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Assessing physical activity in the elderly: A comparative study of most popular questionnaires

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Abstract

Introduction. During assessing physical activity researchers often use self-reported methods which may not meet psychometric standards and can lead to false results due to the application of inaccurate or wrongly chosen tools. Aim of Study. The aim of this paper was to compile a list of most popular questionnaires used for assessing physical activity among the elderly and to examine their qualitative and psychometric characteristics. Methods. An analysis of articles published in international scientific journals on the topic of physical activity assessment among elderly people was performed in order to select reliable and valid questionnaires. Results. Twenty-one papers containing information on psychometric criteria of eleven questionnaires were analyzed. The majority of reliability and validity studies were performed on the PASE and YPAS questionnaires. In terms of objectivity, the best ones turned out to be the CHAMPS, IPAQ, PAQE, PASE, and YPAS questionnaires. The highest reliability assessment scores were given to the APAFOP, PAR, PAQE, and QAPSE questionnaires. The best validation scores with objective methods assessing physical activity were carried out for the APAFOP, PAQE, PASE, and YPAS questionnaires. Conclusions. Among the analyzed questionnaires, the best one in terms of objectivity, standardization, validity, and reliability was the Yale Physical Activity Survey (YPAS).

KEYWORDS: physical activity, elderly, reproducibility of results, questionnaires.

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What is already known on this topic?
Measurements of physical activity are usually carried out using various types of questionnaires or interviews. There are many questionnaires assessing physical activity of the elderly which are objective and standardized, but researchers still often use self-reported methods which do not meet psychometric standards. The use of methods with no validity and reliability indices may, in consequence, lead to false results.

Introduction

In the last decades, the relationship between physical activity and health has been well documented. Study results of elderly people who engaged in any kind of moderate or high intensity physical activity confirmed the role of physical activity in the prevention of coronary heart disease [1, 2], heart attack [3, 4], and respiratory diseases [5]. Profuse evidence was offered to substantiate the importance of physical activity in maintaining one's proper body weight [6, 7]. Research results concerning the influence of physical activity on body composition confirmed its beneficial impact on obesity prevention and treatment [8] and on maintaining normal cholesterol values [9]. It has been corroborated

that physical activity may improve stability and reduce the risk of bone fractures related to falls [10]. It has also been proven that physical activity helps prevent bone density reduction in elderly people [11] and reduce the risk of osteoporosis [12]. Existing research confirms the beneficial effects of physical activity on maintaining or improving physical fitness, and as a result, the functional fitness of elderly people [13-17]. Aging entails biological, psychological, and social changes, which cause specific discomforts leading to depressive disorders. Research shows that depression symptoms are more frequent in people who do not undertake or rarely undertake physical activity than in physically active people, even several years after the assessment [18-20]. Physical activity may reduce anxiety and depression symptoms [21, 22], and those effects may remain for a long period [23].

Even though the beneficial effects of frequent physical activity are broadly documented, most elderly people do not undertake sufficient physical activity. This is shown by data from government reports from different countries. As many as 65% of elderly Americans [24], 65% of Canadian men and 50% of Canadian women do not undertake the recommended dose of physical activity [25]. The situation is similar in 47% of elderly Australians [26], 30% of elderly South Africans [27], 35% of senior citizens of Austria, Belgium, Denmark, Finland, France, Greece, Spain, the Netherlands, Ireland, Luxembourg, Germany, Portugal, Sweden, the UK, Italy [28], and 49% of elderly Poles [29].

Studies examining the determinants for undertaking physical activity among the elderly and formulating theoretical bases for interventions aimed at promoting a healthy lifestyle require reliable physical activity measurements. According to Welk et al. [30] the development of methods and techniques assessing physical activity is one of priorities of kinesiology studies. However, a reliable and valid physical activity assessment is difficult to achieve. Objective methods of assessing physical activity are costly and difficult to carry out in a wider population, especially among the elderly. In turn, subjective methods of assessment do not require complicated technical equipment, are not a burden for the study population and – as a result – do not affect the population's behavior. Subjective methods of assessing physical activity include direct and indirect observation, interviews, journals, protocols, general questionnaires, recall questionnaires, and quantity questionnaires. Physical activity is most frequently measured with questionnaires or structured interviews.

