BMJ Open

Self-reported measurements of physical literacy in adults: a scoping review

Knud Ryom ,[1] Anne-Sofie Hargaard,[1] Paulina Sander Melby,[2] Helle Terkildsen Maindal,[1,2] Peter Bentsen,[3] Nikos Ntoumanis,[4,5] Stephanie Schoeppe,[6] Glen Nielsen,[7,8] Peter Elsborg[2,3,8]

To cite: Ryom K, Hargaard A-S, Melby PS, *et al*. Self-reported measurements of physical literacy in adults: a scoping review. *BMJ Open* 2022;**12**:e058351. doi:10.1136/bmjopen-2021-058351

► Prepublication history for this paper is available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2021-058351).

Received 25 October 2021
Accepted 24 August 2022

For numbered affiliations see end of article.

Correspondence to
Dr Knud Ryom;
knudryom@ph.au.dk

ABSTRACT

Physical literacy (PL) is a comprehensive concept covering motivation, confidence, physical competence, knowledge and understanding of individuals' physical activity throughout life. PL has three overlapping domains, such as: an affective, a physical and a cognitive domain. So far, PL has not been measured in the adults and no complete measurement has been developed to date.

Objectives The aim of this scoping review was to review existing self-reported instruments measuring different elements of domains of PL.

Method We reviewed Education Research Complete, Cochrane, Medline, ScienceDirect, Scopus and SPORTDiscus. The reporting followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews guidelines. Studies were coded using a thematic framework, which was based on the three domains of PL. The eligibility criteria were as follows: (1) age groups between 18 and 60 years; (2) meta-analyses, reviews or quantitative studies focusing on the measurement of at least one of the three domains of PL and (3) instrument that was self-reported. We finalised search on 1 August 2021

Results In total, 67 articles were identified as studies describing instruments reflecting the three domains of PL. Following full-text reading, 21 articles that met our inclusion criteria were included. Several instruments of relevance to PL are available for assessing motivation, confidence and the physical domain. However, few instruments exist that measure elements of the cognitive domain.

Conclusion This review showed that a range of existing and validated instruments exists, covering two out of the three domains of PL, namely affective and physical domains. However, for the knowledge domain no valid measurement tools could be found. This scoping review has identified gaps in the research (namely the cognitive domain) and also a gap in the research as no measures that consider the inter-relatedness of the three domains (holistic nature of the concept).

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This scoping review only includes self-reporting instruments.
⇒ There has been little research on physical literacy and adults in general.
⇒ Furthermore, this review is limited by a shortage of particular cognitive domain instruments.
⇒ This review shows validated and useful instruments exist, namely in the affective and physical domains.
⇒ This review suggests possibilities of constructing a holistic instrument measuring physical literacy in adults.

INTRODUCTION

Physical literacy (PL) has become a key focus of physical activity promotion research and practice in countries, such as Australia, Canada, UK and USA, because of the suggested importance for participation in lifelong physical activity.[1] Though this claim is still disputed, longitudinal studies suggest that a versatile breadth of sporting experience significant effect later exercise habits in life, partly supporting the claims of PL.[2] PL is a comprehensive concept integrating components, such as knowledge and understanding, motivation, self-efficacy and physical competencies in relation to physical activity.[1] Even though PL is a relative new concept, first proposed in 1993, various definitions exist.[3 4] Common for all such definitions are three domains, such as : affective, physical and cognitive domain.[5] Some definitions also include a behavioural domain[3] and others also incorporate a social domain.[6] International Physical Literacy Association (2017) defines PL as '… the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life.' . This definition highlights PL as interchangeable throughout life and thus useful in this paper.

PL is expected to improve the all-around health and well-being of individuals by enhancing their ability to be physically active.[7 8] This makes PL important from a population health perspective. Addressing the components of PL (motivation, knowledge, competence and confidence) in physical activity interventions, and thereby targeting participants' prerequisites and

personal resources for being active has the potential for impacting individuals' continued physical activity participation beyond the intervention period. However, when such interventions or programmes are to be evaluated, a valid and reliable measure for adults PL is necessary.

