

## **Feasibility and reliability of the Spanish version of the Youth Activity Profile questionnaire (YAP-Spain) in children and adolescents**

José Manuel Segura-Díaz, Yaira Barranco-Ruiz, Romina G. Saucedo-Araujo, María Jesús Aranda-Balboa, Cristina Cadenas-Sanchez, Jairo H. Migueles, Pedro F. Saint-Maurice, Francisco B. Ortega-Porcel, Gregory Welk, Manuel Herrador-Colmenero, Palma Chillón and Emilio Villa-González

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## Feasibility and reliability of the Spanish version of the Youth Activity Profile questionnaire (YAP-Spain) in children and adolescents

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### ABSTRACT

Considerable public health efforts across the globe have focused on promoting physical activity (PA) and minimizing sedentary behaviour (SB) in youths. However, it is important to have valid, reliable and feasible methods to assess these behaviours in youths. The purpose of this study was to analyse the feasibility and reliability of the Spanish version of the previously validated Youth Activity Profile questionnaire (YAP) in children and adolescents. The YAP-S is a 15-item self-report instrument designed to capture PA and SB in youths. A total of 604 children (5–12 years old) and 346 adolescents (12–17 years old) filled out the questionnaire twice (14 days apart). Feasibility was evaluated through required time and number of misunderstood questions by participants. The test-retest reliability was examined using the weighted kappa coefficient ( $\kappa$ ) and intraclass correlation coefficient. The average time to complete the questionnaire was  $28.85 \pm 14.28$  and  $12.24 \pm 9.84$  minutes in children and adolescents, respectively. No misunderstanding of questions was reported. The questionnaire showed an adequate reliability for activity at school, out-of-school and sedentary behaviours ( $\kappa = 0.61$ – $0.77$ ; ICC =  $0.77$ – $0.89$ ) in children and adolescents. The YAP-S might be considered a feasible and reliable questionnaire for assessing PA and SB in Spanish children and adolescents.

### ARTICLE HISTORY

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### KEYWORDS

Psychometric properties; self-reported; physical activity; sedentary behaviour; youths

## 1. Introduction

Worldwide obesity rates have increased over the last few decades and it is currently considered a major public health concern (Caprio et al., 2020; Ezzati et al., 2017; Tran et al., 2019). These obesity trends parallel lower levels of physical activity (PA) and increased time in spent in sedentary behaviours (SB) in modern societies (Aubert et al., 2018; Farooq et al., 2019). However, the examinations of PA patterns at the population level are still limited by the lack of feasible and reliable PA/SB assessment instruments that can capture youth activity in various domains and across-cultures (i.e., multiple countries; Ekelund et al., 2011). Reliable and feasible measures would help to develop successful interventions to evaluate daily PA. Accelerometers can provide accurate and reliable descriptions of PA/SB, however these tools do not provide domain-specific PA/SB information, require substantial expertise for handling the data generated from these devices and have significant associated costs for large scale PA/SB assessments (Migueles et al., 2017; Strugnell et al., 2016; Troiano et al., 2008). Physical activity questionnaires rely on youth’s ability to interpret and recall PA/SB information and hence pose legitimate concerns about their accuracy and precision. However, physical activity

questionnaires can be administered at an affordable cost, are easy to handle and hence are considered the most feasible PA/SB measurement tool for assessing PA/SB in large samples (Sprengeler et al., 2017; Vanhees et al., 2005). For these reasons, there has been continued interest in improving the utility and accuracy of physical activity questionnaires for use among youths (Hidding et al., 2018).