It has been observed that when assessing physical activity researchers often used the self-reported methods, which did not meet psychometric standards [31]. Scientists frequently assume that a used method is reliable, which consequently may lead to presenting false results due to the application of inaccurate or wrongly chosen tools. When commencing scientific studies, researchers require information on the psychometric indices of a given method or measuring tool.

Questionnaires assessing physical activity are easily accessible and non-invasive research methods. However, similarly to the objective methods, they should produce reliable and valid results and comply with the test criteria, which by definition constitute an objective and standardized measurement of an individual's behavior [32]. A subjective assessment of physical activity is expected, just as any psychological test, to meet certain formal criteria, called goodness criteria, such as objectivity, standardization, reliability, and normalization, and, if necessary, adaptation.

If the formal criteria of an assessment method are weak, than the risk of fallacious reasoning is very high. As it can be surmised from a survey of studies by Jørstad-Stein et al. [33], the knowledge of assessment features was not utilized during the construction of the questionnaires assessing physical activity among the elderly. Among the questionnaires published between 1966 and 2003, none met all the formal criteria of an assessment method. Forsén et al. [34] reviewed 13 questionnaires and only three received positive recommendations, i.e. International Physical Activity Questionnaire-Chinese (IPAQ-C), Women's Health Initiative-PAQ (WHI-PAQ), and Physical Activity Scale for the Elderly (PASE). The authors of both publications point to a constant need for validation studies of questionnaires used for physical activity assessment, especially those concerning the elderly population.

Aim of Study

The aim of this paper was to compile a list of most popular questionnaires used for assessing physical activity among the elderly and to examine their qualitative and psychometric characteristics.

Material and Methods

An analysis of international scientific journals on the topic of physical activity assessment among the elderly was performed in order to select reliable and valid questionnaires. The search of the SPORTDiscus, MEDLINE, and Health Source – Consumer Edition (until April 2013) databases was carried out following the algorithm: SU ("motor activity*" OR "physical activity*" OR exercise*) AND SU (questionnaire* OR test* OR scale* OR measure* OR method* OR assess*) AND SU (old* OR eld* OR aged OR aging) AND (psychometr* OR valid* OR reliab* OR norm* OR standard* OR objective*). Initially, 12,979 records were found and after limiting the search only to studies on people, the number of records was reduced to 402. Articles concerning questionnaires measuring physical activity levels in English, French, Spanish, and Chinese, and their adaptations were included in these databases. Next, using an analysis of abstracts, two independent reviewers excluded a number of articles on the grounds of some complex criteria. Finally, papers and questionnaires in other languages than English targeted at people with certain diseases were excluded as well.

Results

The study results indicated 11 questionnaires from among 21 papers, which were examined with respect to goodness criteria: Assessment of Physical Activity in Frail Older People (APAFOP) [35], Community Healthy Activities Model Program for Seniors (CHAMPS) [36-38], Physical Activity Questionnaire for the Elderly: Modified Baecke Questionnaire for Older Adults (PAQE) [39, 40], 7-Day Physical Activity Recall (PAR) [41, 42], Physical Activity Scale for the Elderly (PASE) [37, 40, 43, 44], Questionnaire d'Activite Physique Saint-Etienne (QAPSE) [45], The International Physical Activity Questionnaire (IPAQ) [46], The International Physical Activity Questionnaire for the Elderly (IPAQ-E) [47], The Older Adult Exercise Status Inventory (OA-ESI) [48], Yale Physical Activity Survey (YPAS) [37, 40, 41, 46, 49], and Zutphen Physical Activity Questionnaire [40, 50].

The examined qualitative features of each questionnaire included the aim, target population, assessed areas of physical activity, number of items, completion time, and the interpretation of results. Table 1 summarizes the qualitative features of the analyzed questionnaires.

In terms of objectivity, the best questionnaires were CHAMPS, IPAQ, PAQE, PASE, and YPAS. These questionnaires contain the precise instructions how to fill them, and the procedure for calculation and interpretation of results. All of these questionnaires were easy to understand. The PASE questionnaire required the shortest time to fill. The IPAQ had the lowest number of items.

Access to properly designed research tools is important for investigators, therefore we also checked the availability of the questionnaires. Full versions of APAFOP, CHAMPS, PAQE, YPAS questionnaires can be found as attachments to papers demonstrating their theoretical assumptions [35, 39, 51]. IPAQ and PASE are available on the Internet. Access to the other questionnaires can be obtained upon written request to their authors or managing institutions.

