

DIFFERENCES IN PHYSICAL ACTIVITY PARTICIPATION, SCREEN TIME, AND
BODY MASS INDEX FOR CHILDREN WITH LEARNING DISABILITIES AND
TYPICALLY DEVELOPING CHILDREN.

By

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ABSTRACT

TOPIC: There is a vast body of research revealing low levels of physical activity, excessive use of electronic media, and increasing obesity rates for children in the United States and Europe. This study measures differences in physical activity, screen time, and Body Mass Index (BMI) between typically developing (TD) children and children with learning disabilities (LD). **METHODS:** The study included 404, thirteen year old Irish children with an LD diagnosis and 440 randomly selected 13 year olds that are typically developing. Children self-reported on how many days in the past two weeks they participated in moderate to vigorous physical activity (MVPA) and light physical activity for more than 20 minutes. Participants also reported on how much time they spent watching television, playing video games, or using a computer in an average week. Body Mass Index (BMI) was measured for each child and they were classified as non-overweight, overweight, or obese. **RESULTS:** There was a significant difference in the number of children with LD who reported having less than 5 days of MVPA and light physical activity in the past two weeks in comparison to TD children. Children with LD had significantly larger amounts of total screen time, and nearly twice as many children with LD (5.1%) were obese compared to TD children (3.6%). A positive association was found between physical activity measures and screen time measures for children with LD. **CONCLUSION:** This study revealed lower levels of physical activity and higher amounts of screen time for children with LD when compared to TD children.

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INTRODUCTION

A lack of physical activity in children's lifestyles increases their risks for health issues such as obesity (during youth and into adulthood), associated cardiovascular diseases, and various respiratory maladies (LeBlanc, et. al., 2015). Yet a majority of youth in the United States are not meeting the recommended daily amounts of physical activity (Wethington, Pan, & Sherry, 2013). In 2011, a survey conducted by the YMCA in the United States involving 1,630 children ages 5 to 10 found that only 15% of the sample were meeting the daily recommended physical activity guideline of 60 minutes or more each day. Furthermore, they found that 41% of the sample only exercised on one day each week for less than 60 minutes (YMCA, 2011). Similarly, statistics from the World Health Organization (WHO) in 2015 revealed that only 12% of youth ages 12 to 18 in Ireland were meeting the recommended 60 minutes of physical activity per day (World Health Organization, 2015). Moreover, in 2013 a study by the Center for Disease Control (CDC) revealed that only 29% of high school students in the sample had participated in 60 minutes of physical activity in the seven days prior to the survey. They also found that less than half (48%) of high school students attended physical education classes in an average school week. The CDC's records show that the percentage of high school students attending physical education classes daily has decreased from 42% in 1991 to 29% in 2013 (How Much Physical Activity, 2015).

Obesity and childhood physical inactivity are related with a child's amount of "screen time," such as watching television, movies; video gaming, or computer usage (Yilmaz, Demirli,

Caylan, & Karacan, 2015). Electronic media can be a valuable resource for learning, but excessive usage can interfere with physical activity. Larger amounts of screen time (>20 hours per week) for children have been directly associated with adiposity when compared with moderate levels (<6 hours per week) of screen time (Berentzen, Smit, Van Rossem, Gehring, Kerkhof, Postma, & Wijga, 2015). The American Academy of Pediatrics recommends that children ages 3 to 18 engage in no more than two hours of screen time each day (Barlow, 2007). However, research by the CDC found that 15% of youth ages 12 to 15 watched greater than four hours of television daily and that 12% used a computer for greater than four hours daily, greatly exceeding the recommended time limit (HealthDay, 2014).

Due to the tendency for children to fail to meet physical activity and screen time guidelines, obesity has become an international health concern. It is suggested that excessive screen time is related to youth obesity (Wethington, et al., 2013). The percentage of youth who are obese, ages 12 to 19, in the United States has increased from 5% in 1980 to 20% in 2012 (Childhood Obesity Facts, 2015). An international study in 2005 collected Body Mass Index (BMI) data from youth ages 10 to 16 in 34 countries and ranked the countries by prevalence of individuals who were overweight or obese. The United States ranked second highest in overweight and obesity prevalence with 18.3% of youth being overweight and 5.5% of youth being obese. Ireland was ranked 11th with 11.3% of youth identified as overweight, and 2.4% of youth classified as obese (Janssen, Katzmarzyk, Boyce, Vereecken, Mulvihill, Roberts & Pickett, 2005).

