Cohort study evaluating how changes in school programs, policies, and resources impact youth health behaviours

Reliability and validity of the physical activity and sedentary behaviour measures in the COMPASS study

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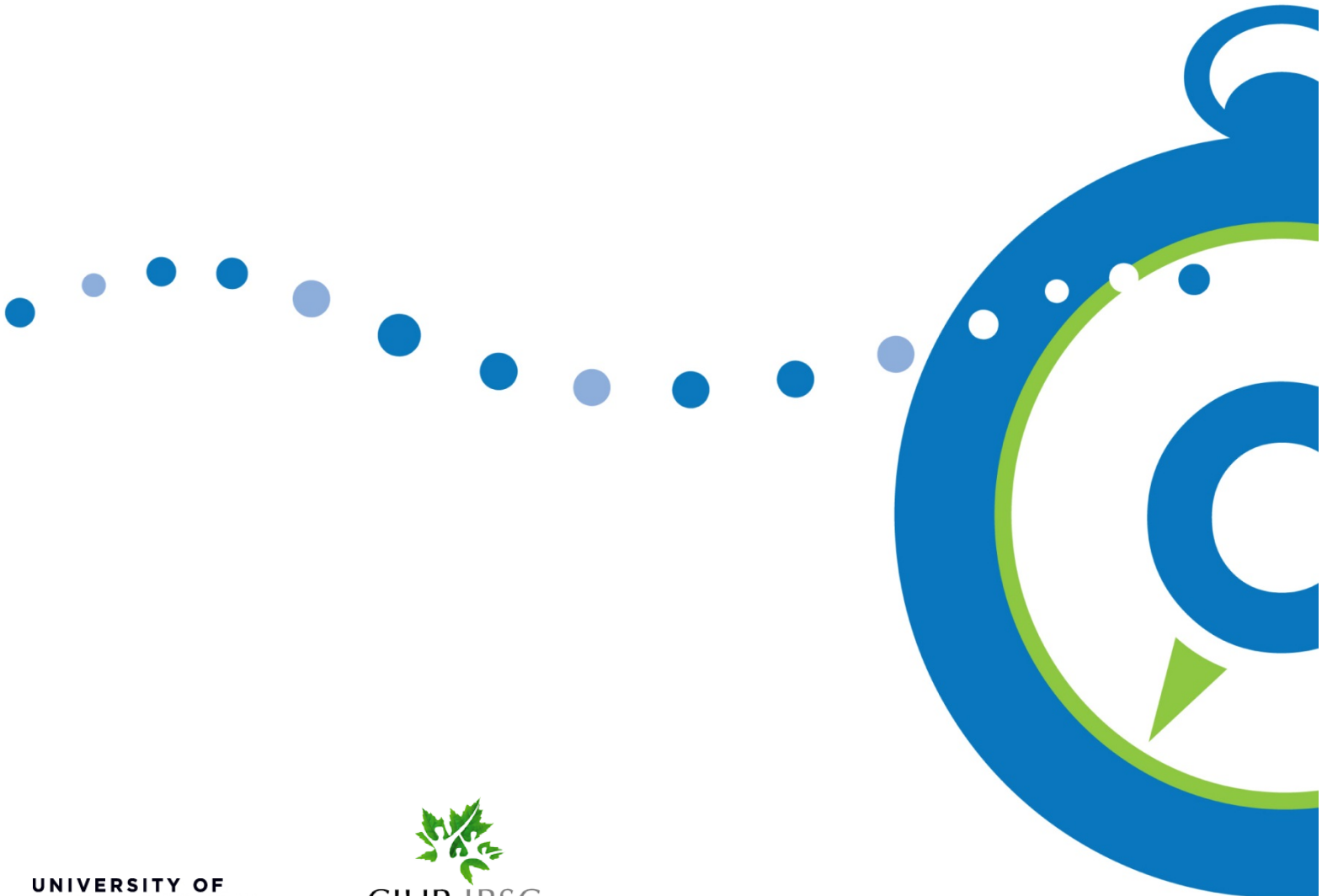

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Introduction

Physical activity (PA) is an important part of a healthy lifestyle. Regular PA is associated with a decreased risk for chronic illness and obesity [1-2], in addition to improved physical, mental, and social well-being among youth [3-4]. Perhaps, most importantly, health behaviours such as PA that are established during adolescence are likely to be carried out through adulthood [5-6]. Given the ongoing decline in PA levels among Canadian youth populations [7-8], and the need for stakeholders to implement more effective initiatives to promote PA among youth [9], improving our understanding of how to increase PA among youth is critical to advance relevant public health initiatives in Canada.

