Physical activity, sedentary screen time and bullying behaviors: exploring differences between adolescents with and without disabilities

Yeshayahu Hutzler\textsuperscript{a, b}, Riki Tesler\textsuperscript{c}, Kwok Ng\textsuperscript{d,e}, Sharon Barak\textsuperscript{f, g, h}, Hadas Kazula\textsuperscript{a} and Yossi Harel-Fisch\textsuperscript{i}

\textsuperscript{a}Academic College at Wingate, Wingate Institute, Netanya, Israel; \textsuperscript{b}Israel Sport Center for the Disabled, Ramat-Gan, Israel; \textsuperscript{c}Department of Health Systems Management, Faculty of Health Sciences, Ariel University, Ariel, Israel; \textsuperscript{d}School of Educational Sciences and Psychology, University of Eastern Finland, Kuopio Finland; \textsuperscript{e}Physical Activity for Health Research Cluster, Department of Physical Education and Sport Sciences, University of Limerick, Limerick Ireland; \textsuperscript{f}Department of Pediatric Rehabilitation, The Chaim Sheba Medical Center, Tel Hashomer, Ramat-Gan; \textsuperscript{g}Kaye Academic College of Education, Physical Education, Beer-Sheva, Israel; \textsuperscript{h}College of Public Health, Ben Gurion University, Beer-Sheva, Israel; \textsuperscript{i}Faculty of Social Sciences, School of Education, Bar-Ilan University, Ramat-Gan, Israel

\textbf{ABSTRACT}

The study’s purpose was to examine the prevalence of sedentary screen time and physical activity (PA) participation, and their association with environmental (socioeconomic status, bullying behaviours) and personal factors (age, sex). We analysed data from the 2013–14 Health Behaviour in School-aged Children survey among Israeli adolescents aged 11–17 [N = 4,241; 56% female; 9.3% = adolescents with disability (AWD)], A minority (<10%) of all participants compiled with the 2010 World Health Organization global PA recommendations. AWD were significantly more involved in bullying behaviours. PA participation was significantly decreased in AWD in grades 6 and 8 compared to adolescents without disability. Furthermore, >30% of AWD and adolescents without disability engaged in sedentary screen time >3 hours/day. In conclusion, AWD in grades 6 and 8 should be given specific attention, to reduce the likelihood of bullying at school and to increase the inclusion of AWD in PA lessons.

According to the Convention on the Rights of Persons with Disabilities (The United Nations, 2006), adopted by the United Nations in 2006 and with 182 ratifications as of July 2020, member nations must ensure that adolescents with disabilities (AWD) have access to an inclusive, quality, and free primary and secondary education on an equal basis with their peers (United Nations, 2020). Furthermore, nations must ensure that AWD have equal access to play, recreation, leisure, and sporting activities in both formal and informal education settings, as people without disabilities (Central Bureau of Statistics (Pupils with Special Needs, 2016/17. Media Announcement 354/2018 December, 2. 2018); Ng et al., 2019). Therefore, AWD are increasingly being included within regular school frameworks worldwide. In Israel, about 65% of the 235,240 pupils labelled with ‘special needs’ were included in the general school system in the 2016/2017 school year (Central Bureau of Statistics (Pupils with Special Needs, 2016/17. Media Announcement 354/2018 December, 2. 2018), 2018). In total school pupils with disabilities comprise about 13% of the total school pupil population in 2017 (Munikedem-Givon, 2019). Within the general school system, such adolescents are exposed to mobility and social barriers (e.g., lack of the physical educators’ knowledge of adapted physical education), thereby requiring particular

\textbf{CONTACT} Yeshayahu Hutzler \textsuperscript{a} shayke@wincol.ac.il

© 2021 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.
attention of educators and health care providers for managing participation opportunities (Klitsie et al., 2013; Olds et al., 2010). The International Classification of Functioning, Disability and Health (ICF), officially endorsed by all World Health Organization (WHO) member states (World Health Organization, 2001), is a framework and common language used to describe and organize information on outcomes and sources of functioning and disability. Within the ICF, contextual factors from environmental variables such as attitudes of others and personal variables such as age and sex, interact with the individual’s functional limitations and health condition, as well as the activity limitations and participation restrictions, in a holistic model of disability (World Health Organization, 2013). The principles of ICF have been well established within rehabilitation research (Reinhardt, 2011), as well as within adapted physical activity (PA) research (Hutzler & Sherrill, 2007). According to this framework, personal and environmental contextual factors are associated with activity limitation and participation restriction.

**Sedentary screen time behaviour, physical activity, and adolescents with disabilities**

Much of adolescents’ voluntary sedentary time is related to screen utilization, including using smartphones, television viewing, playing computer games, and using the computer for other activities (Klitsie et al., 2013; Olds et al., 2010). Evidence of associations between sedentary behaviour and poor health outcomes among AWD, such as obesity, low fitness, and even low self-esteem (Haegle et al., 2020), compliments to recommended limits of less than two hours per day spent on screen time for all adolescents (On behalf of SBRN Terminology Consensus Project Participants, Tremblay, M. S., Aubert, S., Barnes, J. D., Saunders, T. J., Carson, V., Latimer-Cheung, A. E., Chastin, S. F. M., Altenburg, T. M. & Chinapaw, M. J. M., 2017; Domoff et al., 2020). Despite these recommendations, there is evidence to suggest that a high proportion of AWD do not keep to these limits, and this has been increasing over time (Haegle et al., 2020; Ng et al., 2018, 2019). School-aged adolescents have the opportunity to spend more time partaking in sedentary screen-time behaviour (SSB) during the weekends, and therefore it is important to examine the behaviours during the week and weekends separately (Throuvala et al., 2020). Moreover, boys tend to report more time partaking in SSB than girls, especially regarding computer games (Humbert et al., 2006). Socioeconomic status (SES) is an important environmental factor in SSB and PA participation (Humbert et al., 2006). Adults and children from higher SES groups are more likely to participate in PA compared to lower SES groups (Crespo et al., 1999; Woodfield et al., 2002), and are less likely to partake in SSB (Kristjansdotir & Vilhjalmsson, 2001; Lowry et al., 1996).

AWD are at risk of developing further health conditions due to their sedentary behaviour (Li et al., 2019). They are often excluded from different types of exercise programs, both in school and after-school activities, due to inaccessibility – making them more likely to engage in sedentary activities (Ganz et al., 2020). In the school setting, AWD are excluded more often from a variety of activities, and may be placed in environments with more sedentary activities. Furthermore, the experience of physical education for children with disabilities is the participation is in passive activities (Fitzgerald, 2012). Due to the lack of physical activity opportunities, AWD become more likely to engage in SSB such as watching television, and may have more school absenteeism as well as other exclusions from school activities, such as physical education class and field trips (Walker et al., 2019).

Due to the significantly higher incidence of obesity and the lower level of PA in AWD compared to adolescents without disabilities, which will likely result in greater health concerns in adulthood, PA levels should be increased in AWD (McPherson et al., 2016; Rimmer & Rowland, 2008). These authors suggested that environmental barriers imposed on AWD may be considered as the primary reason for their lack of participation in PA.

