

Agreement between the printed version versus the electronic version of the Webcas Electronic Questionnaire

Concordancia entre la versión impresa y la versión electrónica del Cuestionario Electrónico Webcas

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Abstract

Introduction: This study aimed to analyse the agreement between the printed version (PV) and the electronic version (EV) of the WebCas questionnaire.

Method: A total of 153 elementary school students participated (56.2% boys and 43.8% girls). The EV was applied at two different time points, with a seven-day interval (test and retest). The WebCas questionnaire was administered in both printed and electronic versions. Weighted Kappa (k), Pabak Kappa (Pabak), and the concordance correlation coefficient (CCCpc) were used for statistical analysis, employing MedCalc 15.2 software, with a significance level of $p < .05$

Results: The weighted Kappa values indicated strong agreement (91.6%, $k > .80$), except for the variables "alcohol consumption in the last 30 days" ($k = .44$) and "daytime sleepiness" ($k = .10$), which showed moderate and weak agreement, respectively. The Pabak percentages showed values ($Pabak > .60$) in five variables. The highest agreement values were observed in the consumption of legal drugs: intoxication 98.7%, alcohol (last 30 days) 89.5%, smoking 86.3%, and alcohol in doses 84.3%. The lowest values were found among food consumption frequency variables: fruit 37.3%, vegetables 37.3%, sweets 47.1%, snacks 54.9%, and soft drinks 38.6%.

Conclusions: The correlations between the WebCas application replicas were moderate to strong for most variables, demonstrating satisfactory values and potential for assessing health-related behaviours.

Keywords: behaviours, health, adolescents, children, questionnaires.

Resumen

Introducción: Este estudio tuvo como objetivo analizar la concordancia entre la versión impresa (VI) y la versión electrónica (VE) del cuestionario WebCas.

Método: Participaron un total de 153 estudiantes de educación primaria (56.2% niños y 43.8% niñas). La VE se aplicó en dos momentos distintos, con un intervalo de siete días (prueba y retest). El cuestionario WebCas fue administrado tanto en su versión impresa como en la electrónica. Para el análisis estadístico se utilizaron el coeficiente Kappa ponderado (k), el coeficiente Pabak Kappa (Pabak) y el coeficiente de correlación de concordancia (CCCpc), utilizando el software MedCalc 15.2, con un nivel de significancia de $p < .05$.

Resultados: Los valores de Kappa ponderado indicaron una concordancia fuerte (91.6%, $k > .80$), excepto en las variables "consumo de alcohol en los últimos 30 días" ($k = .44$) y "somnolencia diurna" ($k = .10$), que mostraron concordancia moderada y débil, respectivamente. Los porcentajes de Pabak mostraron valores ($Pabak > .60$) en cinco variables. Los mayores niveles de concordancia se observaron en el consumo de drogas legales: embriaguez 98.7%, alcohol (últimos 30 días) 89.5%, tabaquismo 86.3% y alcohol por dosis 84.3%. Los valores más bajos se encontraron entre las variables de frecuencia de consumo alimentario: frutas 37.3%, verduras 37.3%, dulces 47.1%, aperitivos 54.9% y refrescos 38.6%.

Conclusiones: Las correlaciones entre las réplicas de aplicación del WebCas fueron de moderadas a fuertes para la mayoría de las variables, demostrando valores satisfactorios y potencial para la evaluación de conductas relacionadas con la salud.

Palabras clave: conductas, salud, adolescentes, niños, cuestionarios.

Introduction

Changes in lifestyle patterns in contemporary society have increased health risks, including among children and adolescents (Dłużniak-Gołaska et al., 2020; Recchia et al., 2023). Childhood and adolescence are critical phases of human development, marked by biological, psychological, and social transformations that may negatively influence the adoption of health-related behaviours (HRB) (Recchia et al., 2023; Pavan & Shavitt, 2023). These inadequate practices increase susceptibility to the development of non-communicable chronic diseases (NCDs), expanding the inclusion of this population in risk groups and reinforcing the need for preventive interventions (Recchia et al., 2023; Silva et al., 2020; Brady et al., 2024).