There is also concern about the impact sedentary lifestyles have on youth health [10], as youth obesity trends appear to coincide with the increasing prevalence of youth reporting more time spent in sedentary activities [11]. There appears to be a 'perfect storm' for increasing youth obesity prevalence as declining PA levels among youth [7] coincides with an overall increase in the time spent in sedentary behaviours, such as screen-based activities (e.g., television viewing, video game playing, computer activities, text messaging) [12-13]. Considering that sedentary behaviour is emerging as an important risk behaviour distinct from PA [10,14], we therefore must improve our understanding of how to decrease sedentary behaviours among youth.

Given the problems associated with physical inactivity and excessive sedentary behaviour among youth populations in Canada, the Canadian Society for Exercise Physiology (CSEP) developed recommendations for the amount of time that youth spend being both physically active [15] and in sedentary activities [16]. Despite these published recommendations, few Canadian youth are currently meeting and following these guidelines [17]. For example, the 2007-09 Canadian Health Measures Survey (CHMS) identified that only 9% of boys and 4% of girls accumulate the recommended 60 minutes of moderate-to-vigorous PA on at least 6 days a week [18], and the 2008 Youth Smoking Survey (YSS) identified that the average daily sedentary screen time among Canadian youth was 7.8 (± 2.3) hours per day [12], far surpassing the recommendation to limit recreational screen time to a maximum of 2 hours per day [16]. It remains a public health priority to both increase the prevalence of youth that are sufficiently active and reduce the prevalence of youth engaging in excessive sedentary behaviour.

Since youth spend a large part of their days at school, schools are increasingly tasked with promoting active lifestyles, including the promotion of PA and decreased sedentary behaviours. However, school stakeholders are not provided with the tools or resources necessary to develop evidence-based programs to effectively improve these health behaviours [19-20]. The COMPASS project was designed to fill this gap (www.compass.uwaterloo.ca); it is a longitudinal study (starting in 2012-13) following a cohort of ~50,000 grade 9 to 12 students attending ~90 Ontario secondary schools for four years to understand how changes in school environment characteristics (policies, programs, built environment) are associated with changes in youth health behaviours. COMPASS provides school stakeholders with the evidence to inform and evaluate school-based interventions related to PA and sedentary behaviour (as well as tobacco use, alcohol and drug use, obesity, healthy eating, school connectedness, bullying, and academic achievement). Similar to other data systems [19,21], the student-level questionnaire for COMPASS was designed to facilitate multiple large-scale school-based data collections; it therefore required passive consent procedures (i.e., no objective measurements were possible), and had to be short enough to be completed in one classroom period to minimize the burden on students and schools (~30 minutes to complete the whole survey). This created a challenge in selecting items to balance both

the depth of the core measures associated with each behavioural outcome and the breadth of data that could be measured in each domain. Within this protocol restriction, it was not possible to use detailed PA or sedentary behaviour checklists or measures (we were limited to ½-page for sedentary behaviour and ½-page for PA). Given this restriction, we used a modified version of the previously validated brief PA measure used in the School Health Action Planning and Evaluation System (SHAPES) [22]. Since the SHAPES PA measure did not measure vigorous PA accurately, the COMPASS measure was reworded to provide respondents with definitions and examples of 'hard' and 'moderate' PA (e.g., instructions not to include time in hard PA when calculating moderate PA). To assess sedentary behaviour, COMPASS made use of a modified version of the sedentary behaviour measure previously used in the National Youth Smoking Survey (YSS) [12]; the YSS sedentary behaviour measure has never been validated and the COMPASS measure adapted the wording to include examples of how to complete the question, new categories of sedentary behaviour (e.g., streaming TV shows or movies), and new response categories that allow students to respond in 15 minute increments. Given these substantial modifications to the original measures, the purpose of this study was to assess the 1 week (1wk) test-retest reliability and the criterion validity of the COMPASS questionnaire (Cq) measures used to determine PA and sedentary behaviour.