**Adolescents bullying and adolescents with disabilities**

Bullying is characterized by repeated and unwanted aggression where there is a power differential that results in physical, emotional, social, or educational harm (Gladden et al., 2014). According to the Indicators of School Crime and Safety (Harel-Fisch et al., 2016), approximately 20% of adolescents
aged 12–18 years reported being bullied. In Israel about 10.5% of the adolescents in grades 6–12 have reported being bullied within the last month. In the general adolescent population, sex was found to be a consistent factor influencing the likelihood of bullying, with significantly more males involved in bullying than females (Carbone-Lopez et al., 2010; Von Marées & Petermann, 2010; Wang et al., 2009). Additional factors associated with bullying were older age and lower psycho-social status of the bullying participants (Von Marées & Petermann, 2010). AWD are commonly affected by bullying behaviour, oftentimes more than adolescents without disabilities. Based on meta analyses, children and adolescents with disabilities or chronic physical conditions were 1.65 times more likely to be victims of bullying behaviours than their peers without disabilities (Pinquart, 2016). Some authors also reported the troubling occurrence of bullying behaviours within PA participation in physical education and club sports (e.g., Dane-Staples et al., 2013; Haegel & Kirk, 2018).

**Health Behaviour in School-aged Children Survey**

The Health Behaviour in School-aged Children (HBSC) survey has been conducted every four years since the early 1980s, as a collaborative cross-national study, coordinated by the WHO Regional Office for Europe in Denmark (Currie et al., 2009). In the recent surveys, more than 40 countries were involved, mostly in Europe. PA participation has been documented in the HBSC study, and was found to be linked to overweight and obesity rates (Janssen et al., 2005) and sedentary behaviour (Guthold et al., 2010). School bullying is also reported in the HBSC study, and results from previous years have shown that boys have been more involved in physical and verbal bullying than girls (Wang et al., 2009).

PA participation of school AWD was reported in a few of the HBSC studies. For example, Steele et al. (2004) compared health behaviours among school adolescents with physical disabilities with the Canadian national sample. Significant differences were found, suggesting that AWD participated less in PA (Steele et al., 2004). More specifically, fewer boys with disabilities were reported to partake in a sufficient amount of PA compared to males without disabilities, when data from 15 countries were pooled together from the HBSC study (Ng et al., 2017). Moreover, more males and females with disabilities reported a greater amount of screen-time than their peers without disabilities (Ng et al., 2018). Regarding bullying behaviours, Sentenac et al. (2013) reported that the percentage of victims was significantly higher among those reporting disability than among their peers without disabilities in 11 countries studied within the HBSC study 2005/2006.

Therefore, based on an Israeli 2014–15 HBSC data subset, the first purpose of the current study was to describe the SSB and PA participation of AWD compared to adolescents without disabilities in Israeli schools. The second purpose was to outline the associations between SSB and PA with environmental factors such as bullying behaviour and SES, as well as personal factors including sex and age (classified by grade level). The current study examined the role of environmental and personal contextual factors among AWD compared to adolescents without disability as correlates and predictors of SSB related to screen time behaviour and physical inactivity.

**Methods**

**Participants**

This study uses Israeli data from the 2014–15 Health Behaviour in School-aged Children: WHO Collaborative Cross-National survey/study (HBSC) cross-national survey conducted among adolescents aged 11–17. The HBSC is a school-based survey of adolescent health behaviours and psychosocial determinants, carried out among representative samples of school-aged adolescents every four years, using an international standardized methodological protocol involving standardized procedures for sampling and translation of items (Inchley et al., 2018). In order to ensure a representative sample, according to the international HBSC protocol (Inchley et al., 2018) the Israeli Ministry of Education’s list of schools was used. Classrooms were randomly sampled (90% classroom response) and for each sampled school an additional class was also randomly sampled. All school pupils present in the
sampled classrooms were included (>95% pupil response). The research protocol received approval from ethics committees of the Israeli Ministry of Education and Bar-Ilan University.

The research population included students from Hebrew-speaking state-secular and state-religious schools. Participation in the study was fully voluntary and anonymous, with no explicit incentives provided for participation. Questionnaires were administrated by trained research assistants in the absence of a teacher during regular class time. Parents were informed about the study via the school administration and could bar their children from participating if they disagreed with it. Pupils were divided into three similarly clustered and representative sub-samples, each of them answering all core and one segment of elective questions on disabilities.

**Instruments**

**Personal factors**

Individual variables included sex and age. Individuals were asked to report their sex (male or female). Age was determined by their school grade (6th, 8th, 10th, 12th). Disability type was established via the participant’s self-report. Participants answered the question ‘Do you suffer from a disability?’ A list of specific impairment types followed: visual impairment, hearing impairment, mobility impairment – not using a wheelchair, mobility impairment – using a wheelchair, and other. Answers were yes or no.

**Environmental factors**

**SES** – SES was estimated with the Family Affluence Scale II (FAS). The scale is composed of four items (number of cars, holidays taken, computers owned, and bedrooms) and has a total score that ranges from 4 (lowest) to 15 (highest), which determines the FAS level. The FAS has been found to be a better proxy of SES than measures that rely on adolescent reports of parental occupation or income (Boyce et al., 2006).

**School bullying** – We measured school bullying from nine questions pertaining to bullying others and nine questions pertaining to being bullied. The questions focused on the following bullying behaviours: fighting, harassment, using derogatory names, hitting, spreading lies, ridiculing someone because of his/her colour or ethnicity, boycotting others, sexual comments, and texting related harassment. In each question, the participant was asked to report the amount of times he or she was engaged in or was the subject of such behaviours in school. The participant could respond with: none, only once or twice, two or three times a month, about once a week, or several times a week. Scores ranged from 9 to 45, with higher scores representing a greater extent of school bullying (bullying others or being bullied). The items were based on the Olweus Bully/Victim Questionnaire (Olweus, 1993).

**Sedentary screen-time behaviour**

SSB was assessed using six questions from the HBSC survey pertaining to the number of hours the participant engaged in screen watching behaviours (i.e., television, computer, video, DVD, and other screen-related entertainment) during the weekdays (Sunday through Thursday) and weekend (Friday through Saturday). For each question there was a 9-point response scale ranging from ‘none at all’ to ‘seven or more hours a day’ (Iannotti & Wang, 2013). Weighted means for weekday and weekend use were used to calculate the total hours per week (average weekday screen time*5 + average weekend screen time*2). A previous validation study examined a brief questionnaire used to measure television time, similar to that used in the HBSC study (Bucksch et al., 2014). In addition, these HBSC items have acceptable test-retest reliability (intraclass correlation coefficients ranging from 0.76-to-0.81) and validity (correlations ranging from 0.36-to-0.54) (Vereecken et al., 2006). As adolescents who watch television for three hours or more per day have a 65% higher chance of being obese than adolescents who watch less than one hour per day (Boone et al., 2007), we further
grouped the sample based on their SSB to adolescents with SSB of up to three hours a day and adolescents with SSB of three hours or more a day.

**Physical activity level**

PA was defined by ‘any activity that usually increases your heart rate and makes you get out of breath some of the time’. An example of a question was, ‘How often over the past seven days have you been physically active for a total of at least 60 minutes per day?’ Answers were given on an 8-point scale (0 = none to 7 = daily). The measure has reasonable validity (r = 0.37) with 5-day accelerometer data (Walker et al., 2019) and acceptable test-retest reliability when used as a dichotomous variable (Ng et al., 2019). According to the WHO (World Health Organization, 2010), adolescents and young people aged 5–17 should engage in at least 60 minutes of moderate-to-vigorous intensity PA (MVPA) daily. Accordingly, participants’ responses were converted into the following two categories: not meeting and meeting the WHO recommendations.

**Data Analysis**

**Study participants’ characteristics**

Descriptive statistics for the study participants (AWD and adolescents without disability) were calculated and compared using chi-squared tests for categorical variables and independent t-tests for continuous variables.