A review of scientific journals allowed us to collect the results of studies by different authors on the reliability and validity of questionnaires assessing physical activity among the elderly. We considered the methodology of assessing reliability and validity, and the obtained measures; time between the study and the repetition of the study; and the number of participants. Particular questionnaires were subject to different numbers of validation studies. We also considered the time from the publication of a given method, since the longer a questionnaire was available, the better it was disseminated among the researchers.

Our review of the databases showed that the most studies on reliability and validity were performed for the YPAS [37, 40, 41, 46, 49, 51, 52] and PASE [37, 43, 44, 53, 54] questionnaires.

In all the studied questionnaires, reliability (overall consistency of measurement) was tested with a test-retest technique, which is based on performing an assessment twice on one study group at different times. The time from the first test to the retest should be long enough, so that the study population does not recall their answers given the first time. However, the time between the two tests cannot be too long, because the volume of physical activity might change substantially. The time between the test and the retest depends on the activity period assessed by a given questionnaire. In order to assess weekly physical activity, the time between the test and the retest can vary from one week to several months [55].

Table 1. Quality characteristics of physical activity questionnaires for older adults

Questionnaire	Purpose	Target population	Areas	Time	Mode of administration	No. of items	Recall period	Scores
APAFOP	to measure PA in older frail or impaired people	> 65 y	walking, outdoor, indoor, sitting, lying, sport	24'±5'	interview	10	past 24 h	MET
CHAMPS	to evaluate effectively interventions to increase PA among older persons	65–90 y	exercise, household, recreation	15'	self-administered, interviewer-administered (by telephone or face to face)	41	typical wk in the past 4 wk	MET summary frequency/wk
PAQE	to classify apparently healthy elderly people in a consistent way into extremes of the distribution of PA	60–83 y	household, sport, leisure	30'	interview	12	past 1 y	PAQE activity score
PAR	to assess PA in older people	60–80 y	household, leisure, occupation	?	interview	?	past 7 d	EE (kcal x kg/d)
PASE	to assess PA in large scale epidemiologic studies where limited time is available	≥ 65 y	household, leisure, occupation	5'	self-administered, interviewer-administered (by telephone or face to face)	11	past 7 d	PASE activity score
QAPSE	to provide a complete measure of daily PA and daily EE in population of elderly subjects	65–84 y	occupation, leisure, household, basic, moving, sport	20'–30'	self-administered, interviewer-administered	35	1 wk	EE (kJ/d)
IPAQ	for cross-cultural surveillance to assess PA in a comparable manner	> 60 y	moderate, vigorous, walking	?	self-administered, interviewer-administered (by telephone or face to face)	7	past 7 d	MET
IPAQ-E	to classify old people into PA categories	≥ 65 y	low, moderate, vigorous, walking	?	self-administered	?	past 7 d	moderate act. (min/d) vigorous act. (min/d) walking (min/d)
OA-ESI	to capture information about PA patterns without markedly increasing respondent burden	65–90 y	occupation, leisure, sport	few min	self-administered	38	past 7 d	MET total time (h/wk)
YPAS	to measure PA in epidemiological studies	60–86 y	household, yard work, care giving, exercise, recreation	20'	interviewer-administered (by telephone or face to face)	36	typical wk in the past mth	total time (h/wk) EE (kcal/wk) act. dimensions index
Zutphen PAQ	to assess PA in retired men	65–84 y	leisure	?	self-administered	15	past wk past mth	EE (kcal/kg/day)

act. – activity, d – day, EE – energy expenditure, h – hours, MET – Metabolic Equivalent, min – minutes, mth – month, PA – physical activity, wk – week, y – year, ? – no information