One recent attempt to improve physical activity questionnaires has been to calibrate questionnaires to mimic estimates obtained from devices. The Youth Activity Profile questionnaire (YAP) is a unique example of this approach. The YAP is a 7 day physical activity questionnaire that assesses domains-specific PA (i.e. activity at school, activity out-of-school, and sedentary habits). It has shown to provide accurate representations of PA/SB in youths (10–18 years) (Saint-Maurice et al., 2017; Saint-Maurice & Welk, 2015). More recently, the YAP has also been tested in other countries, namely the United Kingdom and the calibration results demonstrated good agreement between calibrated YAP scores and estimates obtained from accelerometry (Fairclough et al., 2019). Given the potential of the YAP to evaluate PA and SB, we recently adapted and translated this tool to be used in Spain. Before the YAP can be fully deployed it is important to test the feasibility and reliability properties of the instrument, due to lack

of this information on the scientific literature (Hidding et al., 2018), our study provides more information about an important gap in the scientific literature by examining the feasibility and reliability of PA/SB in questionnaires while examining the potential of this tool to be used in Spain.

The aim of this study was to formally evaluate the feasibility of implementation, i.e. time of completion and understandability as well as the reliability, i.e. the consistency, coherence, constancy and stability of the scores, of the Spanish version of the YAP in a sample of Spanish children and adolescents. We hypothesized that YAP was feasible and overall, with adequate reliability across age groups and gender.

## 2. Methods

### 2.1. Participants

A total sample of 994 youth, including 634 children (5–12 years old, i.e. grade 1 to 6) and 360 adolescents (12–17 years old, i.e. 7<sup>th</sup> to 12<sup>th</sup> grade) from Granada (South of Spain) were surveyed. Granada is the capital city of the province of Granada, in the region of Andalusia (Spain). It has an average elevation of 738 m (2,421 ft.) above the sea level and is the 13<sup>th</sup> largest urban area of Spain. This feasibility and reliability study was part of the study PACO (*Pedalea y Anda al COlegio*, in English *Cycle and Walk to School*), where the objectives were: 1) to design and examine biometric parameters of the instruments and 2) to implement interventions to promote active commuting to school (ACS) to increase PA levels in children and adolescents. Participants were recruited from three primary schools (School 1 (children = 152), School 2 (children = 135), and School 3 (children = 101), two secondary public schools (High School 1 (adolescents = 182) and High School 2 (adolescents = 178), and two private primary schools (School 4 (children = 126) and School 5 (children = 120) all of them with a medium socio-economic level and located in an urban environment. All seven schools recruited agreed to participate in the study. Of 994 participants surveyed a total of 576 children and 346 adolescents agreed to complete both YAP assessments. Regarding the response rate of the participants, we were only able to record response rate from two schools, calculated at 70.1%. The study was explained to the participants before starting and parents or tutors provided informed consent.

From the 576 children and 346 adolescents that agreed to complete both YAP assessments, 220 children and 62 adolescents were excluded from the feasibility analysis since their starting and/or ending times of the survey completion were missing due to the integration of the YAP questionnaire within another questionnaire of our study. Regarding the reliability analysis, 54 children and 24 adolescents were excluded as they did not complete the retest questionnaire. We examined individually the reliability of the 15 questions included in the questionnaire, and separately for the three sections (i.e. activity at school, activity out-of-school, and sedentary habits).

### 2.2. Design

Participants completed the YAP twice, 14 days apart: between February – May 2016 (n = 709) and between March – April 2018

(n = 285). All measurements were taken under similar conditions regarding the weekday (Tuesday – Thursday from 8:15 am to 15:15 pm), the evaluators (4 evaluators), and the seven schools belonged to the same region (Granada) and had similar weather conditions (variable and temperate climate). Regarding weather data, the mean temperature registered in Granada averaged 22° during 2016–2018 according to the Spanish Meteorological State Agency ([www.aemet.es](http://www.aemet.es)).

## 2.3. Instruments

### 2.3.1. Feasibility sheet

Feasibility was examined using a checklist that allowed the research team to register the participants' comments about their experiences with the YAP-S, as well as the time spent to complete the YAP-S (Supplementary Figure 1). First, they were asked if they had any questions about the YAP-S items. Then, the evaluators noted comments from of each participant they completed the YAP-S. Feasibility was assessed considering the time needed to complete the YAP-S for each children and adolescents and by flagging questions that were not clear to participants.