Unhealthy HRB include physical inactivity (less than 60 minutes of moderate to vigorous daily activity) (World Health Organization [WHO], 2020), inadequate nutrition (low consumption of fruits and vegetables and high intake of ultra-processed foods), as well as alcohol and tobacco consumption (Dłużniak-Gołaska et al., 2020; Oliveira et al., 2017; Er et al., 2019). Insufficient sleep duration (<9–12 hours for children and <8–10 hours for adolescents) is also a relevant risk factor (Becker et al., 2020; Paruthi et al., 2016). The impact of these behaviours can extend into adulthood (WHO, 2019).

Technological, social, and environmental advancements have led to structural changes that significantly affect lifestyle and population health (Tremblay et al., 2017). Among these changes, an increase in time dedicated to sedentary behaviours stands out. These behaviours are defined as low-energy expenditure activities (1.0–1.5 METs) performed predominantly in a sitting, reclining, or lying position (Bauman et al., 2011; Jerome et al., 2022; Legnani et al., 2024). In this context, investigating HRB is essential, as it helps identify risk patterns and supports intervention strategies (Recchia et al., 2023; Silva et al., 2020; Brady et al., 2024; Pavan & Shavitt, 2023).

Recent literature has emphasized the relevance of using structured questionnaires to assess health-related behaviors in adolescents, particularly within school environments. For example, Benítez-Sillero et al. (2022) explored the relationship between empathy and physical activity through a questionnaire administered to adolescents, while González and Molero (2022) examined prosocial behavior and social skills using electronic instruments, reinforcing the feasibility of such tools.

The use of digital tools represents a promising opportunity to collect and organize relevant information (Legnani et al., 2024), providing a foundation for implementing health promotion programs and public policies aimed at encouraging healthier lifestyles, particularly among adolescents (Pinto et al., 2019). In this context, the use of electronic questionnaires has intensified in recent years, following the transition from paper-based instruments to online platforms, enabling greater reach, speed, and efficiency in data collection.

Studies indicate that digital questionnaires are an effective strategy for large-scale investigations, as they facilitate the acquisition of more accurate and accessible information (Evans & Mathur, 2005; Van Gelder, Bretveld, & Roeleveld, 2010). The adaptation to an electronic format represents a significant methodological advancement, contributing to the modernization of research strategies and improving HRB assessment in this population (Van Gelder et al., 2010).

Electronic questionnaires, such as WebCas, offer significant advantages, including low cost, ease of application, and expanded reach, allowing the inclusion of participants

regardless of their location. These characteristics make this approach particularly useful in research involving children and adolescents, a demographic that tends to respond better to dynamic and less complex formats. Electronic questionnaires also optimize data collection, enabling quick and efficient analyses while reducing costs and promoting sustainability by minimizing paper and material usage (Braekman et al., 2018; De sousa et al., 2023; Regmi et al., 2016).

Given this context, the present study aimed to analyse the agreement between the printed version (PV) and the electronic version (EV) of the WebCas questionnaire to assess the feasibility and reliability of transitioning to an electronic format for collecting HRB data among children and adolescents.

Methods

Participants

This study is characterized as cross-sectional research involving students from the 5th to the 9th grade of elementary school, aged between 9 and 15 years, of both sexes, who were regularly enrolled in public (municipal and state) and private schools in Curitiba, Paraná. The selection was intentional, supported by sample size calculation using G*Power software (Faul et al., 2007), considering: Type I error (α) = .05, Type II error ($1-\beta$) = .80 (Cohen, 2013), and an effect size of .5. The result indicated a minimum of 140 students for analyses based on the Chi-square association test and at least 26 students for correlation analyses.

Questionnaires

To assess HRB, the WebCas questionnaire was developed in two modalities: PV and EV. Initially, the PV was structured based on internationally referenced instruments, subsequently undergoing linguistic and cultural adaptations to ensure its applicability to the target audience. The EV was developed by a specialized programming service, ensuring its compatibility with mobile devices, computers, and tablets. The digitization process involved the exact replication of the content and structure of the PV, maintaining identical question layout and response options. The questionnaire was segmented into seven main areas: dietary patterns, physical activity level, sleep quality, psychoactive substance use, sedentary behaviour time, mode of commuting, and emotional aspects. These sections were structured to encompass different dimensions of students' lifestyles, as detailed in previous studies (Legnani et al., 2019; Legnani et al., 2020).