Methods

Data Collection

We used data from a convenience sample of 178 students in grade 9 from four schools in Southwestern Ontario (Canada) who participated in the COMPASS validation study; details on the validation of the BMI and diet measures in the Cq have been published [23]. Participants completed the Cq during class time (~30 min) on two separate occasions between September and December 2011. At time 1 (T1), staff administered the Cq in classrooms using a common protocol and standardized instructions. Once the Cq was completed, student participants were instructed on how to properly wear accelerometers (ActiGraph GT3XP+) on an adjustable belt worn over the right hip. The ActiGraph GT3X+ provides various PA measurements and can identify when the device has been removed (http://dl.theactigraph.com/GT3Xp_wGT3Xp_Device_Manual.pdf). Students were requested to wear the accelerometer for the one week between Cq administrations for at least 10 hours a day and informed that they will be collected by research staff one week (7 days) later during the same class (T2). After one week, the Cq was re-administered to the same students (T2). A self-generated code was included on the cover sheet of the Cq to permit accurate tracking of participants over time [24]. Upon T2 completion of the Cq, study staff verified that all participants returned their accelerometers and uploaded their data. Students were provided $15 for returning the accelerometer at T2. Ethics approval was granted by the University of Waterloo Office of Research Ethics, participating school board and school ethics committees.

Measures

Self-Reported Physical Activity

Weekly time spent performing vigorous physical activity (VPA) in minutes per week (min/wk) was measured by summing the responses from the Cq 7-day recall question about "HARD" PA (Question 10 in Figure 1). Weekly time (min/wk) spent performing moderate physical activity (MPA) was measured by summing the responses from the Cq 7-day recall question about "MODERATE" PA (Question 11 in Figure

1). Weekly time (min/wk) spent performing moderate to vigorous physical activity (MVPA) was calculated by summing the responses from the two 7-day recall questions about "HARD" and "MODERATE" PA (Questions 10 and 11 in Figure 1).

Measured Physical Activity

Objective measures of PA were based on accelerometer data using previously established cut-points for children recommended for ActiGraph accelerometers [25-26]. MPA was defined using the cut-point of 500 to 3999 counts/minute, VPA was defined as ≥4000 counts/minute, and MVPA was defined as ≥500 counts/minute.

Self-Reported Sedentary Behaviour

The Cq asked respondents to report the average time in minutes per day (min/day) that they spent in six sedentary behaviours: "Watching/streaming TV shows or movies" (Question 9a in Figure 2); "Playing video/computer games" (Question 9b in Figure 2); "Doing homework" (Question 9c in Figure 2); "Talking on the phone" (Question 9d in Figure 2); "Surfing the internet" (Question 9e in Figure 2); and, "Texting, messaging, emailing" (Question 9f in Figure 2). Average total sedentary behaviour (ATSB) was measured by summing the responses from these six items.

Measured Sedentary Behaviour

The objective measure of ATSB was based on accelerometer data using previously established cut-points for children for ActiGraph accelerometers [25,27]. ATSB was defined using the cut-point of 0 to 149 counts/minute. ATSB did not include time sleeping or time when the accelerometer was not worn (10 min or more of consecutive zero-activity counts).

Analyses

Consistent with previous research [22,28], to be included in the statistical analyses, participants must have worn the accelerometer for at least 10 hours per day for a minimum of 5 days. Conventional descriptive statistics were used for the self-reported and measured PA and sedentary behaviour measures (examined by sex). Test-retest reliability of the self-reported PA and sedentary behaviour measures at T1 and T2 were examined using intraclass correlation coefficients (ICC). Criterion validity of the objectively measured and self-reported VPA, MPA, MVPA and ATSB at T2 were also examined using intraclass correlation coefficients (ICC). For the purpose of comparison to previous studies, test-retest reliability and criterion validity analyses were also determined using Pearson correlation and Cronbach's Alpha. In order to make our results meaningful and easier to interpret for a broader audience of stakeholders and researchers, correlation rating interpretations [29] are also provided to help with the interpretation of the strength of the results presented for our reliability and validity values: ICC (0.00 to 0.10 virtually none, 0.11 to 0.40 slight, 0.41 to 0.60 fair, 0.61 to 0.80 moderate, and 0.81 to 1.0 substantial); Pearson correlation (0.10 to 0.30 weak, 0.30 to 0.50 moderate, >0.50 strong); and, Cronbach's Alpha (<0.50 unacceptable, 0.50 to 0.59 poor, 0.60 to 0.69 questionable, 0.70 to 0.79 acceptable, 0.80 to 0.89 good, ≥ 0.90 excellent). Means and standard deviations for the objectively measured and Cq T2 self-reported VPA, MPA, MVPA and ATSB were calculated to determine the difference between the self-reported and objective measures and the accuracy (over or under reporting) of the self-reported measures. The statistical package SAS 9.2 was used for all analyses.

Results

Descriptive Statistics

The initial sample was 52.8% (n=94) female and 47.2% (n=84) male. Overall, sufficient accelerometer data required to calculate PA and sedentary behaviour (at least 10 hours per day for at least 5 days) were only available from 139 respondents (78.1%); data were missing from 16.0% of females (n=15) and 28.6% of males (n=24). As such, the final sample was 56.8% (n=79) female and 43.2% (n=60) male. Table 1 presents descriptive statistics for PA and sedentary behaviour of the 139 respondents in the final sample.