### 2.3.2. Youth activity profile

The YAP is a 15-item self-report instrument designed to capture PA and SB in youth (Saint-Maurice & Welk, 2014). The YAP was designed to be a self-administered 7-day (previous week) recall questionnaire suitable for use in children and adolescents from 8–17 years old (grades 4–12). The items divided into three sections: 1) activity at school, 2) activity out-of-school, and 3) sedentary habits (Saint-Maurice & Welk, 2015). Items in the activity at school section include: transportation to and from school, as well as activity during physical education class, lunch, and recess. Items in the activity out-of-school section include activity before school, activity right after-school, activity during the evening and activity in each weekend day (Saturday and Sunday). Sedentary habits items include time spent watching television (TV), playing videogames, using the computer, using a cell phone and an overall sedentary time item. All questions use a 5 point Likert scale.

In the present study, a translation of the original questionnaire into the Spanish language was conducted in several steps. First, two independent Spanish researchers with English knowledge translated the original YAP to Spanish. Then, differences between translations were discussed in a meeting and items wording were adjusted to reach consensus. Second, the Spanish version was back-translated to English by two other independent researchers who had never seen the original YAP. Finally, a different researcher fluent in English compared the original YAP with the new version translated to English. We then conducted a pilot administration of the YAP-S in a small group of children and adolescents (n = 20) and made additional refinements in the YAP-S wording based on the feedback. All the changes done in the Spanish version of the YAP were deemed appropriate by the researchers who created the original version of the YAP in a final meeting. The Spanish version (YAP-S) and an adaptation to Latin American Spanish are freely available: <http://profith.ugr.es/yap>.

## 2.4. Statistical analysis

Percentages for categorical variables and means and standard deviations for continuous variables were calculated. The differences in the time spent to complete the questionnaire (first evaluation point) were analysed using a dependent t student test with a Bonferroni adjustment for multiple comparisons. Paired samples were used to check the time taken to complete the questionnaire in the two evaluation points (i.e., test and retest), whereas unpaired samples were used when comparing different age groups (i.e., 6–7, 8–9, 10–11, 12–13, 14–15, 16–17 years). The test-retest reliability was calculated using the weighted kappa coefficient ( $\kappa$ ) and the intraclass correlation coefficient (ICC) scores (i.e. activity at school, activity out-of-school and sedentary habits) and by items. The  $\kappa$  coefficient is appropriate to calculate the degree of agreement of categorical variables in which there is a graduation order or ordinal variables such as the Likert scales of the YAP-S items (Vanbelle & Albert, 2009). All analysis were performed separately for YAP categories (i.e. activity at school, activity out-of-school and sedentary habits) and YAP items in children and adolescents, by age groups (6–7; n = 104, 8–9; n = 138, 10–11; n = 255, 12–13; n = 234, 14–15; n = 140 and 16–17 years old; n = 112) according to the educational stage and by boys and girls. We used the cut points proposed by Colton et al. to interpret kappa and weighted kappa scores: <0.0 = poor; 0.00–0.20 = light; 0.21–0.40 = correct; 0.41–0.60 = moderate; 0.61–0.80 = substantial; 0.81–1.00 = almost perfect (Colton, 1974). The level of significance was set at  $p < 0.05$ . ICC were interpreted as: <0.50 = poor; 0.50–0.75 = moderate, 0.75–0.90 = good and > 0.90 = excellent (Koo & Li, 2016). The level of significance was set at  $p < 0.05$  for the ICC analysis and  $p < 0.001$  for the weighted kappa analysis. The Fujitsu fi-7160 scanner and the Data-scan software version 5.7.7 were used to read the questionnaires and create a data base. All analyses were performed using the SPSS v.22.0 program (Chicago, Illinois) for Windows.

