correlates with an observed increased weight status of their children.

Table 2. Weight Status Variable Descriptives

Measure	N	Minimum Value	Maximum Value	Mean	Standard Deviation
Child Weight Status	113	1	9	3.90	2.044
Caregiver Weight Status	113	1	6	1.65	.961

Table 3. Pearson Correlations

Measure	1.	2.	3.	4.	5.	6.	7.	8.
1. Child Age in Months	–							
2. Child Gender	*.111*	–						
3. Annual Household Income	*.089*	*.122*	–					
4. Child Race/Ethnicity	*.052*	*.099*	*-.206**	–				
5. Child Overweight	*-.172*	*.108*	*-.209**	*.083*	–			
6. Caregiver Overweight	*-.069*	*.000*	*-.044*	*.020*	*.296***	–		
7. Locomotor – raw score	*.475***	*.115*	*-.048*	*.112*	*-.095*	*-.133*	–	
8. Object Control – raw score	*.191**	*.210**	*-.177*	*.125*	*.065*	*.0249*	*.676***	-–

Notes.
** denotes correlation significant at the .01 level (2-tailed)
* denotes correlation significant at .05 Level (2-tailed)

Discussion:

These results are in line with what previous studies of typically developing children have found in regards to the relationship between parent and child weight status (Danielzik, et al. 2004). Observed correlations are likely due to the increased dependence that children with developmental disabilities have on their parents in combination with general environmental and genetic influences associated with weight status (Chen et al. 2010; Danielzik et al. 2004). This unique relationship is often beneficial and necessary for the child but may, unfortunately, have negative consequences – such as increased weight status in children (Chen, et al., 2010; Curtis, et al., 2010). Due to the young age of the sample from this study, results indicate that the relationship presents early on in the child's life. Unfortunately, the consequences of becoming obese at such a young age are well established in both typically developing and developmentally delayed children as it leads to increased morbidity and mortality as adults and is a risk factor for the development of other serious conditions such as high blood pressure and cholesterol (Rimmer, et al., 2010). Additionally, both children and adults with developmental disabilities already face known inequities in regards to prevalence of overweight and obesity (Caprio, et al., 2008). However, identifying children that are at risk for becoming overweight or obese, perhaps by the presence of an overweight or obese parent, the associated side effects could be minimized by early intervention through a variety of available programs. The results from this study establish this relationship and support the need for the implementation and development of the aforementioned interventions. Rates of obesity are extremely high and the age of onset of obesity is declining as well. To

preserve the health of these children, further interventions must be established and utilized by these families.

Results also indicated other concerning demographic inequalities that exist in this sample that support previous related research (Caprio et al., 2008). A negative correlation was observed between the variables of child weight status and household income. Unfortunately, low-income households are often unable to provide healthy food choices to their children and often resort to fast-food and other energy-dense, nutrient-lacking options (Drewnowski, & Eichelsdoerfer, 2010). This certainly contributes to the increased weight status that exists in this population and may aid in explaining the results of this study (Stelmach-Mardal et al., 2016). Additionally, parents of children with developmental disabilities may be more inclined to utilize food as a pacifier for treating bad behavior more often than parent of typically developing children who may be better socialized in various settings resulting in increased weight status in these children (Williams, Hendy & Knecht, 2007).

Further research should be focused on developing interventions to alleviate the serious consequences of obesity and overweight development in young children with developmental disabilities. With the results from this study in mind, possible children in need of intervention could be identified by the presence of one or both overweight/obese parents. Parents play a key role in determining the health of their child and including them in primary or secondary prevention efforts in childhood obesity is key, especially in children with developmental disabilities (Lindsay et al., 2006) Specific interventional programs could include education of parents regarding the importance of physical activity and healthy eating in this population. Furthermore,

a program focused on primary prevention of the child (preventing the onset of obesity) and secondary prevention of the parent (alleviating the secondary effects of obesity) could be more successful than just focusing on the health of the child individually. Such a program could be successful in increasing the physical health of each party while working to strengthen the parent-child connection which is incredibly important in children with developmental disabilities.

References:

Agras, W., Hammer, L. D., Mcnicholas, F., & Kraemer, H. C. (2004, July 14). Risk factors for childhood overweight: A prospective study from birth to 9.5 years. The Journal of Pediatrics, 145(1), 20-25.

Berkeley, S. L., Zittel, L. L., Pitney, L. V., & Nichols, S. E. (2001). Locomotor and object control skills of children diagnosed with autism. *Adapted Physical Activity Quarterly, 18*(4), 405-416.