PL is best grasped using both objective measures (eg, physical testing, accelerometers and pedometers) and questionnaires,[9] as done in the comprehensive Canadian Assessment of Physical Literacy (CAPL) for children. Involving objective measures requires significant time, economy and space for testing (eg, The National Health and Nutrition Examination Survey). Such endeavours should be encouraged on adult PL, however, they should advantageously be supplemented with larger investigations on PL among adults from a population health perspective. Self-reported questionnaires are more easily accessible in such perspectives and chosen as the focus point of this review.

While research on children and adolescents has examined the concept of PL extensively in recent years, applications of this concept to adults' physical activity are scarce.[10] A review by Edwards *et al*[11] examined studies attempting to measure PL and found limited empirical studies. Furthermore, they found that almost all the literature focused on children and adolescent.[11] In an initial explorative desk research phase, we found no systematic reviews nor validated measurements involving PL and adults (using different search terms, PL, review, adults and measurements); empirical research in this area was also limited (for an exception, see Holler *et al*[12]; however this measurement is yet to be validated). Thus, today no validated instrument for measuring PL among adults exists.

However, several instruments from related fields and relevant to PL exists, which potentially in combination could be used as a measurement tool for PL in adults. However, no studies have mapped these instruments, reviewed and understood them within a PL theoretical framework. Therefore, the aim of this scoping review was to review existing self-reported instruments useful for measuring the different elements of the three overall domains of PL (ie, affective, physical and cognitive) in a population health perspective.

METHOD

Study design

Scoping reviews are suitable for mapping broad topics and gaps in research related to a defined topic, through systematical searches, selection criteria and synthesising knowledge.[13 14] We adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews,[15] which were used as a framework for the reporting of the abstract, methodology and results. This checklist consists of 20 essential reporting items and 2 optional items.[15]

Information sources and search strategy

A literature search was conducted using the following six electronic databases: (1) Cochrane Library; (2) Education Research Complete; (3) Medline; (4) ScienceDirect; (5) Scopus;and (6) SPORTDiscus. These databases cover a broad range of different fields related to PL, including the fields of public health, behavioural and social science, sport, exercise, and health education. The final search was conducted on 1 August 2021. The search strategy covered three elements, namely: instrument or measuring; adult and constructs relating to the three domains of PL: affective, physical and cognitive. For example, search terms combined to identify measures relating to the affective domain were "instrument OR measuring AND adult AND motivation". To provide a comprehensive coverage of possible instruments of the cognitive domain of PL, a search on health literacy was also conducted "instrument OR measuring AND adult AND health literacy". To ensure the search results were as relevant as possible, the term 'physical activity' was added as a fourth element [example of a search string: instrument OR measuring AND adult AND motivation AND "physical activity"]. The searches were limited to English language and peer-reviewed articles in all six databases. Furthermore, the searches were limited to abstracts, title and keywords. The systematic reviews by Edwards *et al*[4 11] were used to identify other articles through a chain search based on the references in these reviews.

Eligibility criteria and study records

The eligibility criteria of inclusion were as follows: (1) studies with age groups between 18 and 60 years; (2) meta-analyses, reviews or quantitative studies focusing on the measurement of at least one of the three domains of PL and (3) instrument that were self-reported.

Exclusion criteria were as follows: (1) articles not covering instruments of at least one of the three domains concerning PL; (2) studies on children, adolescents (under 18 years) and older people (above 60 years); (3) conference abstracts, position papers, editorials, forewords, letters or comments; (4) non-English language instruments and (5) instruments that were not self-assessed (eg, motor competence or fitness test).

Though self-reported instruments are often considered unreliable,[16] we opted to only include self-reported instruments, as these in large scale would be more applicable in adult populations.