## 3. Results

### 3.1. Descriptive characteristics of the sample

Participants were 634 children (52% girls) and 360 adolescents (51% girls). Mean age was  $9.77 \pm 1.86$  years old for children and  $14.80 \pm 1.48$  years old for adolescents. The average aggregate scores per YAP category was as follows: activity at school (children =  $2.42 \pm 0.90$  points; adolescents =  $2.57 \pm 0.95$  points) (score 0 to 5) ( $p < 0.133$ ), activity out-of-school (children =  $2.07 \pm 0.92$  points; adolescents =  $2.21 \pm 0.85$  points) (score 0 to 4) ( $p < 0.191$ ), and sedentary habits (children =  $1.28 \pm 0.63$  points; adolescents =  $1.22 \pm 0.61$  points) (score 0 to 4) ( $p < 0.504$ ).

### 3.2. Feasibility

The feasibility analyses were conducted on a final sample of 414 children and 298 adolescents. In general, participants (95%) thought the YAP-S items were clear and had no major challenges interpreting the items. Children and adolescents spent an average of  $28.85 \pm 14.28$  minutes and  $12.24 \pm 9.84$  minutes to complete the whole questionnaire. There were significant age group differences to complete the YAP-S. The 6–7 years age

group took the longest time to complete YAP-S ( $29.88 \pm 11.56$  minutes), while age group 16–17 years old took the least amount for time for completion ( $7.82 \pm 5.18$  minutes).

### 3.3. Reliability

The reliability analyses were conducted on a final sample of 414 children and 298 adolescents. Participants who answered more than two response options or left the response option blank both in the test and retest were excluded from the reliability analysis. The younger groups (aged from 6 to 9 years old) required at least 2 researchers per group and additional clarifications of terms such as 'sedentariness' or "PA". The reliability results were divided in three categories: activity at school, activity out-of-school and sedentary habits in children and adolescents, by age groups and gender respectively; they are shown in Table 1. The reliability was substantial ( $k = 0.61$ – $0.77$ ) for activity at school, activity out-of-school, and sedentary habits in children and adolescents. After grouping participants by age, the reliability was substantial ( $k = 0.61$ – $0.77$ ) in children groups (lowest  $k$  for 10–11 years old) and in adolescents groups ( $k = 0.71$ – $0.76$ ) for the activity at school category. For the activity out-of-school category the reliability was substantial ( $k = 0.65$ – $0.72$ ) except in 6–7 years old and 8–9 years old where it was moderate ( $k = 0.55$ – $0.57$ ). For the sedentary habits category, the reliability was substantial ( $k = 0.66$ – $0.70$ ) in all age groups except in 6–7 years old and 8–9 years old where was moderate ( $k = 0.32$ – $0.58$ ). Regarding gender, overall, the reliability was moderate to substantial ( $k = 0.60$ – $0.79$ ) for the activity at school and activity out-of-school categories in both boys and girls in children and adolescent. For the sedentary habits category, the reliability was substantial ( $k = 0.63$ – $0.77$ ) except in girl children where it was moderate ( $k = 0.52$ ). Similar reliability was showed in children and adolescents and, age groups after adjusting for gender (Supplementary Table 1). Additionally, the ICC was good in children (0.77 to 0.86) and adolescents (0.77 to 0.89). The ICC by age groups were good for the three categories. Finally, the Spearman's correlations for the three categories in children and adolescent in both boys and girls ranged from good to excellent (0.75 to 0.94).

The kappa coefficients for the test-retest reliability in children and adolescents are shown in Table 2. The total weighted kappa score was moderate for children ( $k = 0.51$ ) and adolescents ( $k = 0.57$ ). The weighted kappa for children items was between correct and substantial ( $k = 0.31$ – $0.82$ ), and as for adolescents ( $k = 0.33$ – $0.84$ ). Additionally, the ICC of these scales ranged from 0.47 to 0.89 in children (poor to good respectively) and from 0.49 to 0.91 (poor to excellent respectively) in adolescents.