**Physical activity level, sedentary screen time behaviour, and bullying behaviours (being bullied and bullying others)**

Within-group differences in PA level, SSB, and bullying behaviours in the different age groups, and sex, were compared using independent t-tests or one-way analysis of variance with Tukey’s honest significant difference post-hoc test. Between-group differences (differences between adolescents with and without disability) were compared using independent t-tests. In addition, SSB was examined via calculation of the percentage of adolescents in each study group and in each grade who engaged in the sum SSB of up to three hours a day and adolescents with SSB of three hours or more a day. For example, a participant who engaged in two hours of watching TV and one hour of working on the computer has a total of three hours of SSB. Accordingly, this participant will be part of the SSB of three hours or more a day group. Between-group differences in SSB were compared using chi-squared test of independence. Based on the question ‘How often over the past seven days have you been physically active for a total of at least 60 minutes per day?’, participants were grouped into two groups: participants meeting and not meeting the WHO 2010 PA recommendations (i.e., engaging vs. not engaging in at least 60 minutes of MVPA daily). The prevalence of adolescents in each study group was calculated and compared via chi-square test of independence.

**Variables related to and predicting sedentary screen time behaviour and physical activity level**

To evaluate factors associated with SSB and PA levels, Pearson correlations were conducted. In addition, differences between categorical variables in SSB and PA level were examined separately with independent t-tests. Next, four separate forward multiple stepwise regression procedures were conducted to analyse factors predicting SSB and PA level among adolescents with and without disability. Only variables that had significant correlations or presented significant differences within the different sub-categories (categorical variables) with the dependent variables were included. All independent variables were checked for multicollinearity using the variance of inflation factor (variance of inflation factor > 10; Myers, 1990). The criterion for inclusion in the model was an alpha level of 0.05, and the exclusion criterion was an alpha level of 0.10. The aforementioned analyses were conducted separately for adolescents with and without disability. In all statistical analysis procedures, the level of significance was set to P < 0.05 (2-tailed).
Results

Study participants’ characteristics

This study included 4,612 adolescents, 429 of whom AWD (9.3%), who completed the items on disabilities. Additional information on group characteristics and between-group differences is presented in Table 1.

Sedentary screen time behaviour and physical activity level

During the week, 37% (12th grade) to 49% (10th and 11th grades) of adolescents without disability engaged in SSB for ≥ three hours/day. Among the AWD, this ranged from 43% (11th grade) to 52% (8th grade). During the weekend, 33% (12th grade) to 55% (10th grade) of adolescents without disability were engaged in SSB for ≥ three hours/day. For the AWD, the range was from 40% (8th grade) to 58% (8th grade). No statistically significant between-group differences were observed in SSB in either the weekdays or weekends (chi-square ranged from 0.01 to 1.41; p > 0.05). Moreover, among AWD, no statistically significant differences were observed in SSB between males and females, between adolescents in different grades (Table 2), or between adolescents with different aetiologies (Table 3). However, among adolescents without disability, adolescents in 12th grade engaged in less SSB than adolescents in 6th through 10th grades. No statistically significant between-group differences were observed in SSB of adolescents with and without disability (Table 2).

Overall, 422 (9.15%) of AWD and adolescents without disability who participated in this study reported that they carry out a sufficient amount of PA to be considered as physically active. More specifically, 27 AWD (6.29% of the sample with disability) and 395 adolescents without disability (9.44% of the sample without disability) met the 2010 PA recommendations of at least 60 minutes of MVPA per day. Moreover, among adolescents without disability, this compliance level ranged from 3% (12th grade) to 16% (6th grade). The prevalence of males who met the PA guidelines was greater than females (12.97% and 6.53%, respectively). Among AWD, the compliance level ranged from 2% (12th grade) to 12% (6th grade). A higher frequency of adolescents without disability reached the recommended PA level in the 6th and 8th grades (p < 0.05). No statistically significant differences were observed between males and females in the prevalence of participants achieving the recommended PA level (7.40% and 3.26%, respectively). Additional information is presented in Figure 1.

PA levels of adolescents without disability in the 6th and 8th grades were significantly higher than those observed among AWD in the same age groups (p = 0.01). No statistically significant between-group differences were observed in the 10th, 11th or 12th grades. Moreover, in adolescents without

| Table 1. Study participants’ characteristics. |
|-------------------------------------------|
| Variables                                  | Adolescents with disability (n = 429) | Adolescents without disability (n = 4183) | Between-group chi square test or t-test (p value) |
| Sex                                        | Females, n (%)                        | 156 (36.2)                                   | 1935 (46.25)                                  | 15.85 (0.011) |
|                                          | Males, n (%)                          | 273 (63.8)                                   | 2248 (53.74)                                  | 15.35 (0.001) |
| Grade                                     | 6th, n (%)                            | 93 (21.7)                                    | 931 (22.3)                                    | 0.08 (0.89)   |
|                                          | 8th, n (%)                            | 75 (17.5)                                    | 954 (22.8)                                    | 1.12 (0.28)   |
|                                          | 10th, n (%)                           | 112 (26.1)                                   | 828 (19.8)                                    | 2.39 (0.12)   |
|                                          | 11th, n (%)                           | 103 (24.0)                                   | 1056 (25.2)                                   | 0.29 (0.78)   |
|                                          | 12th, n (%)                           | 46 (10.7)                                    | 414 (9.9)                                     | 0.27 (0.86)   |
| Family affluence status                   |                                      | 10.23 (2.11)                                 | 10.32 (2.12)                                  | 0.837 (0.078) |
| Disability type                           | Hearing                               | 214 (49.9)                                   |                                             |               |
|                                          | Vision                                | 70 (16.3)                                    |                                             |               |
|                                          | Mobility – not using                  | 56 (13.1)                                    |                                             |               |
|                                          |  a wheelchair                         |                                             |                                             |               |
|                                          | Mobility – using                       | 13 (3.0)                                     |                                             |               |
|                                          |  wheel chair                          |                                             |                                             |               |
|                                          | Other                                 | 76 (17.7)                                    |                                             |               |
| Variables | Adolescents with disability: | Adolescents without disability: | Between-group differences – Adolescents with disability vs. Adolescents without disability: |
|-----------|-------------------------------|---------------------------------|---------------------------------|
|           | Sedentary behaviour – weekdays and weekend, hours | Sedentary behaviour – weekdays and weekend, hours | t-statistic (p value) |
|           | Days/week of daily 60 minutes of physical activity | Being bullied, score | Days/week of daily 60 minutes of physical activity | Being bullied, score |
|           | Bullying others, score | Bullying others, score | Bullying others, score | Bullying others, score |
| Sex       |                               |                               |                               |                               |
| Males     | 4.48 (2.33)                   | 14.42 (7.14)*                 | 12.40 (5.04)*                  | −0.99 (0.31) |
| Disability, n = 273; No disability, n = 2248 | 2.15 (1.09)                   | 18.35 (9.41)*                 | 8.75*                          | 7.24 (< 0.001) |
| Females   | 4.61 (2.10)                   | 10.61 (5.46)                  | 11.38 (3.79)                   | 0.23 (0.81) |
| Disability, n = 153; No disability, n = 1935 | 2.09 (1.86)                   | 12.98 (5.89)                  | 11.18 (3.97)                   | 0.69 (0.49) |
| Grade 6th |                               |                               |                               | −7.76 (< 0.001) |
| Disability, n = 94; No disability, n = 931 | 4.28 (2.27)                   | 16.95 (8.80)                  | 12.57 (9.64)*                  | −9.06 (< 0.001) |
| 8th       |                               |                               |                               | −3.87 (0.001) |
| Disability, n = 75; No disability, n = 954 | 2.71 (2.33)                   | 14.02 (8.00)                  | 0.39 (0.69)                    | 2.49 (0.01) |
| 10th      |                               |                               |                               | −9.06 (< 0.001) |
| Disability, n = 112; No disability, n = 828 | 4.82 (2.32)                   | 16.77 (9.12)                  | 12.07 (4.79)                   | −3.87 (0.001) |
| 11th      |                               |                               |                               | −7.26 (0.001) |
| Disability, n = 103; No disability, n = 1056 | 2.31 (1.85)                   | 14.66 (2.32)                  | 0.61 (0.53)                    | 2.42 (0.01) |
| 12th      |                               |                               |                               | −3.66 (0.001) |
| Disability, n = 46; No disability, n = 41 | 4.72 (2.34)                   | 16.77 (9.12)                  | 11.71 (4.14)                   | −7.72 (< 0.001) |
|           |                               |                               |                               | −8.19 (< 0.001) |
| Notes: 'Being bullied' and 'Bullying others' scores range from 9 to 45, with higher scores representing a greater extent of school bullying (bullying others or being bullied); * within-group differences – significantly different than females; a) within-group differences – significantly different than 6th grade; b) within-group differences – significantly different than 7th grade; c) within-group differences – significantly different than 8th grade; d) within-group differences – significantly different than 9th grade; e) within-group differences – significantly different than 10th grade; SD, standard deviation.
disability, in comparison to females, males presented a higher level of PA (2.21 days of the week vs. 3.18 days of the week, respectively). Similarly, in comparison to males with disability, males without disability presented a greater level of PA (3.18 days of the week vs. 2.15 days of the week, respectively) (Table 2). Finally, no statistically significant differences in PA level were observed in different aetiologies (Table 3).