Two researchers from the author team used the abovementioned criteria to review the abstract from each article independently. The researchers (KR, PSM, HTM, PB and PE) discussed discrepancies until agreement was reached. A collective list of instruments within each domain was then presented to the full author team and experts within the field of each domain (GN, SS, NN and other experts SB and LCE, please see the Acknowledgements section) who reviewed the list. For each domain, mutual agreement on which instrument to be included was required between the full research team (ie, all authors) and the

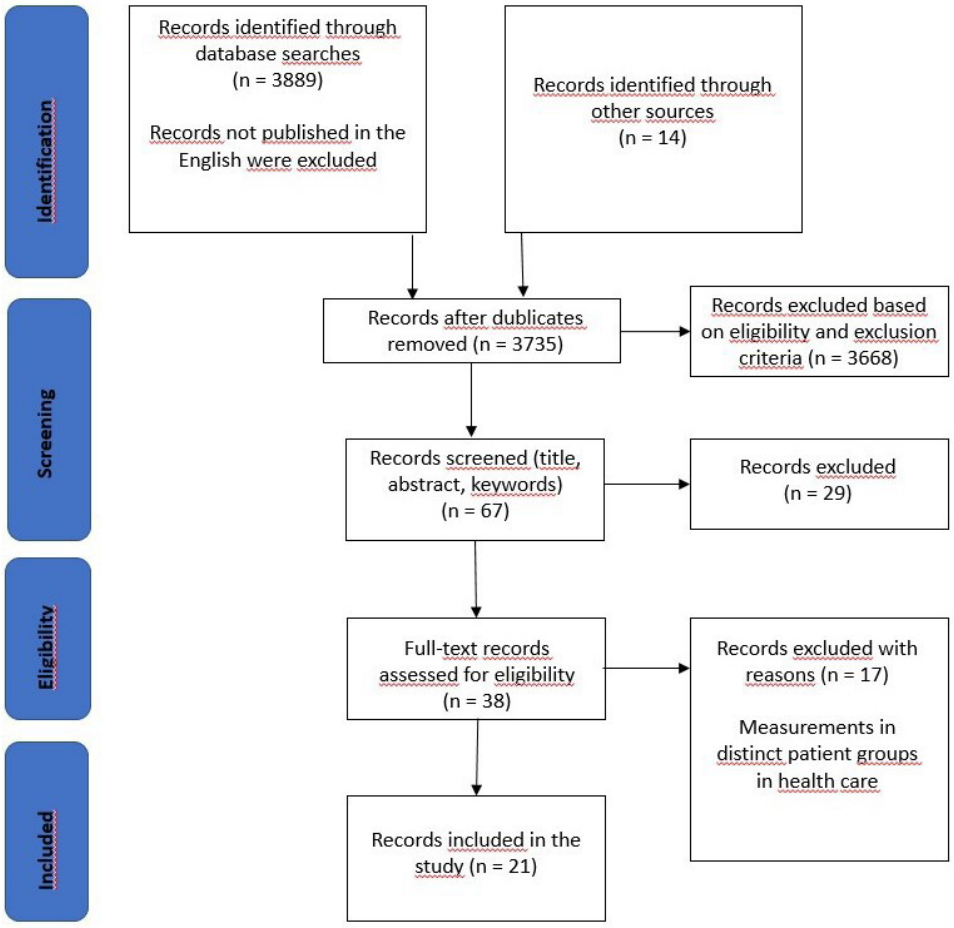

Figure 1 PRISMA flow diagram showing the process of study identification and selection. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

field experts. Figure 1 shows the flow chart of the process of study identification and selection in the literature search.

Data items and data synthesis

The data were summarised through content analysis[17] to highlight similarities and differences across the instruments and domains. A two-step method was used in the analysis process. First, the researchers became familiar with the instruments through a close reading of the included full-text articles. Based on these readings, the instruments were classified into one of three themes representing measures of the affective, physical and cognitive domains of PL. Second, subthemes were generated based on the type of instrument (eg, elements within each domain such as motivation and confidence of the affective domain). The results for each theme/domain are shown in tables 1–4, respectively. It was possible for one article to be represented in multiple themes or subthemes if various instruments were described herein. After identifying the different instruments, the following characteristics were extracted (see tables 1–4): author (year); tool description, outcome, psychometric validation method, strengths and limitations.

Patient and public involvement

No patient involved.

RESULTS

Our search in the six databases resulted in a total of 3889 articles. Additionally, 14 articles were identified via snowballing technique, handsearching and reviewing reference lists of relevant papers. After the title and abstracts of the articles were screened and duplicates were removed, 67 articles remained. After reading the full texts, 21 articles identifying instruments were included in this review (see figure 1).

