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A SHORT REVIEW OF VALIDATED QUESTIONNAIRES FOR EVALUATING LEVELS OF PHYSICAL ACTIVITY IN CHILDREN AND ADOLESCENTS

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ABSTRACT. Childhood and adolescent obesity becomes a worldwide health problem, as for the past years the prevalence of obesity amongst youngsters has reached very high levels. The increased levels of obesity at younger age rises concern at a global basis, therefore the prevalence of childhood obesity sets enormous pressure on healthcare system. Obesity is a complex trait influenced not only by genetic factors, but also by other such as: physical inactivity and unhealthy diet or overeating as well as weight status misperception. Some of the measures needed to overcome these factors is that the intervention programs used to prevent or combat obesity, must include assessment and correction of these factors, as well as monitoring their evolution over time. Questionnaires are efficient instruments that can be used for the evaluation of such parameters. This study aims to revise the scientific literature, from the last five years, to identify and centralize the most reliable and valid questionnaires created and used for the assessment of physical activity in children and adolescents.

Keywords: *obesity, children, adolescent, questionnaires, physical activity*

REZUMAT. ***O scurtă revizuire a literaturii ştiinţifice cu privire la chestionarele validate utilizate în evaluarea nivelului activităţii fizice la copii şi adolescenţi.*** Obezitatea la copii şi adolescenti devine o problemă de sănătate la nivel mondial, deoarece în ultimii ani prevalenţa obezităţii în rândul tinerilor a atins niveluri foarte ridicate. Nivelul crescut de obezitate la vârste mici creşte îngrijorarea la nivel global astfel că, prin creşterea prevalenţei obezităţii la copii se creează o presiune enormă asupra sistemului de sănătate. Obezitatea este o afecţiune complexă influenţată nu numai de factori genetici, ci şi de alţii precum: inactivitatea fizică şi dieta nesănătoasă sau supraalimentarea precum şi de percepţia greşită asupra statutului ponderal propriu. Unele dintre măsurile necesare pentru depăşirea acestor factori constau în faptul că programele de intervenţie utilizate pentru

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prevenirea sau combaterea obezității trebuie să includă evaluarea și corectarea acestor factori, precum și monitorizarea evoluției acestora în timp. Chestionarele sunt instrumente eficiente care pot fi utilizate pentru evaluarea acestor parametri. Acest studiu își propune să revizuiască literatura de specialitate pentru a identifica și centraliza cele mai fiabile și valide chestionare create și utilizate în ultimii 5 ani pentru evaluarea activității fizice la copii și adolescenți.

Cuvinte cheie: *obezitate, copii, adolescenți, chestionare, activitate fizică*

Introduction

Childhood and adolescent obesity becomes a worldwide health problem, as for the past years the prevalence of obesity amongst youngsters has reached very high levels. In 2016, data provided by WHO stated that over 340 million children and adolescents were overweight or obese. Moreover, from a number of 1.9 billion adults, aged 18 years and older, diagnosed as overweight, 650 million were obese (34.21%). The situation is therefore critical, as shown by data from 2019, as an estimated 38 million children under the age of 5 years were overweight or obese. (WHO, 2016; Wiseman, Rossmann, & Harris, 2019).

The increased levels of obesity at younger age rises concern at a global basis, therefore the prevalence of childhood obesity sets enormous pressure on healthcare system, by the fact that an obese child often will maintain its weight status as an adult, developing several medical conditions that will severely affect his life (Kumar & Kelly, 2017).

Obesity is a complex trait influenced not only by genetic factors, but also by other such as: physical inactivity and unhealthy diet or overeating (Kim, Hou, Wang, & Arcan, 2019) as well as weight status misperception (Bayles, 2010; De La O et al, 2009; Figueroa, Ip, Gesell, & Barkin, 2008; Strava, 2017).

Some of the measures needed to overcome these factors is that the intervention programs used to prevent or combat obesity, must include assessment and correction of these factors, as well as monitoring their evolution over time. Questionnaires are efficient instruments that can be used for the evaluation of such parameters. In order to ensure the success of an obesity intervention program, it has been shown that measures must be taken at a very young age (Flynn et al., 2006; Lanigan, Barber, & Singhal, 2010).

This study aims to revise the scientific literature, from the last five years, to identify and centralize the most reliable and valid questionnaires created and used for the assessment of physical activity in children and adolescents.