**Bullying victimization and bullying behaviours**

Within the group AWD, no significant differences were found across the different age groups in either being bullied or bullying others (p > 0.05). However, in comparison to females, males engaged more in both types of bullying activities. Moreover, in comparison to adolescents with vision and hearing problems, adolescents with mobility problems using a wheelchair were significantly more bullied and there were significantly higher rates of bullying others (Table 3).

Within the group of adolescents without disability, older adolescents (grades 10 through 12) reported less frequent occasions of being bullied. Differences across age in bullying others were not statistically significant (Table 2).

In addition, across the different age groups and in both males and females, in comparison to adolescents without disability, AWD were bullied more and also bullied others more (P < 0.001). Additional information is presented in Table 2.

**Variables related to and predicting sedentary screen time behaviour and physical activity level**

**Sedentary screen-time behaviour**

Within the AWD group, all variables associated with SSB were not statistically significant. Accordingly, a regression analysis to predict SSB of AWD was not conducted. Within the group of adolescents without disability, grade and bullying others exhibited statistically significant associations with SSB (r = −0.08 and r = 0.03, respectively; Table 4). Both variables also significantly predicted SSB of adolescents without disability (adjusted R² = 0.04, F ratio = 8.48, p < 0.0001; Table 5).

**Physical activity level**

Among AWD, PA level was associated with grade and SES (r = −0.17 and 0.12, respectively; Table 4). Grade and SES were also statistically significant predictors of PA level of AWD (adjusted R² = 0.04, F ratio = 16.13, p < 0.001; Table 5). Within the group of adolescents without disability, grade (r = −0.23), SES (r = 0.22), being bullied (r = 0.07) and bullying others (r = 0.15) exhibited all statistically significant associations with PA participation level (Table 4). However, a regression analysis showed that only sex (being a male) grade (lower grade) and SES (higher) predicted higher PA participation level (adjusted R² = 0.10, F ratio = 183.03; p < 0.001). Additional information is presented in Table 5.

**Discussion**

Based on the 2014–15 HBSC Israeli data subset, the present study’s main purpose was to compare between adolescents with and without disability regarding the outcomes of and associations between (a) health behaviour (SSB and PA) and (b) personal factors (sex and age), and the environmental factors outlined in the ICF (SES and bullying). The secondary purpose was to outline potential predictors of PA and SSB. Given the data provided by Munikedem-Givon (2019) and the Central Bureau of Statistics (Pupils with Special Needs, 2016/17. Media Announcement 354/2018 December,
2018), the proportion of AWD within the sample (9.3%) appears representing the population of students with disability in the general schools in Israel.

**Sedentary screen-time behaviour**

Based on data from 429 AWD and 4,183 adolescents without disability, only a minority of the participants met the health behaviour recommendations of the WHO. The mean time spent on SSB was more than four daily hours on weekdays (Table 2). Regarding age, nearly half of participants exceeded the recommended screen time threshold of up to three daily hours, with younger students exhibiting longer SSB. Based on our findings, the SSB time did not significantly differ across adolescents with and without disability. Our findings conform with most of the pooled HBSC scores representing 15 European countries (Ng et al., 2018). However, in the latter study the authors reported that after adjusting for age and SES, boys with disabilities spent significantly longer times in SSB compared to those without disabilities, while in girls the difference was not significant. Furthermore, when individual country data were addressed, the differences between those with and without disabilities were barely observable. These inconsistencies highlight the need for future studies to use a different method of examining the associations by sex.

While no personal or environmental factors addressed in this study predicted SSB in AWD, a finding that is of concern was that bullying others predicted SSB in adolescents without disabilities (Table 5). This finding may suggest that in addition to the health-oriented importance of reducing SSB, it also has social implication. Reducing SSB may be associated with less socially disruptive behaviour. In this study we used a pooled bullying score with no splitting by type of bullying behaviour, such as physical, verbal, or cyberbullying. In future studies, it would be important to explore which specific disruptive behaviours are associated with excessive SSB.

**Physical activity participation**

While according to 2010 WHO PA recommendations, adolescents should participate in MVPA at least one hour every day (World Health Organization, 2010), the mean participation rates in this sample were below 10%, with substantial reduced MVPA participation rates among AWD (6.29%), and significant differences presented across the 6th and 8th grade levels. The lack of significant differences in MVPA participation in older adolescents may have been a result of a ‘floor effect’ (i.e. having a large concentration of participants’ scores at or near the lower limit of the scale (Hessling et al.,

### Table 3. Adolescents with disability: One-way analysis of variance for differences in physical activity level, sedentary behaviour and school bullying based on disability type.

| Disability type | Sedentary behaviour – weekdays and weekend, hours: mean (SD) | Days/week of daily 60 minutes of physical activity: mean (SD) | Bullying others, score: mean (SD) | Being bullied, score: mean (SD) |
|-----------------|-------------------------------------------------------------|-------------------------------------------------------------|---------------------------------|---------------------------------|
| Vision (n = 70) | 4.44 (2.31)                                                 | 2.22 (1.92)                                                 | 11.72 (5.83)                            | 15.04 (7.43)                             |
| Hearing (n = 214) | 4.45 (2.12)                                                 | 2.13 (1.95)                                                 | 15.14 (6.26)                           | 17.41 (7.33)                             |
| Mobility – not using a wheelchair (n = 56) | 4.60 (2.18)                                                 | 1.68 (1.91)                                                 | 15.74 (7.17)                              | 19.02 (8.26)                             |
| Mobility – using a wheelchair (n = 13) | 4.10 (3.17)                                                 | 1.84 (2.19)                                                 | 19.00 (11.86)                           | 27.20 (16.5)                            |
| Other (n = 76) | 4.80 (2.08)                                                 | 2.27 (1.99)                                                 | 11.27 (6.98)                             | 14.70 (9.52)                             |

Notes: *a* different than vision; *b* different than hearing; *c* different than mobility – no wheelchair; *d* different than mobility – wheelchair; *e* other; p < 0.05 (two-tailed) SD, standard deviation.
2004), as adolescents from the 11th grade only exhibited a 5% compliance with the 2010 WHO PA recommendations, and adolescents from the 12th grade only a 3% and 2% compliance for adolescents without and with disabilities, respectively. Based on the regression analyses, age represented by grade was the main predictor of participation in PA in adolescents with and without disabilities. In adolescents without disabilities, sex was also a significant predictor, suggesting that males were more compliant with the PA recommendations than females. This predictor did not hold true in AWD, probably also due to the ‘floor effect’.