The term "specific learning disability" means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which the disorder may manifest itself in the imperfect ability to listen, think, speak, read, write,

spell, or do mathematical calculations (IDEA, 2004). In Ireland, specific learning disability is described as a difficulty in an academic area for a student such as reading, writing, or math. The student must show difficulty in a specific area and present average progress in other areas (Cork Education Support Centre, 2005). For example, a student with a specific learning area may be below average in math, but average in reading and writing. A review of research suggests levels of physical activity and screen-time are less favorable for children with LD, when compared to TD children (Atkinson, 2016). In addition, researchers studied sedentary behavior and the likelihood of obesity in youth ages 10 to 17 with comorbid ADHD and LD. Based on a sample of over 45,000 individuals from the United States, longitudinal regression analysis indicated that youth with ADHD and LD were significantly more likely to be obese and to not meet recommended daily physical activity guidelines than their typically developing peers (Cook, Li, & Heinrich, 2015).

In addition to the physical and social benefits that physical activity provides for children with learning disabilities, some studies suggest positive relationships between physical activity and academic performance for typically developing students. For example, results of a correlational study in Massachusetts using data from 2004 and 2005 suggested significant positive relationships between physical fitness measures of students on the state mandated physical fitness test and their scores on state mandated academic performance assessments in reading, writing and math (Chomitz, Slining, McGowan, Mitchell, Dawson & Hacker, 2009). This benefit of physical activity participation may be of particular importance for children with learning disabilities. The purposes of this study are to investigate possible differences in physical activity, screen time, and body mass index (BMI) between children with LD and their TD peers.

METHODS

This study included children from the "Growing Up in Ireland" (GUI) National Study of children in Ireland. The database utilized was initially collected through an extensive survey of 13 year old children, their parents/guardians, and their teachers. Of the 7,525 children in the data base, 404 were reported, by their parents, as having a learning disability diagnosed by a professional, and thus included in this study. In addition, 440 typically developing (TD) children, were randomly selected for comparisons purposes. A comparison of the 440 TD children with the members of the full dataset, indicated there were no significant differences in physical activity, screen time behaviors, or BMI ($p < .05$). It should be noted that all of the children included in the study had only a specific learning disability. There were students in the dataset that had a specific learning disability and other comorbid conditions, but they were left out to create a specific population for measure, leaving 404 children with LD. Demographic data provided by the participants showed a slight but significant difference in equivalized household income between the two groups (See table 1). The sample was also stratified by gender for analysis. The sample included 225 females and 178 males with LD and 259 TD males and 181 TD females.

Table 1. Demographics of TD children and children with LD

Variable	TD children (n=440)	Children with LD (n=404)	p
Sex, Male (%)	259	226	.404
Household Annual Income (equivalized)	17,290	17,933	.000

Physical activity measures in this study included light physical activity, moderate to vigorous physical activity (MVPA), participation in team or individual sports outside of physical education class, participation in team or individual sports with a coach or instructor, and participation in team or individual sports without a coach or instructor. The measure for light physical activity was from a survey question that asked the children to self-report on how many days in the last two weeks they participated in light physical activity for 20 minutes or more. Light physical activity was described to them as walking or slow cycling, or exercise that did not make them breathe heavy or their heart beat faster. The MVPA level for each child is based on a self-reported survey question of how many days in the past two weeks the child participated in MVPA for more than 20 minutes. MVPA was described to the children as activities that make them breathe heavy and their heart beat fast. Examples given were playing football (soccer), running, and fast cycling. For these questions the participants scored themselves on a 1-5 scale: 1 meaning 0 days, 2 meaning 1 to 2 days, 3 meaning 3 to 5 days, 4 meaning 6 to 8 days, and 5 meaning 9 or more days. Both questions were adapted from the Leisure Time Exercise Questionnaire (Godin & Shepard, 1985). A series of 3 questions were also asked regarding the child's participation in sport. The number of team or individual sports in which the child

participates was assessed with the question, "Outside of your physical education classes, how many team or individual sports or activities did you participate in during the past 12 months?" Examples provided included a school or local soccer/netball team, athletics, or tennis club. Respondents choose from none, one, two, three, or four or more activities. The participants were also asked how often they participated in sports or activities with a coach or instructor and how often they participated in sports or activities without a coach or instructor. Respondents selected from never, less than once a week, 1 to 3 times a week, and four or more times a week.