Table 2. Reliability of physical activity questionnaires for older adults

Questionnaire	Reliability method	Reliability results
APAFOP [35]	Test-retest after 24 h, N = 30, aged > 65 (82 ± 7 y) from a geriatric rehabilitation ward and a community-dwelling population	ICC = 0.91^{L}–0.97^{L}
CHAMPS [36]	Test-retest after 6 mth, N = 147, aged 65–90 (74 ± 6 y)	ICC = 0.58^{L}–0.67^{L}
CHAMPS [37]	Test-retest after 2 wk with the use of e-mail, N = 80, aged 65–89 (75 ± 6 y) from community centers and retirement homes	r = 0.62^{L}–0.76^{L} ICC = 0.62^{L}–0.76^{L}
CHAMPS [38]	Test-retest after 1 wk, N = 43, aged 65–96 from independent-living retirement villages	ICC = 0.34*–0.88***
PAQE [39]	Test-retest after 20 d, N = 29, aged 63–80, free-living people, unrepresentative sample	No differences between pairs, $r_S = 0.89^{L}$, 72% of results in the same tercile, $r_B = 0.74^{L}$
PAR [42]	Test-retest after 2–4 wk, N = 220, M aged 60–80 (69 ± 5 y) from The Veterans Affairs Medical Center	ICC = 0.80***–0.90***
PASE [43]	Test-retest after 3–7 wk, N = 254, representative sample of community-dwelling aged ≥65 (mean age 73 y) – mail administration – telephone administration	r = 0.75^{L} r = 0.84^{L} r = 0.68^{L}
QAPSE [45]	Test-retest after 6 wk, N = 44, aged 65–84 (71 ± 4 y)	r = 0.65***–0.97*** NS a paired t-test
IPAQ [46]	Test-retest after 3–5 d, N = 122, W = 70 (66 ± 6 y), M = 52 (68 ± 5 y)	r_S = 0.29*–0.77***
OA-ESI [48]	Test-retest after 4 wk, N = 17, W aged 58–80 (mean age 67 y), athletic sample Test-retest after 1 wk, N = 29, W = 22, M = 7 aged 65–90 (mean age 71 y)	r = 0.34 r = 0.77***
YPAS [49]	Test-retest of Spanish version after 2 wk, N = 108, aged 61–80, 70 women (68 ± 6 y) and 38 men (70 ± 7 y)	ICC = 0.12–0.66***
YPAS [51]	Test-retest after 2 wk, N = 76, aged 60–86, W = 56 (71 ± 7 y), M = 20 (71 ± 6 y)	r = 0.42***–0.65***
YPAS [46]	Test-retest after 3–5 d, N = 122, W = 70 (66 ± 6 y), M = 52 (68 ± 5 y)	r_S = 0.44***–0.99***
Zutphen PAQ [40]	Test-retest after 4 mth, N = 21, M aged 65–84 (mean age 74 y)	r_L = 0.93***

*p < 0.05, **p < 0.01, ***p < 0.001, d – day, h – hours, ICC – Intraclass correlation coefficient, ^{L} – lack of information about the level of significance, M – men, mth – month, NS – non significant, PA – physical activity, r – Pearson's correlation coefficient, r_B – tau-b Kendall's correlation coefficient, r_L – unknown type of correlation, r_S – Spearman's correlation coefficient, y – year, W – women, wk – week