Procedures

Data collection took place between August and September 2014, totaling four visits to each educational institution. During the first visit, the research objectives were presented to school administrators and teachers, and the Free and Informed Consent Terms (FICT) were distributed to guardians, along with the Free and Informed Assent Terms (FIAT) for students. In the subsequent visit, signed documents were collected, anthropometric measurements were taken, and the WebCas questionnaire was administered in its printed form (PV) – referred to as the “test.” After seven days, the EV was applied – referred to as the “retest.”

Participants received instructions on how to complete the questionnaire. On the “test” day, the printed questionnaire was projected via multimedia projector, with examples of completion explained, lasting approximately 40 minutes. For the “retest,” conducted in a computer lab with internet access (www.legnaniwebcas.com.br), students first created a registration to familiarize themselves with the platform before proceeding with the actual completion, which took around 21 minutes under the supervision of the principal researcher and two trained collaborators. After both applications, a final sample of 153 students was obtained for data analysis, corresponding to a 32% loss ($n = 68$).

Data description was conducted using descriptive statistics (mean, standard deviation, and relative frequencies). To assess the reproducibility and agreement between the values obtained in the two applications (test and retest), for ordinal scale variables, the Prevalence-Adjusted Bias-Adjusted Kappa (PABAK-OS) or (PABAK-K) was used. This statistical procedure was performed as suggested by Bland and Altman (1986), applying a methodology that enables reliability analyses of the same instrument on two occasions, particularly when the variable of interest has three to seven categories. The coefficient calculation was performed directly through the online platform <http://www.singlecaseresearch.org>.

For continuous variables, the Concordance Correlation Coefficient (CCC_{pc}) (Lin, 1989) was adopted, which simultaneously encompasses precision (p), represented by Pearson's correlation coefficient, and accuracy (C_b), which quantifies the degree of deviation from the 45° line (perfect identity). The interpretation followed McBride's (2005) theoretical assumptions, categorizing pc as follows: below .90 (low agreement), between .90 and .95 (moderate), from .95 to .99 (substantial), and above .99 (almost perfect). In cases where continuous data did not present a normal distribution, normalization available in MedCalc software (version 15.2) was applied. For all tests, a significance level of 5% ($p < .05$) was adopted.

Statistical Analysis

For the analysis of quantitative data, descriptive statistics (mean, standard deviation, and frequency distribution) were used. The procedures applied to assess the reproducibility and agreement of the measurements included the Prevalence-Adjusted Bias-Adjusted Kappa (PABAK-OS) or PABAK (K) for ordinal scale variables, calculated directly on the website <http://www.singlecaseresearch.org>. This procedure was chosen due to its ability to calculate the reliability of the same instrument in two applications when analyzing an ordinal scale variable with three to seven categories (Lopes et al., 2002).

For continuous variables, the concordance correlation coefficient (CCC_{pc}) technique was used (Bland & Altman, 1986). The CCC_{pc} provides a measure of precision (p) and another of accuracy (C_b), where p represents Pearson's correlation coefficient, and C_b is a bias correction factor that measures how much the line of best fit deviates from the 45° line through the origin, thus serving as an accuracy measure. The suggested interpretation of the Concordance Coefficients (pc) indicates the strength of agreement as follows: $< .90$ = low; $.90 - .95$ = moderate; $.95 - .99$ = substantial; and $> .99$ = almost perfect (McBride, 2005).

For variables that did not follow a normal distribution, data normalization was performed using the statistical software MedCalc 15.2 for Windows. The predetermined significance level was set at 5% ($p < .05$).

Results

The 153 schoolchildren included in the concordance analyses (PV vs. EV) of the Web-Cas questionnaire were distributed as follows: 60.8% (n=93) attended morning sessions, and 56.2% (n=86) were male. Based on the physical activity level classification criteria adopted in this study, the largest proportion of schoolchildren (39.2%; n=60) were classified as insufficiently active, while another 39.2% (n=60) were also insufficiently active. Among the participants, 64.1% (n=98) reported enjoying answering the questionnaire, and 81% (n=123) found the WebCas questionnaire easy or very easy to complete (Table 1).