Screen time was measured for the participants in the study by means of three survey questions. The participants were asked, (1) how many minutes on a normal weekday they spent watching television, videos, or DVD's during the school year; (2) How many minutes they spent using the computer on a normal weekday during the school year, and (3) how many minutes they spent playing video games such as Playstation, Xbox, or Nintendo on a normal weekday during the school year. The participants were asked to select one of thirteen categories split into 30 minute increments regarding the amount of minutes spent on the activities specified in each question. For example, they selected "0" if they spent 0 minutes on the activity asked about, "1" if they spent 1-30 minutes on the activity, "2" if they spent 31-60 minutes on the activity, and so forth up to "13" for 361 or more minutes spent on the specified activity in the question.

Body Mass Index (BMI) is a commonly used method for measuring body composition in children, and has shown to correlate strongly with direct physiological measures of body fat (Wu & Tu, 2016). Body Mass Index is calculated by dividing weight in kilograms by height in meters squared. To calculate body mass index scores in this study, the interviewer measured the weight and height of each study child. A Leicester portable height measurer was used to record height to the nearest millimeter. Medically approved scales (SECA 761) were used to record the child's

weight to the nearest kilogram. Standardized BMI cut-offs, presented by the International Obesity Task Force, were used to calculate scores for the children as 1 for non-overweight, 2 for overweight, or 3 for obese (Cole, et al., 2000).

Statistical Analysis

Frequencies were measured using SPSS to determine differences in physical activity level for TD children and children with LD. The frequencies also measure differences in screen time, such as playing video games, watching television, and using a computer, for the two groups, children with LD and TD children. Mann-Whitney tests and Fisher exact tests were used to compare continuous and categorical physical activity, screen time, and BMI variables between children with LD and TD children. When ordinal or continuous dependent variables were not normally distributed, Kruskal-Wallis tests were used to determine if there were significant differences between the two groups. Moderate to vigorous physical activity participation and light physical activity participation were also measured on 5 or less days and 6 or greater days. The purpose was to use a median cut off point to demonstrate results of less versus more physical activity participation. Moreover, exploratory analyses were completed, with data stratified by gender. The alpha level was set at .05.

RESULTS

On the survey question asking how many days in the past two weeks the child participated in 20 minutes of MVPA, most frequently the TD children reported that they did MVPA on 9 or more days, reported by 32% (n=141), while the most frequently reported amount

of time spent in 20 minutes of MVPA in the past two weeks for 30.2% of children with LD was 3 to 5 days (n=122). (See table 2).

When comparing the data for the two groups (TD and LD) measuring MVPA on 6 or greater days or 5 or less days in the past two weeks, more than half (57%, n=232) of children with LD participated in 5 or less days of MVPA, in comparison to 45% (n=201) of the TD group who participated in 5 or less days of MVPA. The majority (54%, n=239) of the TD children participated in 6 or more days of moderate to vigorous physical activity in the past two weeks. Comparing MVPA participation on 5 or fewer days versus 6 or more days per two week period, Fishers Exact test demonstrated the children with LD to participate in significantly less MVPA ($p = .001$).

Regarding light physical activity participation, the most commonly cited number of days, over a two week period, in which the children with LD participated in at least 20 minutes of light exercise was 1 to 2 days reported by 31% (n=127) of the group. Conversely, TD children most commonly reported participating in light physical activity on 9 or more days (reported by 26%, n=117 of the group). When comparing 5 or less and 6 or more days of light physical activity in the past two weeks, 66% (n=267) of children with LD were in the 5 or less category, in comparison to 56% (n=249) of TD children. More of the children with LD had less than 5 days of light exercise than TD children; a difference deemed significant using Fisher's Exact Test ($p = .005$).