Summary of measurements

The papers and instruments identified and included in the scoping review are shown in tables 1–4. Tables 1–2 describe the included instruments within the affective domain of PL. Ten instruments were measures of motivation and five measured confidence. For the physical domain, four instruments of physical competence and capacity were included (table 3). For the cognitive domain, two measures of knowledge were included (table 4). Table 4 provides an overview of all included instruments and their strengths and limitations in the

Table 1 Instrument overview: affective domain (motivation)

Affective domain: motivation					
Instrument and authors	**Tool description: target group, litems and scales**	**Construct(s) assessed**	**Validation**	**Overall strengths**	**Limitations**
The Exercise Motivations Inventory (EMI-2) and the Exercise Motives and Gains Inventory. Markland and Hardy (1993).[30]	Target group is the whole population. The EMI-2 comprises 14 subscales and 56 items.	Motivation to exercise based on Deci and Ryan's[31] (1985) self-determination theory.	The factorial validity and invariance of the factor structure across gender were rigorously tested using confirmatory factor analytic procedures (Markland and Ingledew, 1997).[32]	Strong validation results. Assess what people want to gain from PA compared with other measurement. Translated to numerous languages.	EMI-2 is not theory driven.
Motivation for Physical Activity Measure (MPAM-R). Ryan, *et al* (1997).[33]	Target group is the general population. The measurement consists of 30 items shared among five motivation subscales: interest/ enjoyment motivation; competence motivation; appearance motivation; fitness motivation and social motivation.	The tool assesses participants' motivation for sport and exercise activities.	Studies support that the MPAM-R is both valid and reliable measurement (Ryan *et al*, 1997).[33]	The measurement has been shown to predict various behavioural outcomes (eg, attendance, persistence or maintained participation, and to predict mental health and well-being). Acceptable reliability and validity results. Easy to administrate.	Problems with cross-cultural adaptations.
Kerner and Grossmans intention to exercise scale: Four scales that measure the exercise behaviour of individuals. Kerner and Grossman (2001).[34]	Target group is the general population. The measurement consists of 4 subscales with 40 items in total: fitness attitude scale (19 items); expectations of others scale (seven items); perceived behavioural control scale (three items) and intention to exercise scale (11 items).	The measurement predicts participation in physical activity and measures the different independent variables from the theory of planned behaviour model (Ajzen, 1985).[35]	Studies support that the four scales have content validity and reliability. (Kerner and Grossman, 2001).	Preliminary content validity and good scale reliability. Using theory (Theory of planned behaviour).	Small scale pilot study. Problems with cross-cultural adaptations.

Continued

Table 1 Continued

Affective domain: motivation					
Instrument and authors	**Tool description: target group, litems and scales**	**Construct(s) assessed**	**Validation**	**Overall strengths**	**Limitations**
Behavioural Regulation in Exercise Questionnaire-2 (BREQ-2). Markland and Tobin (2004).[36]	Target group is the general population. The measurement consists of 19 items and 5 subscales: amotivation; 3 types of extrinsic motivation (external regulation; introjected regulation; identified regulation) and intrinsic motivation.	BREQ-2 assesses the level of self-determined motivation for the exercise activity in question.	Studies have supported the factorial and construct validity of BREQ-2. Furthermore, BREQ-2 has been shown to be a reliable instrument to determine the regulation levels of the amotivation-intrinsic motivation continuum (Markland and Tobin, 2004).	Adds the dimension of amotivation to BREQ. Strong validity.	Amotivation assessment in BREQ-2 has been criticised (Liu *et al*, 2020).[37]
BREQ-3 Wilson *et al*[28]	Target group is the general population. BREQ-3 consists of 24 items and 6 subscales, adding integrated regulation to BREQ-2.	The tool assesses the six types of motivation in self-determination theory as well as amotivation.	The BREQ-3 has been found to be a valid and a reliable measurement instrument to measure behaviour regulations, stemming from self-determination theory, in the exercise domain.[28]	BREQ-3 is a valid and reliable measurement of behaviour regulation underlying Self-determination theory in the exercise domain. Used broadly among researchers.	It has been suggested that it is difficult to translate some of the items to different language and cultural contexts directly (Cid *et al*, 2018).[38]
Sports Motivation Scale (SMS-6): Revised six-factor sports motivation scale. Mallett et al, (2007).[39]	Target group are athletes' motivation toward sport participation. SMS-6 consists of 24 items and six subscales, stemming from self-determination theory (Deci and Ryan, 1985).	The SMS-6 is a measure of contextual motivation that is intended to identify the perceived reasons for participating in sport.	Items measuring self-determining forms of extrinsic motivation have been found to possess satisfactory levels of construct validity. Moreover, it has been found that integrated regulation significantly and positively correlated with various aspects of flow (eg, autotelic experience, sense of control) (Mallett *et al*, 2007).	SMS-6 is preferable to the original SMS.	It measures motivation for sport, which make it less inclusive in term of general PA.
The Behavioural Regulation in Sport Questionnaire (BRSQ). Lonsdale et al, (2008).[40]	Target group are elite and nonelite athlete populations (competitive). Consists of 7 subscales and 36 items.	Measures intrinsic motivation, four types of extrinsic motivation and amotivation (self-determination theory; Deci and Ryan, 1985).	BRSQ has shown good reliability and validity in elite and nonelite athlete populations. The test–retest reliability of the scores has been found acceptable. The factorial validity of the BRSQ scores has also been generally supported. The majority of the evidence also supports the nomological validity of the scores. (Lonsdale *et al*, 2008).	Strong reliability and validity.	Developed for competitive sports.