Test-Retest Reliability

As shown in Table 2, test-retest reliability for self-reported VPA (ICC 0.68), MPA (ICC 0.71), MVPA (ICC 0.75), and ATSB (ICC 0.79) are considered moderate. When examining the different types of sedentary behaviour measured, the test-retest reliability for self-reported texting, messaging, emailing was considered substantial (ICC 0.86), playing video or computer games (ICC 0.65), talking on the phone (ICC 0.76), and surfing the internet (ICC 0.71) were considered moderate, and watching TV or movies (ICC 0.56) and doing homework (ICC 0.54) are considered fair. The strength of the Pearson correlations and Cronbach's Alpha were consistent with the ICC estimates.

Comparison between Self-Report and Objective Measures

Table 3 demonstrates the differences for self-reported and objectively measured VPA, MPA, MVPA and ATSB. On average, self-reported VPA was overestimated by 425.8 min/week compared to objective VPA [92.8% (n=129) of respondents overestimated their average daily VPA], and self-reported MPA was underestimated by 235.4 min/week compared to objective MPA [79.1% (n=110) of respondents underestimated their average daily MPA]. When combined, average self-reported MVPA was overestimated by 190.4 min/week compared to the average objective MVPA [56.8% (n=79) of respondents overestimated their average daily MVPA]. Interestingly, although the average self-reported ATSB was overestimated by 70.2 min/week compared to objective ATSB, the majority of respondents [54.7% (n=76)] actually underestimated their average daily ATSB.

Criterion Validity

As shown in Table 4, the criterion validity for self-reported VPA (ICC 0.18), MPA (ICC 0.22), MVPA (ICC 0.25), and ATSB (ICC 0.15) are considered slight. The strength of the Pearson correlations and Cronbach's Alpha were consistent with the ICC estimates.

Discussion

Evidence suggests that there is an immediate need for ongoing surveillance, research and evaluation on modifiable youth risk behaviours and the school-level characteristics (programs, policies, resources) associated with those behaviours which are amenable to modification [17]. However, the large school-based studies that are designed to inform and evaluate school-based prevention programming in multiple health domains (e.g., COMPASS), require self-reported instruments that are easy to complete, cheap, reproducible, and accurate. The present study assessed the test-retest reliability and criterion validity of self-reported measures of PA and sedentary behaviours in the Cq. Consistent with the

evidence from the Cq measures of diet and BMI [23], we found that the simple questions in the Cq provided a reliable and sufficiently valid measures of youth PA and sedentary behaviour for use in large scale school-based research.

Reliability of the Cq measures

We identified that the 1-week test-retest reliability of the Cq self-report measures of PA and sedentary behaviour was moderate overall but individual items did range from fair to substantial. Our findings are consistent with previous research [22,30-33], and suggest that the Cq measures of PA and sedentary behaviour are acceptable for use in self-report surveys with youth. Given that PA and sedentary behaviours can reasonably be expected to vary from day-to-day (e.g., due to weather), it is unreasonable to expect there to be perfect agreement in the measures from T1 to T2. As such, our results give us confidence that the simple PA and sedentary behaviour measures used in the Cq can provide reliable self-report data over time.

The reliability of the Cq measures are comparable with other self-report measures of PA and sedentary behaviours in similar-aged youth. For example, the 1-week test-retest reliability of a health behaviour questionnaire administered to a sample of 10-12 year olds in six European countries demonstrated good to excellent reliability for the majority (77%) of the items (ICC>0.60) [34]. The 2-week test-retest reliability of the Adolescent Sedentary Activities Questionnaire (ASAQ), administered to 250 students aged 11-15 years in Australia, was considered good to excellent (ICC > 0.70) [30]. The Adolescent Physical Activity Recall Questionnaire (APARQ) and the World Health Organization-Health Behaviour in School-Aged Children survey (HBSC) were administered to students in grades 8 and 10. The APARQ assessed PA using three-categories, while the HBSC assessed the frequency and duration of vigorous PA outside of school hours. The kappa coefficients for the APARQ ranged from 0.33 to 0.71 [32], and 0.22 to 0.73 for the HBSC [33], and were both considered sufficient for use in their study population. Two-week test-retest reliability of the PA measures in the Youth Risk Behavior Survey (YRBS), administered to students in grades 9-12 was moderate to high (kappa coefficients ranged from 46.7-84.8) [31]. And finally, 1-week test-retest reliability of the SHAPES PA questionnaire in 2812 students in grades 9-12 was considered moderate (kappa=0.57) and acceptable for use in large-school based studies [22]. Based on these standards, the reliability of the Cq PA and sedentary behaviour measures are sufficient and appropriate for use in school research of youth health behaviours.