Birch, L. L., & Davison, K. K. (2001, August). Family Environmental Factors Influencing The Developing Behavioral Controls Of Food Intake And Childhood Overweight. *Pediatric Clinics of North America, 48*(4), 893-907. doi:10.1016/s0031-3955(05)70347-3

Bonvin, A., Barral, J., Kakebeeke, T. H., Kriemler, S., Longchamp, A., Marques-Vidal, P., & Puder, J. J. (2012). Weight status and gender-related differences in motor skills and in child care - based physical activity in young children. *BMC Pediatrics, 12*(1). doi:10.1186/1471-2431-12-23

Caprio, S., Daniels, S. R., Drewnowski, A., Kaufman, F. R., Palinkas, L. A., Rosenbloom, A. L., Kirkman, M. S. (2008). Influence of Race, Ethnicity, and Culture on Childhood Obesity: Implications for Prevention and Treatment. *Obesity, 16*(12), 2566-2577. doi:10.1038/oby.2008.398

Chen, A. Y., Kim, S. E., Houtrow, A. J. and Newacheck, P. W. (2010), Prevalence of Obesity Among Children With Chronic Conditions. *Obesity,* 18: 210–213. doi:10.1038/oby.2009.185

Curtin, C., Anderson, S. E., Must, A., & Bandini, L. (2010, February 23). The prevalence of obesity in children with autism: A secondary data analysis using nationally representative data from the National Survey of Children's Health. *BMC Pediatrics BMC Pediatr, 10*(1). doi:10.1186/1471-2431-10-11

Danielzik, S., Czerwinski-Mast, M., Langnäse, K., Dilba, B., & Müller, M. J. (2004, August 24). Parental overweight, socioeconomic status and high birth weight are the major determinants of overweight and obesity in 5–7 y-old children: Baseline data of the Kiel Obesity Prevention Study (KOPS). *International Journal of Obesity, 28*(11), 1494-1502. doi:10.1038/sj.ijo.0802756

De, S., Small, J., & Baur, L. A. (2008). Overweight and obesity among children with developmental disabilities. Journal of Intellectual and Developmental Disability J Intellect Dev Dis, 33(1), 43-47.

Drewnowski, A., & Eichelsdoerfer, P. (2010). Can Low-Income Americans Afford a Healthy Diet? *Nutrition Today*, *44*(6), 246–249. http://doi.org/10.1097/NT.0b013e3181c29f79

Emerson, E. (2009, January 14). Overweight and obesity in 3- and 5-year-old children with and without developmental delay. *Public Health, 123*(2), 130-133. doi:10.1016/j.puhe.2008.10.020

Goodway, J., Crowe, H., & Ward, P. (2003). Effects of motor skill instruction on fundamental motor skill development. *Adapted phyiscal activity quarterly, 20*(3), 298-314.

Lindsay, A. C., Sussner, K. M., Kim, J., & Gortmaker, S. (2006). The role of parents in preventing childhood obesity. *The Future of children*, 169-186.

Mcgillivray, J., Mcvilly, K., Skouteris, H., & Boganin, C. (2013, March 25). Parental factors associated with obesity in children with disability: A systematic review. *Obesity Reviews, 14*(7), 541-554. doi:10.1111/obr.12031

Mikulovic, J., Marcellini, A., Compte, R., Duchateau, G., Vanhelst, J., Fardy, P. S., & Bui-Xuan, G. (2011, December 10). Prevalence of overweight in adolescents with intellectual deficiency. Differences in socio-educative context, physical activity and dietary habits. *Appetite*, 56(2), 403-407. doi:10.1016/j.appet.2010.12.006

Must, A., Curtin, C., Hubbard, K., Sikich, L., Bedford, J., & Bandini, L. (2014, June 18). Obesity Prevention for Children with Developmental Disabilities. *Curr Obes Rep Current Obesity Reports, 3*(2), 156-170. doi:10.1007/s13679-014-0098-7

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of Childhood and Adult Obesity in the United States, 2011-2012. *Journal of The American Medical Association, 311*(8). doi:10.1001/jama.2014.732

Rimmer, J. H., Rowland, J. L., & Yamaki, K. (2007, September). Obesity and Secondary Conditions in Adolescents with Disabilities: Addressing the Needs of an Underserved Population. Journal of Adolescent Health, 41(3), 224-229. doi:10.1016/j.jadohealth.2007.05.005

Rimmer, J. H., Yamaki, K., Lowry, B. M., Wang, E., & Vogel, L. C. (2010). Obesity and obesity-related secondary conditions in adolescents with intellectual/developmental disabilities. *Journal of Intellectual Disability Research, 54*(9), 787-794.

Silventoinen, K., Rokholm, B., Kaprio, J., & Sørensen, T. I. (2009, September 15). The genetic and environmental influences on childhood obesity: A systematic

review of twin and adoption studies. *International Journal of Obesity*, 34(1), 29-40. doi:10.1038/ijo.2009.177

Staples, K., & Reid, G. (2010). Fundamental movement skills and autism spectrum disorders. *Journal of Autism & Developmental Disorders, 40*(2), 209-217. doi: 10.1007/s10803-009-0854-9

Stelmach-Mardas, M., Rodacki, T., Dobrowolska-Iwanek, J., Brzozowska, A., Walkowiak, J., Wojtanowska-Krosniak, A., … Boeing, H. (2016). Link between Food Energy Density and Body Weight Changes in Obese Adults. *Nutrients*, *8*(4), 229. http://doi.org/10.3390/nu8040229

Ulrich, D. (2000). *TGMD-2: Test of gross motor development- second edition*. Austin, Texas: Pro-Ed.

Williams, K. E., Hendy, H., & Knecht, S. (2007). Parent Feeding Practices and Child Variables Associated with Childhood Feeding Problems. *Journal of Developmental and Physical Disabilities, 20*(3), 231-242. doi:10.1007/s10882-007-9091-3