The reliability by age groups is presented in Table 3. The lowest reliability was shown in the youngest group 6–7 year old children ranged light to substantial reliability ( $k = 0.05$ – $0.64$  and 8–9 years old,  $k = 0.17$ – $0.76$ ). Better results were shown in the older ages with values in 10–11 years old ranged moderate to almost perfect reliability ( $k = 0.31$ – $0.90$ ), 12–13 years old, ( $k = 0.27$ – $0.87$ ), 14–15 years old ( $k = 0.31$ – $0.89$ ) and 16–17 years old ( $k = 0.30$ – $0.84$ ). The ICC by age groups were poor for nine items in 6–7 years old and for four items in 8–9 years old (in the rest of the age groups, reliability was between moderate and excellent for all items).

Reliability results in children and adolescents categorized by gender are shown in Table 4. In children and adolescents the total weighted kappa score was similar for boys and girls, who

**Table 1.** Test-retest reliability for sections of the Youth Activity Profile questionnaire by age groups and gender (unadjusted).

	Activity at school ‡			Activity out at school‡			Sedentary Habits‡		
	n	Kappa	ICC	n	Kappa	ICC	n	Kappa	ICC
All									
Total	769	0.76	0.87	754	0.68	0.81	753	0.66	0.79
Children	474	0.76	0.86	463	0.66	0.83	465	0.61	0.77
Adolescents	295	0.77	0.89	291	0.69	0.77	288	0.69	0.82
Age groups									
6–7 yr	104	0.76	0.86	104	0.55	0.84	104	0.32	0.80
8–9 yr	138	0.77	0.83	138	0.57	0.83	138	0.58	0.83
10–11 yr	255	0.61	0.84	255	0.65	0.80	255	0.70	0.66
12–13 yr	234	0.69	0.85	234	0.70	0.77	234	0.67	0.85
14–15 yr	140	0.71	0.92	140	0.72	0.80	140	0.68	0.87
16–17 yr	112	0.76	0.90	112	0.69	0.79	112	0.66	0.73
Gender									
Children									
Boys	195	0.77	0.88	195	0.66	0.84	195	0.63	0.76
Girls	199	0.73	0.84	199	0.60	0.82	199	0.52	0.75
Adolescents									
Boys	175	0.73	0.94	175	0.68	0.77	175	0.63	0.89
Girls	201	0.79	0.80	201	0.71	0.78	201	0.77	0.80

n = sample size; ‡ = weighted kappa values; yrs = years; ICC = intraclass correlation coefficient.

Statistically significant differences in weight kappa were all  $p < 0.001$ . Statistically significant differences in intraclass correlation coefficient were:  $p \leq 0.05$ . All coefficients are adjusted for gender.

**Table 2.** Test-retest reliability of the Youth Activity Profile questionnaire among children and adolescents.

	Children			Adolescents		
	n	Kappa	ICC	n	Kappa	ICC
Activity at school						
1. Transportation to school‡	489	0.82	0.90	309	0.84	0.91
2. Days of Physical Activity‡	491	0.31	0.47	306	0.33	0.49
3. Recess‡	494	0.51	0.68	309	0.60	0.75
4. Lunch‡	489	0.60	0.75	307	0.49	0.65
5. Transportation from school‡	492	0.81	0.89	308	0.84	0.91
Activity out-of-school						
6. Activity before school‡	487	0.42	0.60	304	0.40	0.58
7. Activity right after-school‡	483	0.38	0.55	302	0.49	0.65
8. Activity during the evening‡	486	0.41	0.58	304	0.53	0.69
9. Physical activity in Saturday‡	486	0.45	0.62	306	0.49	0.75
10. Physical activity in Sunday‡	480	0.45	0.63	307	0.63	0.78
Sedentary habits						
11. Watching TV‡	480	0.43	0.60	300	0.61	0.76
12. Playing videogames‡	480	0.58	0.74	299	0.53	0.69
13. Using the computer‡	479	0.49	0.66	306	0.55	0.71
14. Using a cell phone‡	491	0.62	0.77	306	0.72	0.83
15. Overall sedentary time at home‡	493	0.43	0.60	305	0.57	0.72
Total YAP-S score‡	487	0.51	0.66	305	0.57	0.72

n = sample size; ‡ = weighted kappa values; yrs = years; ICC = intraclass correlation coefficient; total YAP-S score = activity at school + activity out-of-school + sedentary habits scores.