Table 3. Validity of physical activity questionnaires for older adults

Questionnaire	Validity method	Validity results	Study population
APAFOP [35]	– Physilog System	r = 0.65***	N = 108, aged >65 (82 ± 7 y) from a geriatric rehabilitation ward and a community-dwelling population
	– PAQE	r = 0.70***	
	– Sensitivity to change (N = 81)	effect size = 0.84–0.90	
	– Change during intervention (N = 98)	effect size = 1.01	
CHAMPS [36]	– BMI	r = 0.04–(–0.21)*	N = 249, aged 65–90 (74 ± 6 y) (87–experimental group, 86–control group and 76–active group)
	– Elements of physical fitness	r = 0.10–0.30***	
	– Psychological well-being	r = 0.05–0.14*	
	– Sensibility to change	effect size =0.38 –0.64	
CHAMPS [37]	– Mini-Logger Recorder	r = 0.36**–0.48***	N = 87, aged 65–89 (75 ± 6 y) from community centers (51) and retirement homes (38)
	– EPESE-lower body parts functioning	r = 0.44**–0.46**	
	– 6 min walk test	r = 0.46**–0.54**	
	– SF-36	r = 0.25**–0.42**	
	– PASE	r = 0.58***–0.64***	
	– YPAS	r = 0.64***–0.68***	
	– BMI	NS	
CHAMPS [38]	– Senior Fitness Test (3 tests)	r_S = 0.14–0.32*	N = 167, aged 65–96 (79 ± 6 y) from independent-living retirement villages
	– SF-12 (physical)	r_S = 0.12–0.24**	
	– SF-12 (mental)	NS	
PAQE [39]	– A repeated 24-hour PA recall	$r_S = 0.78^L$; $r_B = 0.66^L$	N = 31, aged 63–80, unrepresentative sample
	– Pedometers for 3 d (N = 30)	$r_S = 0.72^L$; $r_B = 0.68^L$	
PAR [42]	– 6 min walk test	r_S = 0.21**–0.22**	N = 220, aged 60–80 (69 ± 5 y) M from The Veterans Affairs Medical Center
	– Accelerometer	r_S = 0.33**–0.52**	
	– H sitting per d	r_S = –0.24–(–0.45)**	
	– Min walking per d	r_S = 0.02–(–0.40)**	
	– SF-36	r_S = 0.17–0.36**	
	– Tinetti gait score	r_S = –0.01–0.23**	
	– Basic activities of daily living score	r_S = –0.08–(–0.25)**	
	– Mobility activities of daily living	r_S = –0.01–(–0.24)*	
	– Instrumental activities of daily living	r_S = –0.04–(–0.37)**	
	– Sensitivity to change	inconclusive	
	– Tinetti balance score	NS	
PAR [41]	– VO_2max	r_S = 0.11–0.34**	N = 59, aged 60–80 (67 ± 5 y)
	– YPAS	r_S = 0.09–0.51***	
	– Resting HR, BMI	NS	
PASE [37]	– Mini-Logger recorder	r = 0.52***–0.59***	N = 87, aged 65–89 (75 ± 6 y) from community centers (51) and retirement homes (38)
	– EPESE–lower body functioning	r = 0.57**	
	– 6-min walk test	r = 0.68**	
	– SF-36	r = 0.17–0.30*	
	– CHAMPS	r = 0.58***–0.64***	
	– YPAS	r = 0.61***	
	– BMI	NS	

Cont. Tab. 3

Questionnaire	Validity method	Validity results	Study population
PASE [53]	– PA measured with the double labeled water method	$r_S = -0.58$*	N = 21, aged 60–80 from intervention study
PASE [44]	Accelerometer for 3 days	r = 0.49*	N = 20, aged 69–89 recruited from a university supervised PA program for older adults
PASE [43]	– Resting HR – Sickness Impact Profile – Perceived health status – Grip strength – Static balance – Leg strength – Age – BMI, BP	r = –0.13* r = –0.42** r = –0.34** r = 0.37* r = 0.33** r = 0.25**–0.28** r = –0.34* NS	N = 222, representative sample of community-dwelling aged ≥ 65 (mean age 73)
PASE [54]	– VO_2peak – Systolic BP, – Balance score – Diastolic BP, Resting HR, Body fat	r = 0.20** r = –0.18* r = 0.20** NS	N = 190 (W = 134, M = 56) mean age 67 ± 5

*p < 0.05, **p < 0.01, ***p < 0.001, BP – blood pressure, d – day, EPESE – Established Populations for Epidemiologic Studies of the Elderly, h – hour, HR – heart rate, M – men, min – minute, NS–non significant, L – lack of information about the level of significance, PA – physical activity, r – Pearson's correlation coefficient, r_S – Spearman's correlation coefficient, SF-12 – The 12-Item Short Form Health Survey, SF-36 – The Short Form (36) Health Survey, W – women, y – year

The correlation coefficient between the test and retest results was considered the coefficient of reliability for a given questionnaire. The authors of the papers analyzing the reliability of the questionnaires used the Pearson correlation coefficient, intraclass correlation coefficient, and Spearman's rank correlation coefficient. The acceptance criteria for reliability assessment of a research questionnaire should reach r = 0.7, optimally r = 0.8, with the minimal value of r = 0.5 [34]. Most of the assessed questionnaires on physical activity obtained satisfactory results (Table 2). The APAFOP [35], PAR [42], PAQE [39], QAPSE [45] questionnaires achieved the highest scores.