When asked how often they participate in team sports outside of physical education class, children with LD most commonly reported one activity (n=99, 24.5%). TD children also most commonly reported participating in one activity (n=100, 22.7%), however the same number of TD children also reported 4 or more activities (n=100, 22.7%).

When asked how many sports or activities they participated in with and without a coach or instructor, scores were very similar between the two groups. The mean score for children with LD participating in sports without a coach or instructor was 2.52 per week, compared to a mean of 2.5 per week for TD children. The mean score for children with LD and TD children participating in sports with a coach or instructor was the same at 2.69. See table 2 for an overview of levels of physical activity and sport participation reported between groups.

Table 2. Comparison of physical activity participation between children with LD and TD children.

Measure	LD		TD	
	N	%	N	%
MVPA				
None	22	5.4	17	3.9
1 to 2 days	88	21.8	74	16.8
3 to 5 days	122	30.2	110	25.0
6 to 8 days	64	15.8	98	22.3
9 or more days	108	26.7	141	32.0
Light Physical Activity				
None	52	12.9	44	10.0
1 to 2 days	127	31.4	112	25.5
3 to 5 days	88	21.8	93	21.1
6 to 8 days	56	13.9	74	16.8
9 or more days	80	19.8	117	26.6
None	69	17.1	70	15.9

Measure	LD		TD	
	N	%	N	%
1 activity	99	24.5	100	22.7
2 activities	96	23.8	91	20.7
3 activities	66	16.3	79	18.0
4 or more activities	72	17.8	100	22.7
Sports with a coach				
Never	68	16.8	95	21.6
Less than once a week	69	17.1	47	10.7
1 to 3 times a week	184	45.5	197	44.8
Four or more times a week	82	20.3	101	23.0
Sports without a coach				
Never	91	22.5	94	21.4
Less than once a week	88	21.8	97	22.0
1 to 3 times a week	148	36.6	184	41.8
Four or more times a week	76	18.8	65	14.8

There was a significant difference between males and females in participation in MVPA. For the TD group, out of 259 boys, the time spent participating in MVPA for 20 minutes, was most commonly reported as being 9 or more days in the past two weeks (reported by 42%, $n=109$). Out of 181 girls in the TD group, time spent in 20 minutes of MVPA was most commonly reported as being 3 to 5 days in the two week period (reported by 26%, $n=48$). For the children with LD, 30.5% ($n=69$) of 226 boys participated in MVPA for 20 minutes on 9 or more days in the past two weeks. Conversely, 33.1% of the 178 girls ($n=59$) with LD participated in MVPA for 20 minutes on 3 to 5 days in the past two weeks.

When comparing MVPA participation on less than 5 days and greater than 6 days over a two week period, there was a significant difference between males and females with LD. More males with LD participated in MVPA on 6 or more days than females with LD. Out of 226 males with LD, 51% ($n=117$) participated in less than 5 days of MVPA. Conversely, of the 178 females with LD, 64% ($n=115$) participated in MVPA on less than 5 days. The difference was significant with Fisher's Exact Test ($p = .011$).

Regarding time spent watching television or movies, children with LD reported a mean range of 91 to 120 minutes per week. TD children reported a similar mean range, also representing 91 to 120 minutes per week. For time spent using the computer, children with LD averaged 61 to 90 minutes per week. Typically Developing children averaged 31 to 60 minutes, however, this difference was not deemed significant ($p > .05$). Regarding time spent playing video games, both children with LD and TD children averaged 1 to 30 minutes per week. When examining differences in total screen time, there was a significant difference between groups; ($p = .031$). Children with LD had a mean of 10.18 while TD children had a mean of 9.19.