Statistically significant differences in weighted kappa were all  $p < 0.001$ . Statistically significant differences in Spearman correlation were:  $p \leq 0.05$ . All coefficients are adjusted for gender.

showed a moderate reliability (children girls:  $k = 0.59$  vs children boys:  $k = 0.54$ ) and (adolescents girls:  $k = 0.59$  vs adolescents boys:  $k = 0.54$ ). Similar results were showed in the total ICC score for children and adolescent girls (children girls: ICC = 0.63 and adolescents girls: ICC = 0.72) compared with children and adolescents boys (children boys: ICC = 0.64 vs adolescents boys: ICC = 0.67) which showed good reliability in all cases.

#### 4. Discussion

The main aim of this study was to examine the feasibility and reliability of the YAP-S in a sample of Spanish children and

adolescents. Overall, we found that the YAP-S feasibility was adequate but varied by age group (average of 29 minutes in children and 12 minutes in adolescents respectively) and that the test-retest reliability of the YAP-S was moderate to substantial with the kappa ranging from 0.52 to 0.79 and ICC ranged from 0.79–0.87. While the administration time was longer in the younger age group, there were few challenges with implementation the YAP-S. It had good utility for capturing data on both PA and sedentary habits data collection in young Spanish children and adolescents.

It is important to note that only a few studies have examined the feasibility of questionnaires including variables for PA and/or sedentary habits and especially, across different

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**Table 3.** Test-retest reliability of the YAP-S questionnaire by age group.

	6–7 yrs n = 104		8–9 yrs n = 138		10–11 yrs n = 255		12–13 yrs n = 234		14–15 yrs n = 140		16–17 yrs n = 112	
	Kappa	ICC	Kappa	ICC	Kappa	ICC	Kappa	ICC	Kappa	ICC	Kappa	ICC
Activity at school												
1. Transportation to school‡	0.58	0.73	0.76	0.86	0.90	0.95	0.81	0.90	0.89	0.94	0.80	0.89
2. Days of Physical Activity‡	0.39	0.57	0.35	0.52	0.31	0.48	0.27	0.43	0.31	0.48	0.30	0.47
3. Recess‡	0.27	0.44	0.17	0.30	0.51	0.68	0.63	0.77	0.64	0.78	0.39	0.57
4. Lunch‡	0.45	0.63	0.47	0.64	0.75	0.85	0.48	0.65	0.53	0.70	0.46	0.63
5. Transportation from school‡	0.64	0.78	0.76	0.87	0.83	0.91	0.87	0.93	0.81	0.89	0.84	0.91
Activity out-of-school												
6. Activity before school‡	0.05	0.21	0.35	0.52	0.53	0.69	0.36	0.53	0.44	0.61	0.48	0.65
7. Activity right after-school‡	0.30	0.46	0.17	0.30	0.46	0.63	0.43	0.60	0.38	0.56	0.64	0.78
8. Activity during the evening‡	0.34	0.51	0.29	0.45	0.36	0.53	0.58	0.73	0.48	0.65	0.57	0.73
9. Physical activity in Saturday‡	0.26	0.41	0.51	0.68	0.49	0.65	0.53	0.70	0.57	0.73	0.58	0.73
10. Physical activity in Sunday‡	0.35	0.52	0.55	0.71	0.41	0.58	0.58	0.73	0.67	0.80	0.59	0.74
Sedentary habits												
11. Watching TV‡	0.18	0.33	0.30	0.46	0.56	0.72	0.58	0.73	0.59	0.75	0.61	0.76
12. Playing videogames‡	0.20	0.34	0.59	0.74	0.72	0.84	0.57	0.72	0.49	0.66	0.57	0.73
13. Using the computer‡	0.32	0.49	0.50	0.67	0.54	0.70	0.52	0.68	0.58	0.74	0.51	0.69
14. Using a cell phone‡	0.34	0.51	0.43	0.60	0.64	0.78	0.70	0.82	0.67	0.81	0.70	0.83
15. Overall sedentary time at home‡	0.25	0.40	0.53	0.69	0.40	0.58	0.53	0.69	0.46	0.64	0.74	0.85
Total YAP-S score‡	0.32	0.48	0.44	0.60	0.56	0.70	0.56	0.70	0.56	0.71	0.58	0.73