Table 1
Sociodemographic characteristics of the schoolchildren participating in the agreement procedures between the paper version and the electronic version of the WebCas questionnaire – PV x EV (n=153).

	%	n
Shift		
Morning	60.8	93
Afternoon	39.3	60
Sex		
Boys	56.2	86
Girls	43.8	67
Socioeconomic Stratum		
B	7.2	11
C	73.2	112
D	19.6	30
Physical Activity Level		
Sedentary	18.3	28
Insufficiently Active	39.2	60
Active	25.5	39
Very Active	17.0	26
Enjoyed Answering WebCas?		
Yes	64.1	98
No	35.9	55
Was It Difficult to Answer WebCas?		
Very Difficult	7.2	11
Moderately Difficult	12.4	19
Easy	48.4	74
Very Easy	32.0	49

Table 2 presents the results concerning the anthropometric characteristics of the sample of schoolchildren who participated in the second phase of the study. The sample had a mean age of 13.5 ± 1.5 years, a body mass index (BMI) of $21.0 (\pm 3.98)$ kg/m², and an estimated daily energy expenditure of 2408.01 (± 757.98) kilocalories per day.

Table 2
Anthropometric characteristics and energy expenditure of schoolchildren participating in the agreement procedures between the paper version and the electronic version of the WebCas questionnaire – PV x EV (n=153).

Variable	Mean	Standard Deviation	Minimum	Maximum
Age (years)	13.50	1.50	11.00	16.00
Body Mass (kg)	54.80	13.61	26.70	99.30
Height (meters)	1.60	0.10	1.31	1.86
Body Mass Index (kg/m ²)	21.00	3.98	13.60	33.18
Kcal/day	2408.01	757.98	1330.00	5913.00

Regarding the concordance procedures between the PV and EV of the WebCas questionnaire, the highest concordance values were observed for variables related to the consumption of legal drugs, specifically alcohol consumption in the last 30 days, alcohol consumption in doses, cigarette use, and intoxication. In contrast, the lowest concordance percentages were observed for variables assessing the frequency of food consumption, particularly the consumption of vegetables, fruits, soft drinks, snacks, and sweets (Table 3).

When analysing the variables using the Weighted Kappa technique, eleven of the twelve analysed variables—including school transportation, napping, fruit consumption, vegetable consumption, sweets, snacks, soft drinks, intoxication, cigarette use, and alcohol consumption in doses—showed very good agreement, with values above $k > .84$. Moderate and weak agreement values were observed only for the variables “alcohol consumption in the last 30 days” ($k = 0.44$) and “daytime sleepiness” ($k = .10$).

Using the PABAK technique, seven variables presented moderate values (Pabak $> .41$ and Pabak $< .60$). Five variables were classified as having very good Pabak values, as described in Table 3.

Table 3
Percentage agreement, weighted Kappa index, and PABAK between the WebCas questionnaire applications – PV x EV, regarding school transportation type, food consumption frequency, alcohol, cigarette use, and sleep habits (n=153).

Variable	Agreement % (n)	Weighted Kappa (95% CI)*	PABAK (95% CI)
School Transportation	51.60 (79)	1.00 (1.00 a 1.00)	.48 (.92 – 1.07)
Fruits	37.30 (57)	1.00 (1.00 a 1.00)	.65 (.92 – 1.07)
Vegetables	37.30 (57)	1.00 (1.00 a 1.00)	.65 (.92 – 1.07)
Sweets	47.10 (72)	1.00 (1.00 a 1.00)	.65 (.92 – 1.07)
Snacks	54.90 (84)	1.00 (1.00 a 1.00)	.58 (.92 – 1.07)
Soft Drinks	38.60 (59)	1.00 (1.00 a 1.00)	.58 (.92 – 1.07)
Alcohol Consumption (30 days)	89.50 (137)	.44 (.25 – .62)	.42 (.81 – .97)
Alcohol Consumption (doses)	84.30 (129)	1.00 (1.00 a 1.00)	.58 (.92 – 1.07)
Intoxication	98.70 (151)	1.00 (1.00 a 1.00)	.70 (.92 – 1.07)
Cigarette Use	86.30 (132)	1.00 (1.00 a 1.00)	.37 (.92 – 1.07)
Daytime Sleepiness	37.30 (57)	.10 (.06 – .13)	.58 (-.05 – .10)
Nap (siesta)	73.90 (113)	.87 (.79 – .96)	.77 (.73 – .96)

Note. ** Analysis performed using the Pabak – OS Calculator spreadsheet; *Analysis performed using the MedCalc Statistical Software; Nap.