Compliance with 2010 WHO PA recommendations in our sample (6.53% for females and 12.97% for males) was far below the overall mean from 2010, which was 18.6%, based on data from 32 countries in the HBSC study (Kalman et al., 2015). Furthermore, this rate of compliance was far below the Israeli rates reported in 2010 (23.6% for males and 10% for females). With regard to AWD, the rates presented in our sample (Figure 1) were also far below the rates described in Finland, where an increasing trend was reported in compliance with MVPA recommendations between 2002 and 2014 (8.7% to 15.6% for females and 13.0% to 26.6% for males). It should, however, be acknowledged that the definition of AWD was different in Finland and also included participants with long-term illnesses (Ng et al., 2016). The profoundly low participation rate of MVPA particularly in AWD exhibited in our findings should be considered a major threat to the overall health of this population, which is increasingly being included and integrated within the general school system framework. According to a recent Canadian study (Brown et al., 2019), participation in MVPA confers protective benefits for internalizing disorders in AWD.

Our finding that higher SES significantly predicted MVPA participation in adolescents with or without disabilities is supported in several studies on adults (Crespo et al., 1999), adolescents (Humbert et al., 2006) or children (Woodfield et al., 2002). However, in contrast to our findings, Voorhees et al. (2009) reported that none of the indices of SES within a sample of adolescents from 36 middle schools across six geographic regions in the United States were related to device-based measures of PA. Regarding the potential mechanism explaining the SES effect, Humbert et al. (2006) reported that differences existed between adolescents from high compared to low SES regarding factors associated with their PA participation. Those coming from families with higher SES,
reported less participation barriers. However, in a comprehensive study analysing the relationship between adolescents’ PA and family SES over 28 years, Telama et al. (2009) reported that while increased participation in PA organized by sport clubs was strongly associated with higher SES across sexes, no effect was reported in PA participation at the school. The impact of higher SES on PA participation should be considered by policymakers, and specific programs should be developed that encourage adolescents from families with lower SES to increase their participation in PA.

Based on our data, neither being bullied by others nor actively bullying others significantly influenced PA participation of AWD. This finding may be reassuring, as Haegel and Sutherland (2015) warned that bullying was the most persistently described negative peer interaction during PA in AWD. Interestingly, being bullying victims and bullying others were strongly associated with adolescents with and without disabilities. This finding can be supported by previous reports informing that some children developed a retaliation response with the same bullying behaviour to their peers (Davis & Watson, 2001; Fitzgerald, 2005). Such a response may, however, illustrate the beginning of a vicious cycle of being teased and teasing, which may ultimately result in negative social outcomes. Teasing and bullying experiences may have detrimental outcomes for school achievement (Cornell et al., 2013), and be associated with higher rates of anxiety disorders, such as social phobia, obsessive compulsive behaviour or panic disorders in adults (McCabe et al., 2003).

Given our findings, parents, educators and other stakeholders should be encouraged to support the participation of AWD within inclusive PA frameworks. Doing so may increase the underscored participation rate of AWD in PA. However, based on our data (Table 2), bullying others and being bullied were significantly more common in AWD compared to adolescents without disability. Adolescents who use a wheelchair for their mobility were most likely to be bullied and to engage in bullying others (Table 3). These data are important because they indicate that AWD, and particularly those with severe physical disability, still present a vulnerable minority in the school landscape. Educators and stakeholders should consider precautions during the inclusion process, minimizing the occurrence of bullying behaviours confronting AWD. Specific exposure to disability programs, such as Paralympic School Day (McKay et al., 2015), appears to be one way to cope with this concern.

**Limitations**

There are several methodological limitations to consider when generalizing these conclusions. First, this study utilized a cross-sectional design. Longitudinal studies are warranted to support the magnitude of the associations found in this study. Second, PA and SSB variables were determined by self-report rather than direct measurement. Therefore, under – or over-estimation may have occurred. Third, variables were measured with questions taken from a larger survey, including

**Table 4. Correlations of outcome measures with physical activity level and screen time.**

|                           | Adolescents with disability (n = 429) | Adolescents without disability (n = 4183) |
|---------------------------|--------------------------------------|-----------------------------------------|
|                           | Sedentary behaviour – average of weekdays and weekend, hours | Days/week of daily 60 minutes of physical activity, days | Sedentary behaviour – average of weekdays and weekend, hours | Days/week of daily 60 minutes of physical activity, days |
| Grade                     | r (p)                                | −0.04 (0.35) | −0.17 (0.004) | −0.08 (<0.001) | −0.23 (<0.001) |
| Socioeconomic status      | r (p)                                | 0.03 (0.34) | 0.12 (0.002) | 0.05 (0.30) | 0.22 (0.002) |
| Sedentary behaviour       | r (p)                                | −0.07 (0.14) | 0.07 (0.14) | −0.07 (0.14) | −0.00 (0.78) |
| Days/week of daily        | r (p)                                | 0.07 (0.14) | −0.00 (0.78) | −0.00 (0.78) | −0.00 (0.78) |
| 60 minutes of physical    |                                       |                                       |                                       |                                       |
| activity, number           |                                       |                                       |                                       |                                       |
| Being bullied, score       | r (p)                                | −0.05 (0.35) | 0.04 (0.43) | 0.05 (0.08) | 0.07 (<0.001) |
| Bullying others, score     | r (p)                                | −0.08 (0.13) | 0.06 (0.21) | 0.03 (0.02) | 0.15 (<0.001) |
| Disability group                              | Dependent variables | Independent variables | Unstandardized B Coefficient | Unstandardized Standard error | t     | P     |
|----------------------------------------------|---------------------|-----------------------|------------------------------|--------------------------------|-------|-------|
| Adolescents with disability (n = 429)       | Days/week of daily 60 minutes of physical activity, number    | (Constant)            | 2.96                         | 0.39                           |       |       |
|                                              |                     | Grade                 | −0.29                        | 0.07                           | −4.01 | <0.001|
|                                              |                     | Socioeconomic Status  | 0.15                         | 0.06                           | 7.50  |       |
|                                              |                     | R² = 0.14; Adjusted R² = 0.10; F ratio = 16.13; P < 0.001 |
|                                              | Sedentary behaviour – average of weekdays and weekend, hours | (Constant)            | 4.55                         | 1.31                           |       |       |
|                                              |                     | Grade                 | −0.09                        | 0.02                           | −3.48 | <0.001|
|                                              |                     | Bullying others       | 0.01                         | 0.09                           | 2.04  | 0.04  |
|                                              |                     | R² = 0.05; Adjusted R² = 0.04; F ratio = 8.48; P < 0.0001 |
| Adolescents without disability (n = 4183)    | Days/week of daily 60 minutes of physical activity, number    | (Constant)            | 5.25                         | 0.55                           |       |       |
|                                              |                     | Sex, reference sex – males | −0.99                        | 0.07                           | −13.55| <0.001|
|                                              |                     | Grade                 | −0.38                        | 0.02                           | −13.50| 0.003 |
|                                              |                     | Socioeconomic Status  | 0.12                         | 0.01                           | 7.90  | 0.001 |
|                                              |                     | R² = 0.15; Adjusted R² = 0.14; F ratio = 183.03; P < 0.001 |

Notes: Continuous variables: only variables which had significant correlations with the dependent variables were included; categorical variables – only variables which differed significantly in the dependent variables were included; variance inflation factor in all analyses was < 10.
additional potential personal and environmental factors. The confounding effect of such variables should be considered.