The relationships between physical activity and screen time variables were examined for the children with LD. A moderate positive relationship between participation in MVPA, and light physical activity was found, $r = .386$, $p < .001$. MVPA, and sports participation outside of school also revealed a moderate positive significant correlation, $r = .395$, $p < .001$. With regards to light physical activity, a weak positive relationship with team sports participation was seen, $r = .212$, $p < .001$. Light physical activity also showed a weak negative relationship to watching television and movies, $r = -.112$, $p < .001$. The final correlation for light physical activity was a weak negative relationship with total screen time for children with LD, $r = -.128$, $p = .011$. Watching television and movies showed a weak relationship with light physical activity, $r = -.112$, $p = .025$. There was also a weak negative relationship between playing video games and team sport participation, $r = -.109$, $p = .025$.

BMI was calculated for each child using interviewer-collected height and weight measures. Although, there were no statistically significant differences between the two groups, there was a noticeable difference in the numbers of children who are obese between groups. Twenty-four (5.9%) of the children with LD were classified as obese compared to only 16 (3.6%) of the TD children (See Table 3).

Table 3. Weight classification of children with LD and TD children.

	LD		TD	
	N	%	N	%
Non-overweight	285	70.5	331	75.2
Overweight	85	21.0	81	18.4
Obese	24	5.9	16	3.6

DISCUSSION

The purpose of this study was to measure possible differences in physical activity, screen time, and BMI between TD children and children with LD. Regarding physical activity, a majority of TD children participated in MVPA on nearly twice as many days than children with LD. Moderate to vigorous physical activity measures revealed that children with LD most commonly reported participating in MVPA for at least 20 minutes on 3 to 5 days in the past two weeks (30.2%, n=122), compared to TD children who most commonly reported participation in MVPA for at least 20 minutes on 9 or more days in the past two weeks (32%, n=141). The results were similar for light physical activity when measuring 5 or less days or 6 or greater days of participation for both groups. The most commonly cited number of days, over a two week period, in which the children with LD participated in at least 20 minutes of light exercise was 1 to 2 days reported by 31% (n=127) of the group. This was in contrast to TD children who most commonly reporting participating in light physical activity on 9 or more days in the past two weeks reported by 26% (n=117) of the group. Other research (Cook, Li, & Heinrich, 2015) reflects these results, suggesting that youth with comorbid ADHD and LD demonstrated significantly higher amounts of sedentary time, lower levels of physical activity, and a higher likelihood for obesity than TD peers.

There was also a significant difference between males and females with LD regarding MVPA. One hundred and nine males with LD (48%) participated in MVPA on 6 or more days compared to 63 females with LD (35%). Research has long suggested higher amounts of physical activity for adolescent males than females citing some contributing factors such as interest, and motivation (Telford, et al., 2016). The Center for Disease Control (CDC) and the

WHO recommend that children participate in at least 60 minutes per day of physical activity. The vast majority of children with LD and TD children in this study were not meeting the recommended value. There could be many contributing factors for the lower physical activity levels for children with LD; however, research on this topic is sparse. Possible reasons may be that children with LD may spend more time outside of school working on homework than TD children, limiting their opportunity for exercise and other activities; research is required in this area. Children with LD may also spend less of their free time engaging in physical activity. They may also participate in less active transportation than TD children such as biking or walking to school. Excessive screen time may also be a factor contributing to lower levels of physical activity for children with LD when compared to TD children. More research is needed in these areas.

Results are of concern for children with LD who in this study had a significantly larger amount of total screen time than TD children. This could suggest why there were significant differences in MVPA and light physical activity levels between the two groups. Excessive screen time has been related to obesity, and other health problems (Wethington, et al., 2013; Berentzen, et al., 2014). This study revealed relationships between physical activity and screen time for children with LD. These results reflect other research in the literature with similar findings demonstrating the detriment of sedentary behavior, excessive screen time and revealing relationships between screen time and physical activity levels of children (LeBlanc, et al., 2015; Wethington, et al., 2013; Berentzen, et al., 2014). To the best knowledge of the author, no research exists that specifically examines screen time habits for children with LD. However, there is an abundance of research demonstrating increased levels of screen-time for children with other disabilities. Mazurek, Shattuck, Wagner, and Cooper (2012), found that children with

Autism Spectrum Disorder (ASD) chose to spend the largest amounts of leisure time using electronic media when compared to their TD peers and people with other disabilities. More research is required measuring electronic media usage specifically for children with LD, however, it can be concluded that too much screen time may reduce physical activity and therefore health benefits are limited.