Regarding the analysis of sleep habits and schoolchildren’s energy expenditure, the Concordance Correlation Coefficients (CCC) were below expectations for all analyzed variables (CCC = - .02 to .78). The same pattern was observed for precision (CCC = - .13 to .78), with eight variables classified as having poor CCC values (Table 4).

Table 4
Concordance correlation coefficient between the WebCas questionnaire applications – PV x EV, regarding sleep habits and energy expenditure (n=153)

Variable	ρ	C _b	CCC	95% CI
Time woke up today (1x2)	.78	.99	.78	.71 – .83
Time went to bed yesterday (1x2)	.16	.74	.12	.05 – .23
Sleep duration (1x2)	.75	.99	.75	.68 – .81
Time wakes up Monday–Friday (1x2)	.78	.99	.78	.71 – .83
Time goes to bed Monday–Friday (1x2)	- .26	.47	- .12	- .20 – -.05
Time wakes up on weekends (1x2)	.72	.99	.69	.61 – .76
Time goes to bed on weekends (1x2)	- .13	.19	- .02	- .05 – .04
GEDA 1 x GEDA 2	.72	.93	.67	.58 – .74

Note. GEDA = Previous Day Energy Expenditure; 1 = first WebCas application; 2 = second WebCas application; CCC = Concordance Correlation Coefficient; ρ = precision; C_b = accuracy.

Regarding the accuracy results (Cb), 50% of the analyzed variables—"Time woke up today," "Sleep duration," "Time wakes up Monday–Friday," and "Time wakes up on weekends"—showed almost perfect accuracy values (Cb $\geq$.99). Three variables—"Time went to bed yesterday," "Time goes to bed Monday–Friday," and "Time goes to bed on weekends"—had low accuracy values (Cb = .19 to .74).

Discussion

The present study aimed to evaluate the agreement between the PV and EV of the WebCas questionnaire to understand its feasibility and reliability. Among the twelve analysed variables, seven had agreement percentages above 50% (school transportation, snacks, alcohol consumption in the last 30 days, alcohol consumption in doses, intoxication, cigarette consumption, and napping). Regarding the values obtained using the Weighted Kappa technique, ten variables (school transportation, fruit consumption, vegetable consumption, sweets, snacks, soft drinks, alcohol consumption in doses, intoxication, cigarette consumption, and napping) demonstrated strong agreement ($k > .80$). However, the results from the Pabak statistical procedures had a lower proportion, where only five variables (fruit consumption, vegetable consumption, sweets, intoxication, and napping) showed good values (Pabak $> .60$).

In six variables (school transportation, snacks, soft drinks, alcohol consumption in the last 30 days, alcohol consumption in doses, and napping), the values were moderate (PABAK $> .41 < .60$). These findings are consistent with the results of Lopes, Farias Júnior, and Pires (2002), who tested a questionnaire for collecting data on health-related behaviours in adolescents, reporting moderate to strong levels of agreement.

Regarding the agreement values of continuous variables, such as sleep habits and energy expenditure (Kcal/day), five of the eight variables showed substantial (GEDA 1 $\times$ GEDA 2) or almost perfect accuracy (Time woke up today, Sleep duration, Time wakes up Monday–Friday, and Time wakes up on weekends), while the remaining three variables (Time went to bed yesterday, Time goes to bed Monday–Friday, and Time goes to bed on weekends) had poor accuracy values (Cb $< .90$). On the other hand, 62.5% of the variables had correlations ranging from moderate to strong, with strong correlations in three variables (Cb $> .75$) and moderate correlations in two variables (Cb $> .40 < .70$). In the study conducted by Alves et al. (2020), a high prevalence of insufficient sleep and excessive daytime sleepiness was identified among Brazilian adolescents, with over 54% of participants reporting less than eight hours of sleep per night and experiencing daytime drowsiness. This scenario may help explain the lower levels of agreement observed in the variables related to bedtime, as irregular sleep patterns and limited subjective awareness of their own sleep routines can compromise the accuracy of the responses provided by adolescents.