n = sample size; ‡ = weighted kappa values; yrs = years; ICC = intraclass correlation coefficient; total YAP-S score = activity at school + activity out-of-school + sedentary habits scores. Statistically significant differences in weight kappa were all  $p < 0.001$ . Statistically significant differences in intraclass correlation coefficient were:  $p \leq 0.05$ . All coefficients are adjusted for gender.

**Table 4.** Test-retest reliability of the YAP-S questionnaire in children and adolescents by gender.

	Children				Adolescents			
	Boys n = 186		Girls n = 186		Boys n = 210		Girls n = 206	
	Kappa	ICC	Kappa	ICC	Kappa	ICC	Kappa	ICC
Activity at school								
1. Transportation to school‡	0.85	0.91	0.78	0.88	0.82	0.92	0.88	0.91
2. Days of Physical Activity‡	0.27	0.43	0.38	0.56	0.19	0.32	0.39	0.55
3. Recess‡	0.42	0.51	0.56	0.61	0.62	0.75	0.45	0.71
4. Lunch‡	0.57	0.75	0.61	0.77	0.50	0.63	0.41	0.55
5. Transportation from school‡	0.81	0.89	0.81	0.89	0.81	0.88	0.85	0.92
Activity out-of-school								
6. Activity before school‡	0.39	0.54	0.46	0.64	0.42	0.59	0.37	0.47
7. Activity right after-school‡	0.37	0.58	0.39	0.49	0.43	0.56	0.54	0.70
8. Activity during the evening‡	0.42	0.57	0.40	0.54	0.47	0.66	0.56	0.70
9. Physical activity in Saturday‡	0.42	0.63	0.44	0.59	0.63	0.68	0.54	0.72
10. Physical activity in Sunday‡	0.44	0.61	0.46	0.60	0.61	0.73	0.64	0.78
Sedentary habits								
11. Watching TV‡	0.46	0.62	0.39	0.54	0.48	0.67	0.72	0.80
12. Playing videogames‡	0.54	0.70	0.48	0.65	0.47	0.64	0.40	0.59
13. Using the computer‡	0.54	0.66	0.39	0.53	0.50	0.75	0.61	0.78
14. Using a cell phone‡	0.61	0.72	0.63	0.74	0.64	0.78	0.77	0.86
15. Overall sedentary time at home‡	0.43	0.57	0.42	0.55	0.47	0.62	0.67	0.77
Total YAP-S score‡	0.50	0.64	0.48	0.63	0.53	0.67	0.58	0.72

n = sample size; ‡ = weighted kappa values; yrs = years; ICC = intraclass correlation coefficient. total YAP-S score = activity at school + activity out-of-school + sedentary habits scores. Statistically significant differences in weighted were all  $p < 0.001$ . Statistically significant differences in intraclass correlation coefficient were:  $p \leq 0.05$ . Adjusted for gender.

domains (i.e. activity at school, activity out-of-school, and sedentary habits), as previously showed a systematic review (Hidding et al., 2018). Out of 87 studies included in a previous systematic review, none of them reported time for questionnaire completion among children and adolescents. Thus, our study provides novel information and can inform future logistics when administering the YAP.