Continued

Table 1 Continued

Affective domain: motivation					
Instrument and authors	**Tool description: target group, litems and scales**	**Construct(s) assessed**	**Validation**	**Overall strengths**	**Limitations**
Basic Psychological Needs in Exercise Scale (BPNES). Vlachopoulos, Ntoumanis and Smith (2010).[41]	Target group is the general population. The BPNSE is an 18-item scale with three subscales.	Satisfaction/fulfilment of the three basic psychological needs during exercise	BPNES has shown satisfactory internal reliability coefficients, and evidence for the factor concurrent, discriminant and nomological validity of the translated scale. Cross-cultural validity analyses supported configural invariance and partial metric, partial strong, and partial strict factorial invariance of the BPNES responses (Vlachopoulos *et al*, 2010).	Cross-cultural validated. Relatively short. Strong reliability and validity.	Possible gender measurement non-invariance.
Self-Motivation Inventory (SMI-10). André and Dishman (2012).[42]	Target group are elderly participants. SMI-10 is a 10- item short version of the original SMS (40 items).	Measures participants' self-motivation for exercise adherence.	The SMI-10 shows acceptable internal consistency reliability, similar to the original SMI-40 score. (Andre and Dishman, 2012).	Predicts drop-out from exercise. Validated in English and French. The shortened version SMI-10 has acceptable internal consistency.	Mostly used among elders.
Sports Motivation Scale (SMS-II). Pelletier, Rocchi, Vallerand, Deci and Ryan (2013).[43]	Target groups are sport participants. SMS-II consists of 18 items and six subscales.	The tool assesses the level of motivation towards sport, using the self-determination theory framework (Deci and Ryan, 1985).	Studies have found a good factor structure and adequate convergent validity. Furthermore, the construct validity has been supported (Pelletier *et al*, 2013).	Stronger measurement than SMS. Adds to BRSQ and SMS-6.	Needs more research on test–retest reliability. The invariance of the measurement with regard to different age groups is unknown.

Table 2 Instrument overview: affective domain (confidence)