Materials and methods

Literature Search

Bibliometric analysis was carried out in order to summarize and describe useful validated questionnaires regarding as tools for assessing physical activity in children and adolescents. In the present work, all bibliometric data were obtained from PubMed, Scopus and Google Scholar, from a period of five years, from January 2015 until April 2020. The search strategy on PubMed was based on the following keyword combination: „physical activity" OR „motor activity" AND „Reliability and Validity" AND „Questionnaire" AND „children". For Scopus searches, we used the same keyword combination, but we selected only the papers from medical field. Finally, for Google Scholar searches, we selected articles that contained the keyword combination in the title.

Inclusion and Exclusion Criteria

In order to be included and discussed in this review paper, the selected articles have to describe a questionnaire that meets the following criteria:

- must measure the level of physical activity at children and adolescents (<18 years)
- the questionnaire should be applicable to general children and adolescent population, having either one specific target group, or a general one
- the article must be written in English
- the questionnaire must have passed the Reliability and Validity process.

Exclusion criteria

- systematic review/meta-analysis paper were excluded
- articles that describe questionnaires that lack reliability and validity were eliminated
- studies that use target groups, other than children and adolescents, were also excluded.

Selection of Papers

The selection of the studies to be included in this review paper was a three-phase process, as following:

- First, two reviewers (SCC and MD) independently searched literature studies that meet the requirements needed to be included in this review paper
- For the second phase, searches for both reviewers were compared, duplicates were eliminated and also papers that did not meet the inclusion criteria, based on abstract readings
- For the final phase of the selection process, after all papers were read in full, studies that meet the requirements were included in this review paper. For the last two phases of the selection process, a third reviewer (OM) offered assistance when needed.

Data Extraction

Data extraction, from the selected studies, was performed using The Quality Assessment of Physical Activity Questionnaires (QAPAQ) checklist (Terwee et al., 2010). Thus, we selected the following information: year of publication, tittle of the questionnaire, setting, recall period, language of questionnaire, items, parameters of measurement, as well as statistical data from the Test–Retest Reliability and Construct Validity process.

Results

After the first searches on PubMed, Scopus and Google Scholar, based on the keyword combination mentioned above, we identified a number of 493 articles. In the second phase of the selection process, based on inclusion criteria, and after all papers abstracts were read, we further identified 28 papers.

For the last phase of the selection process, after the full reading of the articles, of the 28 studies, we selected a final number of 10, which were included and thorough discussed in this review. A schematic representation of the selection process is presented in Figure 1.

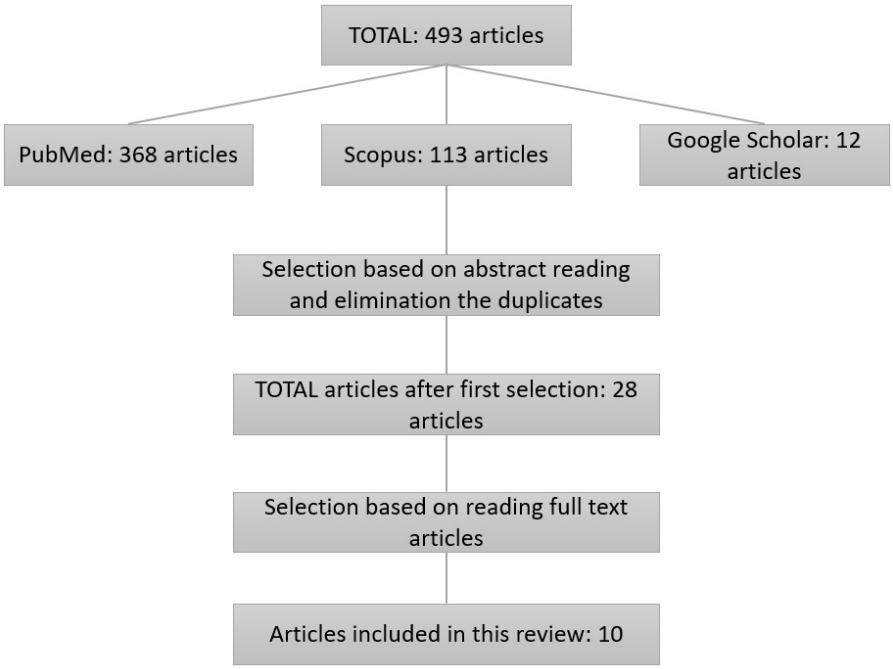

Figure 1. Schematic representation of the selection process of the articles

Description of Questionnaires

Table 1 presents a description of the questionnaires included in this review paper, based on following data: year of publication, tittle of the questionnaire, setting, recall period, language of questionnaire, items, parameters of measurement.