Almost twice as many children with LD were obese than TD children in this study. This could be related to a significantly higher amount of total screen time. Not only does screen time interfere with exercise, it is related to obesity (Bai, et al., 2016). It has also been suggested that screen time is associated with excessive snacking and caloric intake and that children with LD and ADHD are more likely to be obese than TD children (Berentzen, et al., 2014; Cook, Li, and Heinrich, 2015). These results reflect the findings of this study. Generally speaking, children with LD could benefit from a decrease in screen time, which could likely lead to an increase in physical activity participation and a lower prevalence of obesity.

There are measures that can be taken that may increase physical activity and decrease screen time and prevalence of obesity in children with LD. Incentives at school could be provided for physical activity participation to increase physical activity in TD females and children with LD. More high interest physical activities could be offered for both genders and school-wide physical activity interventions could be put in place emphasizing the importance of exercise for good health. Additional physical education could be mandated in public schools to facilitate more frequent physical activity participation for children. Also, physical activity breaks could be provided during class time, or better yet, academic lessons could incorporate physical activity to benefit kinesthetic learners and increase physical activity levels of students. Communities can organize and provide events incorporating physical activity for families such

as bike rides, hiking, and sport opportunities. Information could be provided to children and their families informing them of the relationships between high amounts of screen time, overeating/obesity, and decreased physical activity levels.

There are limitations that may have had an effect on this study. Growing Up in Ireland, the survey, relied on parental, teacher, and self-report for the results. The ability, of individuals to accurately, and honestly, recall information cannot be assured. Future research should examine differences in physical activity and sedentary levels using objective measures. Also, the students that were reported, by their parents, as being diagnosed by a professional as having a learning disability were not required to provide medical records confirming their diagnosis.

CONCLUSION

There is a lack of research regarding screen-time and physical activity participation for children with LD. This study found some significant differences in the physical activity levels and screen time usage of thirteen year old children with LD and their TD peers. There was also a noticeable difference in the number of children who were obese when comparing children with LD and TD children, and there were associations between screen-time and physical activity variables. Children with LD in this study could benefit from an increase in physical activity. An increase in physical activity could benefit their health and cognitive functioning. Further research should be conducted measuring physical activity and screen-time participation for children with LD and also measuring relationships between physical activity and academic performance for children with LD. Results could provide a basis for more kinesthetic learning and physical activity based curriculums to improve the learning, and physical health for children with learning disabilities.

REFERENCES

- Atkinson, S. (2016) Research round up. *Learning Disability Practice*, 19(1), 17.
- Bai, Y., Chen, S., Laurson, K. R., Kim, Y., Saint-Maurice, P. F., & Welk, G. J. (2016). The associations of youth physical activity and screen time with fatness and fitness: The 2012 NHANES national youth fitness survey. *Plos One*, 11(1), 1-13. doi:10.1371/journal.pone.0148038
- Barlow, S. E. (2007) Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: Summary report. *Pediatrics*, 120:S164-S192.
- Berentzen, N. E., Smit, H. A., van Rossem, L., Gehring, U., Kerkhof, M., Postma, D. S., & Wijga, A. H. (2014). Screen time, adiposity and cardiometabolic markers: Mediation by physical activity, not snacking, among 11-year-old children. *International Journal of Obesity*, 38(10), 1317-1323.
- Childhood Obesity Facts. (2015). Retrieved August 11, 2016, from <https://www.cdc.gov/healthyschools/obesity/facts.htm>
- Children, Adolescents, and the Media. (2013). *Pediatrics*, 132(5), 958-961. doi:10.1542/peds.2013-2656
- Chomitz, V. R., Slining, M. M., McGowan, R. J., Mitchell, S. E., Dawson, G. F., & Hacker, K. A. (2009). Is There a Relationship Between Physical Fitness and Academic Achievement? Positive Results From Public School Children in the Northeastern United States. *Journal Of School Health*, 79(1), 30-37. doi:10.1111/j.1746-1561.2008.00371.x
- Cole, T. J. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ: British Medical Journal (International Edition)*, 320(7244), 1240.
- Cook, B. G., Li, D., & Heinrich, K. M. (2015). Obesity, physical activity, and sedentary behavior of youth with learning disabilities and ADHD. *Journal of Learning Disabilities*, 48(6), 563-576.
- Cork Education Support Centre. (2005). Specific Learning Disabilities. Retrieved August 29, 2016, from <http://www.sess.ie/categories/specific-learning-disabilities>