Validity of the Cq measures

The self-reported PA measures in the Cq were significantly correlated with the accelerometer-measured behaviours. While correlations between self-report and objective measures were low to modest, the results are comparable to most other studies using accelerometers to validate self-report PA. For example, in a sample of children and youth aged 8-16 years, responses to a PA checklist were modestly correlated to those of an MTI accelerometer (r=0.30) [35]. Similarly, responses to the Physical Activity Questionnaire for Children and Adolescents (PAQ-C and PAQ-A, respectively) were moderately correlated with accelerometer-measured PA (r=0.39 and r=0.33, respectively) [36-37]. Conversely, a 7-day checklist for PA recall used in the Children's Leisure Activities Study Survey (CLASS) was not correlated to the accelerometer-measured PA [38]. Compared to the self-reported measures of PA validated in Wong et al. [22], the Cq measures appear to be as robust at measuring PA among secondary school students.

The validity of self-report measures of sedentary behaviour remains largely untested [39] and our findings make an important contribution by adding to the very limited number of studies reporting on both the validity and reliability of a self-report sedentary behaviour measure. It is difficult to accurately measure sedentary behaviour given the ubiquitous nature of such behaviours which may be "unremarkable, intermittent and incidental and therefore difficult to recall" [40, p. 1467]. This is likely reflected in the slight ICC values found in the current study (ICC 0.15). However, as time spent being sedentary increased, so did the number of self-reported hours engaged in sedentary behaviours. In a comparable study, Hardy et al. [30] examined the criterion validity of the ASAQ among 12-15 year old adolescent girls. They reported a mean weekly difference (h/wk) between the self-report and accelerometer-based measures of sedentary behavior of −3.2 h/wk (standard deviation [SD] ± 11.9 h/wk). In the present study, the average self-reported ATSB was overestimated by 70.2 min/day (i.e., approximately 8 h/wk) compared to objective ATSB. There are some key differences in the two measurement tools. The ASAQ does differentiate between weekday and weekend, and includes passive travel before and after school on a usual weekday and for each weekend day. Given the need to balance assessing a breadth of behaviours with time and space limitations of the COMPASS questionnaire, the Cq appears to be an acceptable self-report measure of sedentary behaviour given the evidence of slight validity and moderate reliability typically found in such measures [39-40].

We identified that the majority of students in our sample over-reported their time spent in VPA (93%) but underreported time in MPA (79%); resulting in a MVPA measure that was fairly accurate when the two measures were combined (an over estimate paired with an underestimate) as only 57% of our sample over-reported time spent in MVPA. Evidence from the previous SHAPES PA measures reported by Wong et al. [22] identified that 98% of their sample over-reported VPA, 83% over-reported MPA, and 94% over-reported MVPA. This suggests that our new Cq measure for PA was an improvement on the previous SHAPES PA measure as we have eliminated the large bias in over-reporting of MPA and MVPA previously reported [22]. However, additional research should attempt to understand how to improve the self-reported measures of VPA as the over-reporting of VPA via self-report appears to be a consistent phenomenon in the literature. As part of this future work, it may be important to consider if part of the problem may be due to the use of accelerometers as the objective measure of PA. While accelerometers are commonly used to objectively measure PA among youth, there may be limitations associated with their use [41]. For example, accelerometers do not measure certain types of PA common among secondary school aged youth (e.g., cycling, swimming, locomotion on a gradient, weight lifting, etc.), resulting in an underestimate of VPA, MPA and/or MVPA. The epoch/interval length used by researchers may also be important as epoch length can impact the measurement of different intensities of PA [42]. Despite such limitations, the Cq measures of PA, especially with respect to MVPA, appear to provide suitable self-report outcomes for differentiating inactive youth from moderately active or highly active youth.