Test–Retest Reliability and Construct Validity

Statistical data obtained from the Test–Retest Reliability and Construct Validity process are shown in the table below (Table 2). Beside the results, we included data regarding study population that participated in the Reliability and Validity phases, the time interval needed for the retesting, as well as the instrument used to correlate the questionnaire score in order to obtain validation.

Table 1. Description of the questionnaires included in this review paper

Year	**Questionnaire**	**Study population**	**Construct**			**Results**	
			Setting	*Recall period*	*Language*	*Items*	*Parameters*
2020	Madras Diabetes Research Foundation Physical Activity Questionnaires [MPAQ(c)] (Mehreen et al., 2020)	n=104 M/F=49/ 55 age: 14.4 yr.	various physical activities performed during a year	last 7 days	English	74 items	intensity, duration and frequency
2019	Physical Activity Questionnaire for Older Children (PAQ-C) (Turkish version) (Erdim, Ergün, & Kuğuoğlu, 2019)	n=784 age: 9–14 yr.	sports and leisure	last 7 days	Turkish	9 items	frequency
2019	International Fitness Scale, in the Portuguese language version (IFIS-LP) (De Moraes, Vilanova-Campelo, Torres-Leal, & &Carvalho, 2019)	n1=190 age: 6.7 ± 2.1 yr. n2=110 age: 14.6 ± 1.8 yr.	self-reported physical fitness		Portuguese	5 items	Likert-scale

2019	Physical Activity Questionnaire for Older Children (PAQ-C) Japanese version (Isa et al., 2019)	**Reliability**: n=154 age: 9-12 yr. **Validity**: n=184 age: 9-12 yr.	sports and leisure	last 7 days	Japanese	9 items	frequency
2019	The Chinese Children Physical Activity Questionnaire (CCPAQ) (Xi et al., 2019)	**Reliability**: n=119 M/F=56/ 63 boys, age: 13.15 ± 2.4 yr **Validity**: n=106 M/F=53/ 53 age: 13.05 ± 2.45 yr.	physical activity pattern	last 7 days	Chinese	23 items	frequency and time spent
2018	The South American Youth/Child Cardiovascular and Environment Study (SAYCARE) Physical Activity (PA) questionnaire (Nascimento-Ferreira, et al., 2018)	**Reliability:** n=119 M/F=41. 7% / 58.3% age: 11–18 yr. **Validity**: n=60 M/F=44 % / 56% age: 11–18 yr.	physical activity at school, physical activity at leisure time, and physical activity while commuting	last 7 days	English	47 items	frequency and intensities
2017	Youth Leisure-time Sedentary Behavior Questionnaire (YLSBQ) (Cabanas-Sánchez, et al., 2018)	**Reliability:** n=194 M/F= 96/98 age: 10–18 yr. **Validity:** n=1207 age: 8–18 yr.	time spent by youth in a wide range of leisure-time sedentary behaviors	last 7 days	Spanish	12 items	frequency

2016	Physical Activity Questionnaire for older Children (PAQ-C) (Spanish version) (Benítez-Porres, et al., 2016)	n= 83 M/F=46/ 37 age: 10.98 ± 1.17 yr.	sports and leisure	last 7 days	Spanish	9 items	frequency
2016	Physical Activity Questionnaire for older Children (PAQ-C) (Chinese version) (Wang, Baranowski, Lau, Chen, & Pitkethly, 2016)	n=798 M/F=445 /353 age: 8-13 yr.	sports and leisure	last 7 days	Chinese	9 items	frequency
2016	Early Years Physical Activity Questionnaire (EY-PAQ) (Bingham et al., 2016)	**Reliability**: n=104 M/F=52/ 57 age: 3.3 ± 0.8 yr. **Validity**: n=196 age: 3.2 ± 0.8 yr.	physical activity and sedentary time in young children	last 7 days	English/ Urdu	16 items	frequency and duration

Table 2. Statistical data obtained from the Test–Retest Reliability and Construct Validity