Concerning physical activity, other studies have found substantial agreement in their results, similar to the findings of this study (Silva et al., 2022). Data from the Brazilian National School Health Survey (PeNSE) indicate a significant decline in the proportion of physically active adolescents, from 31.2% in 2012 to 18.0% in 2019, in both urban and rural areas (Soares et al., 2023). This trend may be associated with lifestyle changes and increased sedentary behavior, which also impact sleep and overall health.

In general, the reproducibility indicators found in this study are similar to those reported by Legnani et al. (2013) in a study conducted with schoolchildren in Paraná, which assessed the agreement between PV and EV of an instrument for evaluating

physical activity among children. Conversely, these results are lower than those found by Engel et al. (2017) in a study conducted in Santa Catarina, Brazil, which aimed to assess the agreement between EV and PV of the Previous Day Food Questionnaire. In that study, 57.9% of the analysed variables had moderate Kappa values ($k > .40 < .60$), and 88.8% presented very good PABAK values. In research conducted with 45 Brazilian adolescents on eating habits, Lopes et al. (2002) found moderate to strong Kappa indices ($k = .44$ to $.69$) in most variables, which were superior to the findings of this study.

The use of questionnaires has become increasingly common in Brazil, particularly for studies employing invitations sent via email or social media. These strategies, which involve recruiting participants through the internet, are widely used to facilitate research (Abadio de Oliveira et al., 2021; Wachelke & De Andrade, 2009). Among the main advantages of this approach are its practicality in reaching large samples without requiring in-person visits, cost reduction, the ability to access specific populations, and the inclusion of automated routines for data tabulation and analysis (Wachelke et al., 2014; Pedrosa et al., 2022; Carvalho et al., 2015). However, this strategy also has some limitations, such as selection bias (Couper, 2000), and concerns regarding the accuracy of the collected data (Wachelke et al., 2014).

In the present study, these factors were mitigated since the questionnaires were administered in a controlled school setting under the supervision of the research team, as suggested by Wachelke et al. (2014) for online data collection procedures. In fact, studies using EV questionnaires have reported high intraclass correlation coefficients, indicating greater reliability for group-level physical activity estimates than for individual estimates (Ridley et al., 2006; McLure et al., 2009).

The use of the WebCas questionnaire in its EV format eliminated the need for manual data entry by evaluators, thereby reducing potential transcription errors—one of the advantages of this instrument compared to traditional paper-and-pencil methods. Additionally, the online format allowed participants to respond at their own pace without time constraints, saving financial resources and researchers' time, supporting the findings of Legnani et al. (2013). The visually engaging nature of the EV questionnaire also increased interest among children and adolescents. These findings reinforce that EV questionnaires demonstrate good consistency, suggesting their suitability for research as a cost-effective and efficient method for monitoring HRB levels in children and adolescents at a group level, with the potential for large-scale application across different populations and regions simultaneously.

A key strength of this study is the evidence supporting the use of EV questionnaires in epidemiological research, which represents a promising approach for innovating research methods related to population health—particularly among adolescent students. WebCas can be used in different locations in real time, whether in large urban centres or remote areas.

However, the study also has limitations. The sample selection method was intentional and limited to a single region of the country. Nevertheless, this helped avoid sampling bias and ensured full supervision throughout the data collection process. The number of schoolchildren participating in the study should be expanded in future research; however, the sample size estimation indicated a minimum of 140 students, which was met in the present study ($n = 153$). Thus, further agreement and validation studies involving students from different types of educational institutions and regions of the country are recommended.

Conclusion

The results indicated that the WebCas questionnaire applications showed moderate to strong correlations for most analyzed variables, demonstrating satisfactory agreement and reproducibility indices. These findings reinforce the methodological robustness of both the printed and electronic versions in assessing health-related behaviours in schoolchildren.

In this regard, WebCas demonstrates potential for use in larger-scale studies, as well as in different population contexts, given its observed practicality and reliability. However, further research is recommended, involving more heterogeneous samples and different age groups, in addition to longitudinal surveys, to enhance and expand the evidence on the validity and applicability of the instrument.

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Conflict of interest

The authors state no conflict of interest.

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