Regarding reliability results, the activity at school, activity out-of-school and sedentary habits categories, our examinations revealed similar reliability indices when compared to previous studies (Cerin et al., 2014; Nascimento-Ferreira et al., 2018; Wong et al., 2006) and that reliability varied

depending on YAP section/domain. We found that activity at school had the highest reliability indices while reliability was similar for activity out-of-school and sedentary habits. Our results are aligned with those of previous studies in children and adolescents (Bervoets et al., 2014; Nascimento-Ferreira et al., 2018). For example, the study of Nascimento-Ferreira et al. conducted in Brazilian children also found that reliability varied depending on the activity item

When analysing the reliability results for individual items and by age, our study showed that reliability was high for aggregate YAP scores (i.e., activity at school, activity out-of-

340 school, sedentary habits) but particularly low among partici-  
 345 pants 6–9 years for items included in activity out-of-school  
 and sedentary habits ( $k = 0.32\text{--}0.58$ ). These two sections  
 include recalls of longer periods of the day and in younger  
 children can create additional challenges (Saint-Maurice  
 et al., 2020; Sallis & Saelens, 2000). These results are consis-  
 350 tent with previous studies that examined reliability by age  
 (Bobakova et al., 2015; Busschaert et al., 2015; Rangul et al.,  
 2008; Singh et al., 2011). For example, in two studies con-  
 355 ducted in European older children with 10–12 years old, the  
 reliability results were similar to the present study for SB  
 category (Bervoets et al., 2014; Singh et al., 2011). It is  
 worth noting that in our study a greater reliability was  
 achieved in adolescents compared to children for almost all  
 YAP-S individual items. Examinations of reliability by gender,  
 showed that there were no major differences between boys  
 and girls. Similar results with respect to gender have been  
 shown in previous studies conducted in Norwegian (Rangul  
 et al., 2008), Chinese (Cerin et al., 2014), Czech, Slovakian, and  
 Polish adolescents (Bobakova et al., 2015).

360 Our study has several limitations. First of all, only partici-  
 pants from one city were included, limiting the generalizabil-  
 ity of the results to the whole population. No distinction was  
 conducted between behaviour variability (i.e. variability in  
 365 scores associated with changes in behaviour from one week  
 to the other) and technical variability (i.e. variability in scores  
 associated with the questionnaire design). Finally, we only  
 considered time to complete the questionnaire to demon-  
 strate feasibility but there are other important dimensions of  
 feasibility, including satisfaction, interpretability or access to  
 370 schools that were not taken into account. The specific  
 strengths of our study, include our cross-cultural assessment  
 of a previously validated questionnaire that has shown poten-  
 tial to accurately predict time spent in PA/SB (Saint-Maurice &  
 Welk, 2015). The sample size is also large relative to other  
 375 studies examining PA questionnaires (Gioxari et al., 2013;  
 Nascimento-Ferreira et al., 2018; Telford et al., 2004).  
 Q15 Additionally, to our knowledge, this is the first study that  
 Q16 evaluates the feasibility and reliability of the YAP-S question-  
 naire. Future studies should assess the reliability of the YAP-S  
 380 in different Spanish regions and potentially other Spanish  
 speaking countries, to determine the potential of the YAP for  
 cross-cultural PA/SB comparisons.

## 5. Conclusion

385 We consider that the YAP-S could be a feasible and reliable tool  
 to evaluate PA in Spanish children and especially in adoles-  
 cents, although we must be cautious in relation to the feasi-  
 bility results and in the age group reliability. The lower  
 reliability indices suggest that future studies using the YAP  
 should take age into consideration when administering the  
 390 YAP. Related strategies to address age differences in reliability  
 might include: 1) more evaluators when administering the YAP  
 to younger children, 2) allowing and planning for more time to  
 complete the YAP in younger children, and 3) providing more  
 detailed instructions and explanations about the YAP, including

clarifying that the YAP asks about previous week activity as  
 opposed to usual activity. 395

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## Geolocation information

Data from this study are from Granada (Spain).

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