Limitations

There are several limitations worth considering. There is potential for self-report health behaviour tools to be limited by both recall and social desirability bias. However, since the intraclass correlation for the 1-week test-retest reliability were all fair to substantial, there is little reason to believe that the subjects suffered any recall problems. Similarly, misreporting health behaviours on an anonymous survey to appear more favourable is not likely; however, misreporting will remain consistent over time if the Cq measures are used in longitudinal studies. In fact, the students did not even self-report behaviours more favourable than measured by the accelerometer. Researchers used a small convenience sample of grade 9 students (aged 14-15 years) from southwestern Ontario, thereby limiting the generalizability of the

findings. However, there is little reason to believe that grade 9 students from southwestern Ontario would respond differently than students in other jurisdictions. It is also possible that the accelerometer did not capture all PA and sedentary behaviour; the epoch length chosen for the analyses may have missed shorter bursts of activities (underestimating PA), but may have included behaviours not intended to be 'sedentary' (waiting in line, eating a meal), thereby overestimating sedentary behaviour.

Conclusions

The use of accelerometers to objectively measure PA and sedentary behaviour are not always feasible for large-scale school-based studies. The Cq measures of PA and sedentary behaviour evaluated in this study had test-retest reliability and criterion validity among grade 9 students suggesting that they are acceptable and appropriate for use in a large-scale school surveys where objective measures are not feasible or appropriate. Although not without limitations, the results support the use of the Cq to obtain measures of PA and sedentary behaviours in youth via self-report.

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Figure 1

COMPASS questionnaire measures used to calculate physical activity

HARD physical activities include jogging, team sports, fast dancing, jump-rope and any other physical activities that increase your heart rate and make you breathe hard and sweat.

MODERATE physical activities include lower intensity activities such as walking, biking to school, and recreational swimming.

10. Mark how many minutes of HARD physical activity you did on each of the last 7 days. This includes physical activity during physical education class, lunch, after school, evenings, and spare time.

	Hours					Minutes			
Monday	0	1	2	3	4	0	15	30	45
Tuesday	0	1	2	3	4	0	15	30	45
Wednesday	0	1	2	3	4	0	15	30	45
Thursday	0	1	2	3	4	0	15	30	45
Friday	0	1	2	3	4	0	15	30	45
Saturday	0	1	2	3	4	0	15	30	45
Sunday	0	1	2	3	4	0	15	30	45

For example: If you did 45 minutes of hard physical activity on Monday, you will need to fill in the 0 hour circle and the 45 minute circle, as shown below:

	Hours					Minutes			
Monday	●	1	2	3	4	0	15	30	●

11. Mark how many minutes of MODERATE physical activity you did on each of the last 7 days. This includes physical activity during physical education class, lunch, after school, evenings, and spare time. Do not include time spent doing hard physical activities.

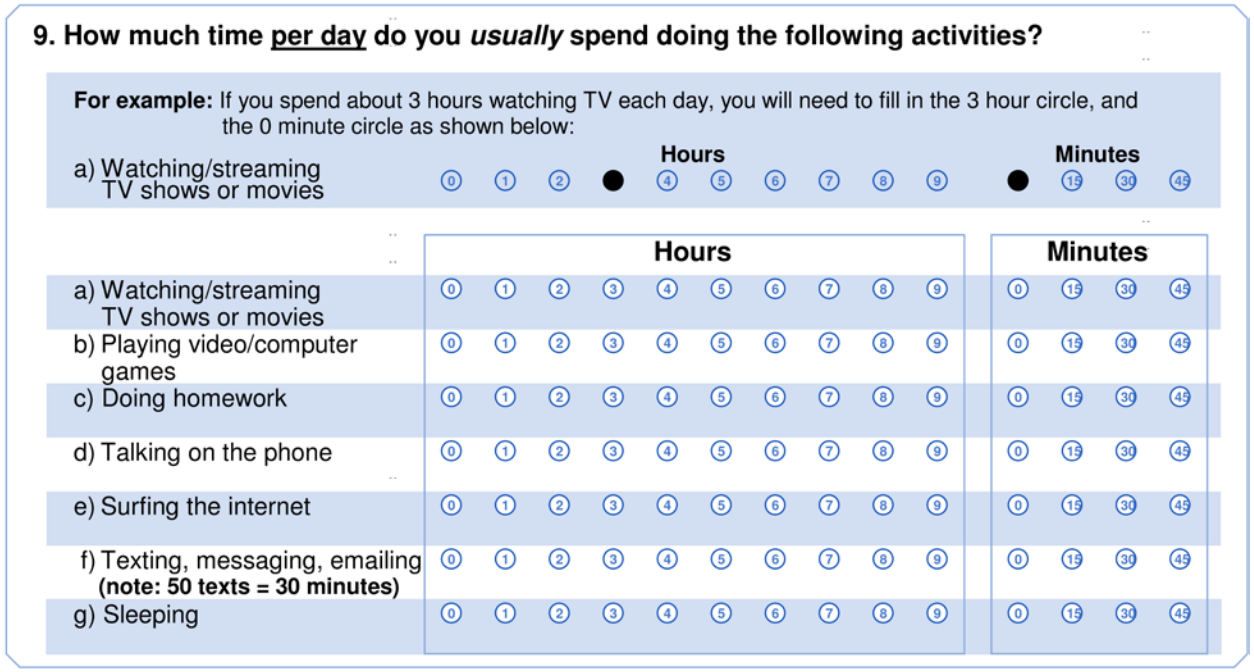
	Hours					Minutes			
Monday	0	1	2	3	4	0	15	30	45
Tuesday	0	1	2	3	4	0	15	30	45
Wednesday	0	1	2	3	4	0	15	30	45
Thursday	0	1	2	3	4	0	15	30	45
Friday	0	1	2	3	4	0	15	30	45
Saturday	0	1	2	3	4	0	15	30	45
Sunday	0	1	2	3	4	0	15	30	45