Year	Questionnaire	Study population	Reliability		Validity	
			Time interval test-retest	*Results*	*Comparison measure*	*Results*
2020	Madras Diabetes Research Foundation Physical Activity Questionnaires [MPAQ(c)] (Mehreen et al., 2020)	n=104 M/F=49/ 55 age: 14.4 yr	14 days	Total score: ICC=0.77	Acc. Actigraph (model Actilife 5 GT3X+) Triaxial Accelerometer	MPAQ(c) score were correlated with ACC: for sedentary behavior: r=0.52; for moderate-vigorous: r= 0.41
2019	Physical Activity Questionnaire for Older Children (PAQ-C) (Turkish version) (Erdim, Ergün, & Kuğuoğlu, 2019)	n=784 age: 9–14 yr.	7–10 days	Total score: ICC=0.91		CVI=0.95
2019	International Fitness Scale, in the Portuguese language version (IFIS-LP) (De Moraes, Vilanova-Campelo, Torres-Leal, & &Carvalho, 2019)	n1=190 age: 6.7 ± 2.1 yr. n2=110 age: 14.6 ± 1.8 yr.	15 days	Total score: for children $\kappa \geq 0.93$; for adolescents $\kappa \geq 0.88$	Physical Fitness Tests	$\kappa \geq 0.40$ in children and adolescents
2019	Physical Activity Questionnaire for Older Children (PAQ-C) Japanese version (Isa et al., 2019)	**Reliability**: n=154 age: 9-12 yr. **Validity**: n=184 age: 9-12 yr.	2 months	Total score: ICC=0.83	Athletic competence; self-efficacy; body fat percentage; cardiovascular fitness	athletic competence (r =0.41, P<.05); self-efficacy (r =0.65, P<.01), body fat percentage (r = −0.19, P<.01), cardiovascular fitness (r=−0.32, P<.05), BMI (r=−0.09, P= .21)

2019	The Chinese Children Physical Activity Questionnaire (CCPAQ) (Xi et al., 2019)	**Reliability**: n=119 M/F=56/ 63 boys, age: 13.15 ± 2.4 yr **Validity**: n=106 M/F=53/ 53 age: 13.05 ± 2.45 yr.	1 day	Total score: ICC=0.63-0.93	Acc. ActiGraph (model wGT3X-BT) cut-points: SB 0–400 cpm; LPA 401–1,900 cpm; MPA 1,907–3,918 cpm; VPA ≥3,918 cpm	Correlation between TSTPA and: SB were all 0.32 (P < 0.001); PAEE was 0.58 (P <0.001) Correlation between MVPA and LPA with Acc. (r_s = 0.20, P = 0.040; r_s = 0.19, P = 0.054)
2018	The South American Youth/Child Cardiovascular and Environment Study (SAYCARE) Physical Activity (PA) questionnaire (Nascimento-Ferreira et al., 2018)	**Reliability:** n=119 M/F=41.7 % / 58.3% age: 11–18 yr. **Validity**: n=60 M/F=44 % / 56% age: 11–18 yr.	15 days	Active commuting: $r_{s=}$ 0.51; PA at school: r_s=0.63; PA at leisure time: r_s=0.68; MPA: r_s=0.36; VPA: r_s=0.93; weekly total MVPA: r_s=0.60 % of agreement with current PA guidelines≥60 min/day: κ 0.56	Acc. Actigraph MTI (model GT3X) cut-points: light (101-1,999 CPM), moderate (2,000-4,999 CPM), and vigorous (4,000 CPM)	MPA vs. acc. MPA: r_s=0.11, VPA vs. acc. VPA: r_s=0.65, Weekly total MVPA vs. acc. total MVPA: r_s=0.88, % of agreement with PA guidelines≥60 min/day: κ=0.51
2017	Youth Leisure-time Sedentary Behavior Questionnaire (YLSBQ) (Cabanas-Sánchez, et al., 2018)	**Reliability:** n=194 M/F= 96/98 age: 10–18 yr. **Validity:** n=1207 age: 8–18 yr.	7 days	Total score: ICC=0.66	Acc. Actigraph TM	Correlation between sedentary time assessed and acc. (r = 0.36; p < 0.001)

2016	Physical Activity Questionnaire for older Children (PAQ-C) (Spanish version) (Benítez-Porres et al., 2016)	n= 83 M/F=46/ 37 age: 10.98 ± 1.17 yr.	6 h	Total score: ICC=0.96	Acc. Actigraph (model GT3X) cut-points: SB* 0–100 cpm; LPA* 101–2296 cpm; MPA* 2296–4011 cpm; VPA* ≥4012 cpm	(r_s = 0.228-0.278, all ps < .05) were observed between PAQ-C and accelerometry
2016	Physical Activity Questionnaire for older Children (PAQ-C) (Chinese version) (Wang, Baranowski, Lau, Chen, & Pitkethly, 2016)	**Reliability**: n=92 M/F=51/ 41 age: 8–13 yr. **Validity**: n=358 age: 10.5±1.1 yr.	7–10 days	Total score: ICC=0.82	Acc. ActiGraph (model GT3X) cut-points: MPA* 2296–4011 cpm; VPA*≥4012 cpm	PAQ-C score were significantly correlated with MVPA: in males (r=0.38, P<0.01); females (r= 0.26, P<0.05) and all children (r=0.33, P<0.01)
2016	Early Years Physical Activity Questionnaire (EY-PAQ) (Bingham, et al., 2016)	**Reliability**: n=104 children M/F=52/ 57 Age: 3.3 ± 0.8 yr. **Validity**: n=196 age: 3.2 ± 0.8 yr.	5 - 7 days	ST (ICC = 0.47) MVPA (ICC = 0.35)	Acc. Actigraph (model GT3X+)	The rank correlation coefficient was non-significant for ST (r_s = 0.19) and significant for MVPA (r_s = 0.30)