The questionnaire validity is the degree to which a questionnaire assesses behavior that can by definition be assessed. In order to study the validity of adapted physical activity questionnaires, investigators usually compare the findings from a given questionnaire with the results from another tool assessing physical activity among the elderly, and with other variables aimed at the assessed theoretical construct (Tables 3 and 4). The validity should obtain at least r = 0.7 for doubly labelled water and step-counters, r ≥ 0.6 for VO_2max, r ≥ 0.5 for accelerometers, diaries, and other questionnaires, and r ≥ 0.3 for fitness and health variables [34].

The most validation studies of questionnaires among the elderly, using objective methods assessing physical activity (doubly labelled water, accelerometers, and step-counters), were carried out for the YPAS questionnaire [37, 46, 49, 52] and PASE [37, 44, 53]. The results for YPAS and doubly labelled water in conjunction with indirect calorimetry collected from among 67 subjects between 45 and 84 years of age did not differ [52], and in the case of PASE correlation with physical activity measured with the double labelled water method amounted to r = 0.58 [53].

The highest correlation coefficients were found between PAQE results and pedometer: r = 0.72 [39], APAFOP and Physilog System: r = 0.65 [35], and YPAS and Mini-Logger Recorder: r = 0.46 – 0.61 [37]. Some authors tested the validity of an analyzed questionnaire assessing physical activity among the

Table 4. Validity of physical activity questionnaires for older adults (continued)

Questionnaire	Validity method	Validity results	Study population
QAPSE [45]	– VO_2max	r = –0.02–0.56***	N = 65 (W = 34, M = 31) aged 65–84 (71 ± 4 y)
	– BMI	r = 0.10–0.46***	
	– Fat-free mass	r = 0.13–0.64***	
	– Body fat	r = 0.07–(–0.64)***	
	– Skinfold thickness	NS	
IPAQ-E [47]	– Accelerometer	r_S = 0.28*–0.47***	N = 54 (W = 31, aged 66–85, M = 23, aged 66–82) living independently
IPAQ [46]	– Accelerometer	r_S = 0.05–0.57***	N = 122 participants, W = 70 (66 ± 6 yr.), M = 52 (68 ± 5 y)
OA-ESI [48]	– Self-efficacy for PA	r = 0.32***	N = 327 (W), aged 70–98 (mean age 77) from different community facilities
	– Social support for PA	r = 0.33***	
	– Risk related to PA	r = –0.19**	
	– Age	r = –0.26***	
	– Positive health self-rating	r = 0.22***	
	– Lifelong activity involvement in PA	r = 0.45**	
	– Number of active d reported per wk	r = 0.49***	
	– PAST4MON	r = 0.41***	
YPAS [49]	– Caltrac	r = –0.01–0.26**	N = 108, aged 61–80, W = 70 (68 ± 6 y), M = 38 (70 ± 7 y)
	– BMI	r = –0.02–(–0.29)***	
	– Body fat	r = –0.05–(–0.27)***	
YPAS [51]	– VO_2max	r_S = –0.20–0.60***	N = 25 (W = 11, M = 14) aged 62–76
	– Diastolic BP	r_S = –0.47**–0.53**	
	– Body fat	r_S = –0.01–(–0.43)*	
	– BMI, Caltrac	NS	
YPAS [40]	– Total ability score	r_L = 0.02***	N = 1189, aged 70–79 from the MacArthur Study of Successful Aging cohort
YPAS [37]	– Mini-Logger Recorder	r = 0.46***–0.61***	N = 87, aged 65–89 from community centers (51) and retirement homes (38)
	– EPESE - lower body parts functioning	r = 0.49**	
	– 6 min walk test	r = 0.58**	
	– SF-36	r = 0.23*–0.31**	
	– CHAMPS	r = 0.64***–0.68***	
	– PASE	r = 0.61***	
	– BMI	NS	
YPAS [46]	– Accelerometer	r_S = –0.01–0.54***	N = 122, W = 70 (66 ± 6 y) M = 52 (68 ± 5 y)
YPAS [52]	– Doubly labeled water in conjunction with indirect calorimetry	NS	N = 67, W = 35, M = 32, aged 45–84
YPAS [41]	– VO_2max	r_S = 0.06–0.36**	N = 59, aged 60–80 (67 ± 5 y)
	– BMI	r_S = 0.02–(–0.31)*	
	– PAR	r_S = 0.09–0.51***	
	– Sensitivity to change	inconclusive	
	– Resting pulse rate	NS	