Conclusions

In conclusion, this study targeted personal and environmental factors associated with SSB and PA participation in adolescents with and without disabilities in a nationwide sample. Based on our findings, it may be suggested that only a minority of the adolescents with and without disabilities in this sample reported complying with WHO recommendations regarding PA and SSB. As to personal factors, the data indicate that adolescents with and without disabilities did not differ across sexes in SSB. However, males without disability were more physically active than females without disability. Furthermore, younger adolescents in Grades 6 and 8 presented increased SSB compared to those in Grades 9 through 12. Furthermore, PA participation was significantly lower among AWD in grades 6 and 8 compared to adolescents without disability. Regarding environmental factors, adolescents with and without disabilities were not influenced by SES. However, bullying behaviour was associated with SSB in adolescents without disabilities. While adolescents with mobility restrictions were significantly more involved in bullying behaviour, this did not seem to impact their PA participation. This study has outlined, for the first time, the risk of increased bullying behaviour and lack of physical activity in Israeli AWD. This said, an association of the bullying behaviour with physical activity was not demonstrated. Therefore, based on our findings, several recommendations can be set forward to educators and policymakers: (a) PA participation of AWD should be encouraged at all ages; (b) While the processes enabling PA participation of AWD are beyond the scope of this article, reducing the likelihood of being bullied seems to be a particularly important goal; and (c) reduction of SSB should be encouraged for all adolescents, thereby increasing desirable social behaviours.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Prof. Yeshayahu Hutzler is Full professor and chair of the Innovation and Entrepreneurship Centre at the Academic College at Wingate, Israel. Between 2007-2011 he assumed Presidency of the International Federation of Adapted Physical Activity and in the year 2017 was awarded for outstanding contributions to this field of study. Between 2013 and 2016 he served as Editor in Chief of the “Adapted Physical Activity Quarterly. By 2020 he published about 150 scholarly contributions. Since 1987, he has designed and developed several innovative inclusive as well as inclusive physical activity models and programmes for persons with disabilities.

Dr. Riki Tesler is Senior Lecturer at the Department for Health systems management. She is also a member of the Health Behaviors in School Age Children research program and co-leader for Active Healthy Kids Global Matrix. Dr. Tesler focuses on research in the fields of health promotion, risk and health behaviors. In particular, her research is engaged in evaluation of health promotion strategies and intervention programs targeting the well-being and salutogenic attitudes among populations.

Dr. Kwok Ng has the title of Docent in Health Promotion and Adapted Physical Activity. He has a dual post at the School of Educational Sciences and Psychology, University of Eastern Finland, Finland, and the Department of Physical Education and Sport Sciences, University of Limerick, Ireland. He chairs the chronic conditions and disability writing group of the HBSC network, is Vice President of the European Federation of Adapted Physical Activity (EUFAPA), and board member of the International Federation of Adapted Physical Activity (IFAPA).

Dr. Sharon Barak teaches at Ben-Gurion University of the Negev and Kaye Academic College of Education, Israel. Dr. Barak specializes in physical activity for people with disability and in clinical exercise physiology. In Addition, she works in development of rehabilitation and evaluation programs in Sheba Medical Center at Tel Hashomer Hospital, Pediatric Rehabilitation Department. Finally, Dr. Barak serves as a researcher and consultant in several prominent Israeli organizations, such as The National Insurance Institute and the Joint Distribution Committee (JDC Israel).

Hadas Kazula is a Pilates teacher and master student within the Physical Education Sciences program of the Academic College at Wingate
Prof. Yossi Harel-Fisch, is an internationally renowned expert on risk behavior prevention and health promotion research. He is the founding-director of the International Research Program on Adolescent Well-Being and Health at Bar Ilan University, and served for the past decade as Chief Scientist of the Israel Anti-Drug Authority (IADA). He is a Visiting Professor at the University of the Chinese Academy of Social Sciences (UCASS) and at the Centers for Disease Prevention and Control (CDC) in Beijing, China. Over the past three and a half decades, Harel-Fisch has been involved in initiating and implementing national, cross-national and regional scientific survey systems, evidence-based policies and intervention strategies, focusing on the psychosocial and cultural determinants of health behaviors, resiliency and well-being of young populations.

ORCID

Yeshayahu Hutzler http://orcid.org/0000-0003-1955-5500
Kwok Ng http://orcid.org/0000-0002-5461-7706
Sharon Barak http://orcid.org/0000-0003-0714-4798