Legend: ***ICC*** *= intraclass correlation coefficient;* $\mathbf{r_s}$ *= Spearman correlation coefficient;* ***ACC****= Accelerometer;* ***PA****= physical activity;* ***ST****= sedentary time;* ***SB****= sedentary behavior;* ***LPA****= light-intensity PA;* ***MPA****= moderate-intensity PA;* ***VPA****= vigorous PA;* ***MVPA****= moderate to vigorous PA;* **κ=***Cronbach alpha;* ***yr.****=years;* ***M****=male;* ***F****=female*

Discussion

Based on literature searches from the past five years (January 2015 – April 2020) and as a result of the selection process, in this review we analyzed and discussed 10 studies. The questionnaires differ by several aspects, such as the language of the questionnaire, number of items used, accuracy, and other. Therefore, we found questionnaires written in English (Bingham et al., 2016; Mehreen et al., 2020; Nascimento-Ferreira, et al., 2018), Chinese (Wang, Baranowski, Lau, Chen, & Pitkethly, 2016; Xi, et al., 2019), Spanish (Benítez-Porres, et al., 2016, Cabanas-Sánchez, et al., 2018), Japanese (Isa et al., 2019), Portuguese (De Moraes, Vilanova-Campelo, Torres-Leal, & Carvalho, 2019); Turkish (Erdim, Ergün, & Kuğuoğlu, 2019) and Urdu (Bingham et al., 2016).

Comparing the number of items used for each questionnaire, we observed that the average for almost half of the questionnaires was of 9 items, while the longest questionnaire has 74 items (Mehreen et al., 2020), and the shortest questionnaire counts only 5 items (De Moraes, Vilanova-Campelo, Torres-Leal &Carvalho, 2019).

The age of the study groups varies also, starting with young children under the age of five (Bingham et al., 2016), and, in other cases, reaching to adolescence years (8–18 years) (Cabanas-Sánchez, et al., 2018).

The results presented in all questionnaires show the frequency at which o certain activity was performed on the last 7 days, while some questionnaires measure the intensity and duration of a physical activity. All these data are transformed in physical activity scores.

The accuracy degree for these questionnaires was obtained following the Reliability and Validity processes. For the Test-Retest Reliability process of eight of the questionnaires described in this review paper, the intraclass correlation coefficient (ICC) was used, giving a score between 0.35-0.96. the remaining two questionnaires the Cronbach's alpha (k) coefficient was used, giving a score of 0.56 - 0.88.

The retesting period for the Reliability process differs from one study to another. Hence, the shortest time interval for test-retest process was of 6 hours, whilst the longest was of two months.

According to the interpretation of Cicchetti et al. (1994) for the coefficients mentioned above, we presented questionnaires having a low degree of reliability (less than 0.40) and an excellent reliability score (between 0.75 and 1.00). For seven of the selected questionnaires, an accelerometer with different cut-point was used as a comparison instrument in the validity process. Some studies (De Moraes et al., 2019; Torres-Lea & Carvalho, 2019; Erdim et al., 2019; Isa et al., 2019) used different physical tests to correlate the results of

the questionnaires. Thus, the correlations will give different degrees of validity, based on the correlation coefficient, such as non-existent, weak, moderate, strong, and perfect.

Specifying the strengths of this review, we can mention that this study contributes to the field of interest by identifying the latest questionnaires that assess the level of physical activity and highlight their main characteristics. On the other side, as limitation of this study, we consider the relatively insufficient data regarding the interpretation of each questionnaire, one aspect that we will consider for further research.

Conclusion

This literature review paper offers a short list of studies that use questionnaires as instruments for measuring the level of physical activity. All of these questionnaires were subjected to the Reliability and Validity process, and were used and applied to children and adolescents. The questionnaires are instruments that can generate valid results, if all authors indications are being accomplished. The results will show data regarding the frequency to which a certain activity is performed on the last seven days. Moreover, some of the studies analyzed in this review paper use extra measurements, such as intensity and duration of certain physical activity. Finally, all these data are transformed into physical activity scores, which will provide a better and more accurate interpretation.

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