- Einarson, I. P., Ólafsson, Á., Hinriksdottier, G., Johanson, E., Daly, D., & Arngrimmson, S. Á. (2015). Differences in physical activity among youth with and without intellectual disability. *Medicine & Science In Sports & Exercise*, 47(2), 411-418.
- Godin G., Shephard RJ. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences*, 10:141-146.
- HealthDay, W. N. (2014). Kids still getting too much 'screen time': CDC – WebMD. Retrieved August 11, 2016, from <http://www.webmd.com/parenting/news/20140709/kids-still-getting-too-much-screen-time-cdc>
- How much physical activity do children need? (2015). Retrieved July 09, 2016, from <http://www.cdc.gov/physicalactivity/basics/children/>
- Individuals with Disabilities Education Act (IDEA), 20 U.S.C. § 1400 (2004)
- Janssen, I., Katzmarzyk, P. T., Boyce, W. F., Vereecken, C., Mulvihill, C., Roberts, C., & Pickett, W. (2005). Comparison of overweight and obesity prevalence in school-aged youth from 34 countries and their relationships with physical activity and dietary patterns. *Obesity Reviews*, 6(2), 123-132.
- LeBlanc, A. G., Katzmarzyk, P. T., Barreira, T. V., Broyles, S. T., Chaput, J., Church, T. S., & Tudor-Locke, C. (2015). Correlates of total sedentary time and screen time in 9–11 year-old children around the world: The international study of childhood obesity, lifestyle and the environment. *Plos ONE*, 10(6), 1-20.
- Mazurek, M., Shattuck, P., Wagner, M., & Cooper, B. (2012). Prevalence and correlates of screen-based media use among youths with autism spectrum disorders. *Journal of Autism & Developmental Disorders*, 42(8), 1757-1767.
- Physical Activity Facts. (2015). Retrieved August 11, 2016, from <http://www.cdc.gov/healthyschools/physicalactivity/facts.htm>
- Sifferlin, A. (2014). Teens are spending a ton of time in front of screens, CDC says. Retrieved August 11, 2016 from <http://time.com/2969587/teens-are-spending-a-ton-of-time-in-front-of-screens-cdc-says/>
- Telford, R. M., Telford, R. D., Olive, L. S., Cochrane, T., & Davey, R. (2016). Why Are girls less physically active than boys? Findings from the LOOK longitudinal study. *Plos One*, 11(3), 1-11.
- V. R., Slining, M. M., McGowan, R. J., Mitchell, S. E., Dawson, G. F., & Hacker, K. A. (2009). Is there a relationship between physical fitness and academic achievement? Positive results from public school children in the northeastern United States. *Journal of School Health*, 79(1), 30-37.
- Wethington, H., Pan, L., & Sherry, B. (2013). The association of screen time, television in the bedroom, and obesity among school-aged youth: 2007 national survey of children's health. *Journal of School Health*, 83(8), 573-581.

- World Health Organization Europe: Ireland physical activity fact sheet. (2015). Retrieved August 11, 2016 from http://www.euro.who.int/__data/assets/pdf_file/0004/288112/IRELAND-Physical-Activity-Factsheet.pdf?ua=1
- Wu, J., & Tu, W. (2016). Development of a pediatric body mass index using longitudinal single-index models. *Statistical Methods in Medical Research*, 25(2), 872-884.
doi:10.1177/0962280212471470
- Yilmaz, G., Demirli, Caylan, N., & Karacan, C. D. (2015). An intervention to preschool children for reducing screen time: a randomized controlled trial. *Child: Care, Health & Development*, 41(3), 443-449.
- YMCA survey finds U.S. parents not making kids' health top priority. (2011). Retrieved August 11, 2016, from <http://www.ymca.net/news-releases/20110413-survey.html>