References

-139. https://doi.org/10.1007/s00038-009-5404-x
Almeida, B., Santos, S., Gomes, F., & Marques, A. (2020). Physical activity practice determinants for people with motor disabilities: inequities in access and physical activity engagement (pp. 150–165). Bentham Science Publishers.
Boone, J. E., Gordon-Larsen, P., Adair, L. S., & Popkin, B. M. (2007). Screen time and physical activity during adolescence: Longitudinal effects on obesity in young adulthood. International Journal of Behavioral Nutrition and Physical Activity, 4(1), 26. https://doi.org/10.1186/1479-5868-4-26
Boyce, W., Torshiem, T., Currie, C., & Zambon, A. (2006). The family affluence scale as a measure of national wealth: validation of an adolescent self-report measure. Social Indicators Research, 78(3), 473–487. https://doi.org/10.1007/s11205-005-1607-6
Brown, D., O’Rourke, R., Kinis, K., & Arbour-Nicitopoulos, K. (2019). Moderate-to-vigorous physical activity confers protective benefits for internalizing disorders among Canadian children and youth with disabilities. Journal of Exercise, Movement, and Sports, 5(1), 187. https://www.scapps.org/jems/index.php/1/article/view/2405
Bucksch, J., Inchley, J., Hamirik, Z., Finne, E., & Kolip, P. (2014). Trends in television time, non-gaming PC use and moderate-to-vigorous physical activity among German children 2002–2010. BMC Public Health, 14(1), 351. https://doi.org/10.1186/1471-2458-14-351
Carbone-Lopez, K., Esbensen, F.-A., & Brick, B. T. (2010). Correlates and consequences of peer victimization: Gender differences in direct and indirect forms of bullying. Youth Violence and Juvenile Justice, 8(4), 332–350. https://doi.org/10.1177/1541204010362954
Central Bureau of Statistics (Pupils with Special Needs, 2016/17. Media Announcement 354/2018 December, 2, 2018). (2018). Central Bureau of Statistics. https://www.cbs.gov.il/he/mediarelease/DocLib/2018/354/06_18_354b.pdf
Cornell, D., Gregory, A., Huang, F., & Fan, X. (2013). Perceived prevalence of teasing and bullying predicts high school dropout rates. Journal of Educational Psychology, 105(1), 138–149. https://doi.org/10.1037/a0030416
Crespo, C. J, Ainsworth, B. E., Keteyian, S. J, Heath, G. W., & Smit, E. (1999). Prevalence of physical inactivity and its relation to social class in U.S. adults: results from the third national health and nutrition examination survey, 1988–1994. Medicine and Science in Sports and Exercise, 31(12), 1821. https://doi.org/10.1097/00005768-199912000-00019
Currie, C., Nic Gabhainn, S., & Godeau, E., & The International HBSC Network Coordinating Committee. (2009). The health behaviour in school-aged children: WHO collaborative cross-national (HBSC) study: Origins, concept, history and development 1982–2008. International Journal of Public Health, 54(S2), 131. https://doi.org/10.1007/s00038-009-5404-x
Dane-Staples, E., Lieberman, L, Ratcliff, J., & Rounds, K. (2013). Bullying experiences of individuals with visual impairments. The mitigating role of sport participation. Journal of Sport Behavior, 36(4), 365–386. http://link.galegroup.com/apps/doc/A351081107/ITOFu?b=brockport&sid=ITOF&xid=6e87cd88
Davis, J. M., & Watson, N. (2001). Where are the children’s experiences? Analysing social and cultural exclusion in “special” and “mainstream” schools. Disability & Society, 16(5), 671–687. https://doi.org/10.1080/09687590120070060
Domoff, S., Borgen, A., & Robinson, C. (2020). Problematic use of screen media and mobile devices. In M. Knox (Ed.), Clinician’s toolkit for children’s behavioral health (pp. 175–198). Academic Press.
Fitzgerald, H. (2005). Still feeling like a spare piece of luggage? Embodied experiences of (dis)ability in physical education and school sport. Physical Education & Sport Pedagogy, 10(1), 41–59. https://doi.org/10.1080/1740898042000334908
Fitzgerald, H. (2012). ‘Drawing’ on disabled students’ experiences of physical education and stakeholder responses. Sport, Education and Society, 17(4), 443–462. https://doi.org/10.1080/13573322.2011.609290
Ganz, F., Hammam, N., & Pritchard, L. (2020). Sedentary behavior and children with physical disabilities: A scoping review. *Disability and Rehabilitation*, 1–13. https://doi.org/10.1080/09638288.2020.1723720
Gladden, R., Vivolo-Kantor, A., Hamburger, M., & Lumpkin, C. (2014). Bullying surveillance among youths: Uniform definitions for public health and recommended data elements, version 1.0. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention and U.S. Department of Education. https://www.cdc.gov/violenceprevention/pdf/bullying-definitions-final-a.pdf
Guthold, R., Cowan, M. J., Autenrieth, C. S., Kann, L., & Riley, L. M. (2010). Physical activity and sedentary behavior among schoolchildren: A 34-country comparison. *The Journal of Pediatrics*, 157(1), 43–49. https://doi.org/10.1016/j.jpeds.2010.01.019
Haegele, J. A., Foley, J. T., Healy, S., & Paller, A. (2020). Prevalence of overweight among youth with chronic conditions in the United States: an update from the 2016 national survey of children's health. *Pediatric Obesity*, 15(4), 4. https://doi.org/10.1111/jpo.12595
Haegele, J. A., & Kirk, T. N. (2018). Experiences in physical education: Exploring the intersection of visual impairment and maleness. *Adapted Physical Activity Quarterly*, 35(2), 196–213. https://doi.org/10.1123/apaq.2017-0132
Haegele, J. A., & Sutherland, S. (2015). Perspectives of students with disabilities toward physical education: A qualitative inquiry review. *Quest*, 67(3), 255–273. https://doi.org/10.1080/00336297.2015.1050118
Harel-Fisch, Y., Walsh, S., Shteingart, N., Lubel, S., Riez, Y., Tesler, R., & Habib, J. (2016). Youth in Israel – Health. well being and patterns of risk behaviors: Finding from the 7th International HBSC Survey (2014) (p. 301). Bar-llan University. Hessling, R. M., Schmidt, T. J., & Traxel, N. M. (2004). Floor effect. In Lewis-BeckM., BrymanA., & FutinglT. (Eds.). The SAGE encyclopedia of social science research methods (pp. 389–391). Sage Publications.
Humbert, M. L., Chad, K. E., Spink, K. S., Muhajarine, N., Anderson, K. D., Bruner, M. W., Girolami, T. M., Odnokon, P., & Gryba, C. R. (2006). Factors that influence physical activity participation among high- and low-SES youth. *Qualitative Health Research*, 16(4), 467–483. https://doi.org/10.1177/104973302586051
Hutzler, Y., & Sherrill, C. (2007). Defining adapted physical activity: International perspectives. *Adapted Physical Activity Quarterly*, 24(1), 1–20. https://doi.org/10.1123/apaq.24.1.1
Iannotti, R. J., & Wang, J. (2013). Patterns of physical activity, sedentary behavior, and diet in U.S. adolescents. *Journal of Adolescent Health*, 53(2), 280–286. https://doi.org/10.1016/j.jadohealth.2013.03.007
Inchley, J., Currie, D., Cosma, A., & Samdal, O. (2018). Health behaviour in school-aged children (hbsc) study protocol: background, methodology and mandatory items for the 2017/18 survey. CHARU.
Janssen, I., Katzmarzyk, P. T., Boyce, W. F., Vereecken, C., Mulvihill, C., Roberts, C., Currie, C., & Pickett, W., & The Health Behaviour in School-Aged Children Obesity Working Group*. (2005). Comparison of overweight and obesity prevalence in school-age youth from 34 countries and their relationships with physical activity and dietary patterns. *Obesity Reviews*, 6(2), 123–132. https://doi.org/10.1111/j.1467-789X.2005.00176.x
Kalman, M., Inchley, J., Sigmundova, D., Iannotti, R. J., Tynjala, J. A., Hamirik, Z., Haug, E., & Bucksch, J. (2015). Secular trends in moderate-to-vigorous physical activity in 32 countries from 2002 to 2010: A cross-national perspective. *The European Journal of Public Health*, 25(suppl 2), 37–40. https://doi.org/10.1093/eurpub/ckv024
Klitsie, T., Corder, K., Visscher, T. L., Atkin, A. J., Jones, A. P., & van Sluijs, E. M. (2013). Children's sedentary behaviour: Descriptive epidemiology and associations with objectively-measured sedentary time. *BMC Public Health*, 13(1), 1092. https://doi.org/10.1186/1471-2458-13-1092
Kristjansdottir, G., & Vilhjalmsson, R. (2001). Sociodemographic differences in patterns of sedentary and physically active behavior in older children and adolescents. *Acta paediatrica*, 90(4), 429–435. https://doi.org/10.1111/j.1651-2227.2001.tb00445.x
Li, C., Haegele, J. A., & Wu, L. (2019). Comparing physical activity and sedentary behavior levels between deaf and hearing adolescents. *Disability and Health Journal*, 12(3), 514–518. https://doi.org/10.1016/j.dhjo.2018.12.002
Lowry, R., Kann, L., Collins, J., & Kolbe, L. (1996). The effect of socioeconomic status on chronic disease risk behaviors among US adolescents. *Journal of the American Medical Association*, 276(10), 792–797. https://doi.org/10.1001/jama.1996.0354010036025
McCabe, R. E., Antony, M. M., Summerfeldt, L. J., Liss, A., & Swinson, R. P. (2003). Preliminary examination of the relationship between anxiety disorders in adults and self-reported history of teasing or bullying experiences. *Cognitive Behaviour Therapy*, 32(4), 187–193. https://doi.org/10.1080/16506070310005051
McKay, C., Block, M., & Park, J. Y. (2015). The impact of Paralympic school day on Student attitudes toward inclusion in physical education. *Adapted Physical Activity Quarterly*, 32(4), 331–348. https://doi.org/10.1123/APAQ.2015-0045
McPherson, A. C., Ball, G. D. C., Maltais, D. B., Swift, J. A., Cairney, J., Knibbe, T. J., & Krog, K., & on behalf of DOCC-Net (Disability and Obesity in Canadian Children Network). (2016). A call to action: Setting the research agenda for addressing obesity and weight-related topics in children with physical disabilities. *Childhood Obesity*, 12(1), 59–69. https://doi.org/10.1089/chi.2015.0119
Munkedem-Givon, Y. (2019). *Children with disability*. Knesset Research and Information Center. https://fs.knesset.gov.il/globaldocs/MMM/bf06ddd8-9e00-ea11-810f-0015sd0af32a2_bf06ddd8-9e00-ea11-810f-0015sd0af32a11_13621.pdf
Myers, R. (1990). *Classical and modern regression with applications*. Duxbury/Thompson Learning.
Ng, K., Augustine, L., & Inchley, J. (2018). Comparisons in screen-time behaviours among adolescents with and without long-term illnesses or disabilities: Results from 2013/14 HBSC Study. *International Journal of Environmental Research and Public Health*, 15(10), 2276. https://doi.org/10.3390/ijerph15102276