Cont. Tab. 4

Questionnaire	Validity method	Validity results	Study population
Zutphen PAQ [50]	– Age – Total cholesterol – HDL cholesterol – Daily alcohol – BMI, Daily cigarettes, Diastolic BP, Subscapular skinfold, Systolic BP	$r_S = –0.28$*** $r_S = 0.08$** $r_S = 0.13$*** $r_S = 0.11$*** NS	N = 863, M aged 65–84, representative sample
Zutphen PAQ [56]	– HR – HDL cholesterol – Alcohol consumption, BMI, Diastolic BP, Non-HDL cholesterol, Smoking, Systolic BP, Total cholesterol	$r_S = –0.11$*** $r_S = 0.08$** NS	N = 1271, M aged 69–90 participated in the 30-year follow-up survey
Zutphen PAQ [40]	– PA index by double labeled water method	$r_L = 0.61$**	N = 21,M aged 65–84 (mean age 74 y)

*p < 0.05, **p < 0.01, ***p < 0.001, BP – blood pressure, d – day, EPESE – Established Populations for Epidemiologic Studies of the Elderly, h – hour, HR – heart rate, M – men, min – minute, NS – non significant, PA – physical activity, PAST4MON – Gaston Godin's survey instrument: "Participation in the Past 4 Months", r – Pearson's correlation coefficient, r_L – unknown type of correlation, r_S – Spearman's correlation coefficient, SF-36 – The Short Form (36) Health Survey, W – women, y – year

elderly by comparing it with a different questionnaire and performing the same assessment [35, 37, 41]. The highest correlation coefficients were obtained by Hauer et al. [35] for APAFOP and PAQE: r = 0.70, and Harada et al. [37], who compared CHAMPS and PASE: r = 0.58 – 0.64, YPAS and PASE: r = 0.61, and CHAMPS and YPAS: r = 0.64 – 0.68.

Researchers used different methods in order to assess the validity of a given questionnaire. The most frequently shown correlation were those between the results obtained from a physical activity questionnaire and the results of fitness tests [36-38, 40, 42, 43], health condition [37, 42, 43, 48], and VO_2max [41, 45, 51]. All methods assessing the validity of selected questionnaires and obtained results are presented in Tables 3 and 4.

Discussion

The present paper is a review of 21 papers containing information on assessment criteria of 11 questionnaires assessing physical activity among the elderly. During the initial selection procedure, especially in studies on the elderly population of Poland, we noticed that very frequently investigators created their own questionnaires assessing physical activity, without verifying the criteria for research methods, which resulted in drawing inaccurate conclusions [31]. In order to provide methodological reliability of a physical activity study, questionnaires used to assess physical activity should have clearly stated terms and conditions of use. Uniform assessment criteria are necessary for any future comparisons of study results. Proper instruction, scope of assistance in explaining the questions, terms and conditions of using the research tool (duration, season, whether the tool should be used with individuals or groups), and the procedure for calculating and interpreting results are of key importance for questionnaires assessing physical activity. Moreover, a questionnaire should be objective, i.e. with constant, clearly established procedures for calculating results, which do not allow for subjective interpretation. The analyzed questionnaires used for measuring physical activity among the elderly differed in terms of assessment aims. Most of the physical activity questionnaires were created for assessing physical activity in epidemiological and comparative studies, for ascertaining whether or not the elderly meet certain health criteria, or for classifying them based on their

physical activity. Only the CHAMPS questionnaire [36-38] was aimed at assessing the effects of interventions which were meant to change the physical activity habits. The results of physical activity questionnaires were most frequently presented as metabolic equivalent (MET), and the frequency or duration of physical activity in a unit of time.

Most reliability and validity studies of the reviewed questionnaires on physical activity were based on research conducted among volunteers or participants in programs for the elderly. This problem was already pointed out by Forsén et al. [34]. Therefore, there is a need for future validation studies on physical activity questionnaires on more representative groups.

Conclusions

From among the analyzed questionnaires, the most highly assessed in objectivity, standardization, validity, and reliability were achieved was the Yale Physical Activity Survey (YPAS).

What this study adds?

When conducting scientific studies, researchers require information on the psychometric indicators of their methods and measuring tools. This paper gives information on the qualitative and psychometric characteristics of the most popular questionnaires measuring the levels of physical activity among the elderly.

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