For example: If you did 1 hour and 30 minutes of moderate physical activity on Monday, you will need to fill in the 1 hour circle and the 30 minute circle, as shown below:

	Hours					Minutes			
Monday	0	●	2	3	4	0	15	●	45

Figure 2

COMPASS questionnaire measures used to calculate sedentary behaviour



9. How much time per day do you *usually* spend doing the following activities?

For example: If you spend about 3 hours watching TV each day, you will need to fill in the 3 hour circle, and the 0 minute circle as shown below:

	Hours										Minutes			
a) Watching/streaming TV shows or movies	0	1	2	●	4	5	6	7	8	9	●	15	30	45

	Hours										Minutes			
a) Watching/streaming TV shows or movies	0	1	2	3	4	5	6	7	8	9	0	15	30	45
b) Playing video/computer games	0	1	2	3	4	5	6	7	8	9	0	15	30	45
c) Doing homework	0	1	2	3	4	5	6	7	8	9	0	15	30	45
d) Talking on the phone	0	1	2	3	4	5	6	7	8	9	0	15	30	45
e) Surfing the internet	0	1	2	3	4	5	6	7	8	9	0	15	30	45
f) Texting, messaging, emailing **(note: 50 texts = 30 minutes)**	0	1	2	3	4	5	6	7	8	9	0	15	30	45
g) Sleeping	0	1	2	3	4	5	6	7	8	9	0	15	30	45

Table 1

Means and standard deviations of COMPASS physical activity and sedentary behaviour measures

	Males			Females			Total		
	N	***μ***	**SD**	***N***	***μ***	**SD**	***N***	***μ***	**SD**
Physical Activity *(Time 1 self-reported)*									
VPA (min/wk) [a]	60	664.2	380.6	79	570.8	347.3	139	611.1	363.7
MPA (min/wk) [b]	60	490.8	378.0	79	540.1	343.4	139	518.8	358.3
MVPA (min/wk) [c]	60	1155.0	664.1	79	1110.9	587.8	139	1129.9	619.9
Physical Activity *(Time 2 self-reported)*									
VPA (min/wk) [a]	60	618.5	342.5	79	527.8	375.6	139	567.0	363.2
MPA (min/wk) [b]	60	557.6	367.4	79	542.9	328.4	139	549.2	344.6
MVPA (min/wk) [c]	60	1176.1	596.3	79	1070.7	605.7	139	1116.2	601.8
Physical Activity *(Measured)*									
VPA (min/wk) [a]	60	185.8	96.1	79	107.3	60.8	139	141.2	87.0
MPA (min/wk) [b]	60	819.7	266.1	79	758.1	211.1	139	784.7	237.5
MVPA (min/wk) [c]	60	1005.5	295.8	79	865.4	236.2	139	925.9	271.7
Sedentary Behaviour *(Time 1 self-reported)*									
ATSB (min/day) [d]	60	559.9	415.2	79	716.8	430.5	139	649.1	429.5
Watching TV or movies (min/day)	60	138.5	104.5	79	153.2	109.4	139	147.3	107.1
Playing video or computer games (min/day)	60	122.5	112.7	79	64.0	86.5	139	89.2	102.5
Doing homework (min/day)	60	58.5	74.4	79	79.0	63.9	139	70.1	69.2
Talking on the phone (min/day)	60	25.5	64.8	79	36.5	74.7	139	31.7	70.6
Surfing the internet (min/day)	60	86.8	89.2	79	126.8	118.4	139	109.5	108.3
Texting, messaging, emailing (min/day)	60	127.2	152.5	79	257.3	224.7	139	201.1	206.5
Sedentary Behaviour *(Time 2 self-reported)*									
ATSB (min/day) [d]	60	561.4	393.4	79	720.4	423.6	139	651.8	416.9
Watching TV or movies (min/day)	60	117.5	61.3	79	142.8	92.1	139	131.9	81.0
Playing video or computer games (min/day)	60	116.5	112.1	79	69.7	103.8	139	89.9	109.6
Doing homework (min/day)	60	70.3	84.1	79	103.3	72.5	139	89.0	79.2
Talking on the phone (min/day)	60	28.8	51.0	79	45.9	89.9	139	38.5	75.9
Surfing the internet (min/day)	60	103.8	129.8	79	129.9	130.8	139	118.6	130.5
Texting, messaging, emailing (min/day)	60	124.7	151.7	79	228.8	214.7	139	183.8	196.4
Sedentary Behaviour *(Measured)*									
ATSB (min/day) [d]	60	610.7	114.0	79	559.4	238.9	139	581.5	196.1