Ng, K., Hämylä, R., Tynjälä, J., Villberg, J., Tammelin, T., Kannas, L., & Kokko, S. (2019). Test-retest reliability of adolescents’ self-reported physical activity data in two consecutive surveys. *Archives of Physical Health*, 77(1), 9. https://doi.org/10.1186/s13690-019-0335-3

Ng, K., Rintala, P., Tynjälä, J., Välimaa, R., Villberg, J., Kokko, S., & Kannas, L. (2016). Physical activity trends of Finnish adolescents with long-term illnesses or disabilities from 2002–2014. *Journal of Physical Activity & Health*, 13(8), 816–821. https://doi.org/10.1123/jpah.2015-0539

Ng, K., Tynjälä, J., Sigmundová, D., Augustine, L., Sentenac, M., Rintala, P., & Inchley, J. (2017). Physical activity among adolescents with long-term illnesses or disabilities in 15 European countries. *Adapted Physical Activity Quarterly*, 34(4), 456–465. https://doi.org/10.1123/apaq.2016-0138

Olds, T. S., Maher, C. A., Ridley, K., & Kittel, D. M. (2010). Descriptive epidemiology of screen and non-screen sedentary time in adolescents: A cross sectional study. *International Journal of Behavioral and Physical Activity*, 7(1), 92. https://doi.org/10.1186/1479-5868-7-92

Olweus, D. (1993). *Bullying at school: What we know and what we can do*. Blackwell.

On behalf of SBNR Terminology Consensus Project Participants, Tremblay, M. S., Aubert, S., Barnes, J. D., Saunders, T. J., Carson, V., Latimer-Cheung, A. E., Chastin, S. F. M., Altenburg, T. M., & Chinapaw, M. J. M. (2017). Sedentary Behavior Research Network (SBNR) – terminology consensus project process and outcome. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1), 75. https://doi.org/10.1186/s12966-017-0525-8

Pinquart, M. (2016). Systematic review: Bullying involvement of children with and without chronic physical illness and/or physical/sensory disability—a meta-analytic comparison with healthy/non-disabled peers. *Journal of Pediatric Psychology*, 43(3), 245–259. https://doi.org/10.1093/jpepsy/jsw081

Reinhardt, J. (2011). ICF, theories, paradigms and scientific revolution. Re: Towards a unifying theory of rehabilitation. *Journal of Rehabilitation Medicine*, 43(3), 271–273. https://doi.org/10.2340/16501977-0673

Rimmer, J. A., & Rowland, J. L. (2008). Physical activity for youth with disabilities: A critical need in an underserved population. *Developmental Neurorehabilitation*, 11(2), 141–148. https://doi.org/10.1080/17518420701688649

Sentenac, M., Gavin, A., Gabhaïn, S. N., Molcho, M., Due, P., Ravens-Sieberer, U., Matos, M. G. D., Malkowska-Szukutnik, A., Gobina, I., Vollebergh, W., Arnaud, C., & Godeau, E. (2013). Peer victimization and subjective health among students reporting disability or chronic illness in 11 Western countries. *The European Journal of Public Health*, 23(3), 421–426. https://doi.org/10.1093/eurpub/cks073

Steele, C. A., Kahnls, I. V., Rossen, B. E., Biggar, D. W., Bortolussi, J. A., & Jutai, J. W. (2004). Age-related health risk behaviors of adolescents with physical disabilities. *Sozial-Und Preventivmedizin/Social and Preventive Medicine*, 49(2), 132–141. https://doi.org/10.1007/s00038-004-3056-4

Telama, R., Laasko, L., Nupponen, H., Rimpelä, A., & Pere, L. (2009). Secular trends in youth physical activity and parents’ socioeconomic status from 1977 to 2005. *Pediatric Exercise Science*, 21(4), 462–474. https://doi.org/10.1123/pes.21.4.462

The United Nations. (2006). Convention on the Rights of Persons with Disabilities. *Treaty Series*, 2515, 3.

Throuvala, M. A., Griffiths, M. D., Rennoldson, M., & Kuss, D. J. (2020). The role of recreational online activities in school-based screen time sedentary behaviour interventions for adolescents: A systematic and critical literature review. *International Journal of Mental Health and Addiction*. https://doi.org/10.1007/s11469-019-00213-y

United Nations. (2020). *Convention on the Rights of Persons with Disabilities (CRPD)*. United Nations, Department of Economic and Social Affairs: Disability. https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html

Vereecken, C. A., Todd, J., Roberts, C., Mulvihill, C., & Maes, L. (2006). Television viewing behaviour and associations with food habits in different countries. *Public Health Nutrition*, 9(2), 244–250. https://doi.org/10.1017/S1368980005002874

Von Marées, N., & Petermann, F. (2010). Bullying in German primary schools: Gender differences, age trends and influence of parents’ migration and educational backgrounds. *School Psychology International*, 31(2), 178–198. https://doi.org/10.1177/0143034309352416

Voorhees, C. C., Catellier, D. J., Ashwood, J. J., Cohen, D. A., Rung, A., Lytle, L., Conway, T. L., & Dowda, M. (2009). Neighborhood socioeconomic status and non school physical activity and body mass index in adolescent girls. *Journal of Physical Activity & Health*, 6(6), 731–740. https://doi.org/10.1123/jpah.6.6.731

Walker, M., Nixon, S., Haines, J., & McPherson, A. C. (2019). Examining risk factors for overweight and obesity in children with disabilities: A commentary on Bronfenbrenner’s ecological systems framework. *Developmental Neurorehabilitation*, 22(5), 359–364. https://doi.org/10.1080/17518423.2018.1523241

Wang, J., Iannotti, R. J., & Nansel, T. R. (2009). School bullying among adolescents in the United States: Physical, verbal, relational, and cyber. *Journal of Adolescent Health*, 45(4), 368–375. https://doi.org/10.1016/j.jadohealth.2009.03.021

Woodfield, L., Duncan, M., Al-Nakeeb, Y., Nevill, A., & Jenkins, C. (2002). Sex, ethnic and socio-economic differences in children’s physical activity. *Pediatric Exercise Science*, 14(3), 277–285. https://doi.org/10.1123/pes.14.3.277
World Health Organization. (2001). *The International Classification of Functioning, Disability and Health (ICF)*. World health Organization. [http://www.who.int/classifications/icf/en/](http://www.who.int/classifications/icf/en/).

World Health Organization. (2010). *Global recommendations on physical activity for health*.

World Health Organization. (2013). *How to use the ICF: A practical manual for using the international classification of functioning, disability and health (ICF)*. Exposure draft for comment. World health Organization. [https://www.who.int/classifications/drafticfpracticalmanual.pdf](https://www.who.int/classifications/drafticfpracticalmanual.pdf)