[a] VPA – vigorous physical activity
[b] MPA – moderate physical activity
[c] MVPA – moderate to vigorous physical activity
[d] ATSB – average total sedentary behaviour (excluding time spent sleeping)

Table 2

Test-retest reliability of the COMPASS physical activity and sedentary behaviour measures

	N	Intraclass Correlation ICC	Pearson Correlation *rho*	Cronbach's Alpha *α*
Physical Activity [§]				
VPA (min/wk) [a]	139	0.68	0.69 (p<0.001)	0.82
MPA (min/wk) [b]	139	0.71	0.57 (p<0.001)	0.72
MVPA (min/wk) [c]	139	0.75	0.68 (p<0.001)	0.81
Sedentary Behaviour [§]				
ATSB (min/day) [d]	139	0.79	0.79 (p<0.001)	0.88
Watching TV or movies (min/day)	139	0.56	0.59 (p<0.001)	0.74
Playing video or computer games (min/day)	139	0.65	0.65 (p<0.001)	0.79
Doing homework (min/day)	139	0.54	0.57 (p<0.001)	0.72
Talking on the phone (min/day)	139	0.76	0.76 (p<0.001)	0.86
Surfing the internet (min/day)	139	0.71	0.72 (p<0.001)	0.84
Texting, messaging, emailing (min/day)	139	0.86	0.86 (p<0.001)	0.93

[§] Self-reported measure at Time 1 and Time 2
[a] VPA – vigorous physical activity
[b] MPA – moderate physical activity
[c] MVPA – moderate to vigorous physical activity
[d] ATSB – average total sedentary behaviour

Table 3

Comparison between self-reported (S) and objectively measured (M) physical activity and sedentary behaviour

	N	S[§]	M	S – M	#	#	#
		μ (SD)	*μ (SD)*	*μ (SD)*	**Over**	**Same**	**Under**
Physical Activity [§]							
VPA (min/wk) [a]	139	567.0 (363.2)	141.2 (87.0)	425.8 (355.5)	129	0	10
MPA (min/wk) [b]	139	549.2 (344.6)	784.7 (237.5)	-235.4 (361.8)	29	0	110
MVPA (min/wk) [c]	139	1116.2 (601.8)	925.9 (271.7)	190.4 (578.0)	79	0	60
Sedentary Behaviour [§]							
ATSB (min/day) [d]	139	651.8 (416.9)	581.5 (196.1)	70.2 (423.8)	63	0	76

[§] Self-reported measure at Time 2 and objective measures taken from Time 1 to Time 2
[a] VPA – vigorous physical activity
[b] MPA – moderate physical activity
[c] MVPA – moderate to vigorous physical activity
[d] ATSB – average total sedentary behaviour

Table 4

Validity of COMPASS self-reported (S) and objectively (M) measured physical activity and sedentary behaviour

	N	Intraclass Correlation ICC	Pearson Correlation *rho*	Cronbach's Alpha *α*
Physical Activity [§]				
VPA (min/wk) [a]	139	0.18	0.21 (p<0.05)	0.34
MPA (min/wk) [b]	139	0.22	0.27 (p<0.01)	0.43
MVPA (min/wk) [c]	139	0.25	0.31 (p<0.001)	0.48
Sedentary Behaviour [§]				
ATSB (min/day) [d]	139	0.15	0.20 (p<0.05)	0.33

[§] Self-reported measure at Time 2 and objective measures taken from Time 1 to Time 2
[a] VPA – vigorous physical activity
[b] MPA – moderate physical activity
[c] MVPA – moderate to vigorous physical activity
[d] ATSB – average total sedentary behaviour

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