Instrument and authors	Tool description: target group, Items and Scales	Construct(s) assessed	Validation	Overall strengths	Limitations
Affective domain: confidence					
Self-efficacy scales for health-related exercise and dietary behaviours. Sallis, Pinski, Grossman, Patterson and Nader (1988).[44]	Target group is the general population. The measurement consists of two exercise self-efficacy subscales and five dietary self-efficacy subscales. 61 items.	Self-efficacy scales are assessed with respect to reported diet and exercise behaviours.	The self-efficacy scales for eating and exercise behaviours have been found to show preliminary evidence of being reliable and valid (Sallis *et al*, 1988).	Preliminary evidence of being reliable and valid.	Diverse populations have not been investigated.
Perceived Competence Scale (PCS). Williams, Freedman and Deci (1998).[45]	Target group is the general population. 4 items, 1 scale; perceived competence.	The PCS assesses participants' feelings of competence about different behaviours such as healthier behaviour or participating in a physical activity regularly.	PCS is one of the most valid measurement designed to assess self-efficacy.	Perceived competence has been assessed in various studies and used to predict maintained behaviour change. It is highly valid and reliable.	Based on Self-determination theory, as to why so some researchers suggest it difficult to use without SDT approaches (debatable).
Self-Efficacy for Exercise (SEE) Scale. Resnick and Jenkins (2000).[46]	Target group is the general population. 9 items measuring one scale	This scale is a self-report of exercise self-efficacy.	The SEE has been found reliable and having good internal consistency. It has also been shown to have predictive validity, with mental and physical health scores on the SF-12. Predicting efficacy expectations as measured by the SEE Scale. Furthermore, SEE efficacy expectations predicted exercise behaviour (Resnick and Jenkins, 2000).	Has strong validity and reliability.	Developed for older adults. More research is needed with young adults and different socioeconomic and cultural groups.
New General Self-Efficacy Scale. Chen, Gully and Eden (2001).[47]	Target group is the general population. Eight items.	Assesses how much people believe they can achieve their goals, despite difficulties.	The New General Self-Efficacy Scale has been found more reliable and valid than other self-efficacy measures (Scherbaum, Cohen-Charash and Kern, 2006).[48]	Reported as reliable and valid (Scherbaum, Cohen-Charash and Kern, 2006).	More resilience oriented. May not be relevant in relation to PL.
Multidimensional Outcome Expectations for Exercise Scale (MOEES). Wójcicki, White and McAuley (2009).[49]	Target group is the general population. 15 items and three subscales: physical, social and self-evaluative. Developed from the Exercise Self-Efficacy Scale, (McAuley, 1993).[50]	MOEES is used to assess three related, but conceptually independent domains of outcome expectations for exercise.	MOEES has shown to be a reliable and valid measure of outcome expectations for exercise (McAuley *et al*, 2010).[51]	Draw from social cognitive theory. Preliminary validity exists.	Based on an interpersonal theory and including intrapersonal perspectives.

PL, physical literacy.

Table 3 Instrument overview: physical domain

Instrument and authors	Tool description: Target group, Items and Scales	Construct(s) assessed	Validation	Overall strengths	Limitations
Physical domain					
Physical Self Inventory-version b (PSI6-b). Ninot, Fortes and Deligniéres (2006).[52]	Target group is the general population. The PSI6-b has six items and six subscales.	The scale assesses global self-esteem, physical self-worth, physical condition, sport competence, physical strength and attractive body.	Studies have found that PSI6-b had acceptable psychometric properties and external validity (Ninot *et al*, 2006).[52]	Strong validity based on the PSI-6.	Non-conventional validation methods used in validating PSI6-b compared with PSI-6. More studies needed. Relevance to PL is unclear.
The sports competence subscale of the Physical Self-Perception Profile. Levy and Readdy (2009).[53]	Target group is the general population. The measurement consisted of six items and one scale.	The tool assesses perception of competence for sport.	The tool has been found to have adequate internal consistency (Levy and Readdy, 2009).	Studies report good validity (Levy and Readdy, 2009).	May not capture all dimensions of important basic movement skills relevant for PL.
Self-reported physical fitness (SRFit) survey. Keith, Clark, Stump, Miller and Callahan (2014).[54]	Target group is the general population. The SRFit has 22 items divided on six subscales.	The measurement assesses health related fitness level across health-domains included in the survey.	SRFit has been found to have a good reliability and construct and concurrent validity (Keith *et al*, 2014).	Initial evaluation supports the SRFit survey's validity and reliability.	Instrument created for 40+ adults. Time-consuming.
Rasch assessment of everyday activity limitations (REAL) item bank. Oude Voshaar, ten Klooster, Vonkeman and van de Laar (2017).[55]	Target group is people with disabilities, however is also used in the wider population. The REAL consists of 47 items.	The purpose of the item bank is to assess disability in complex activities in daily living.	The REAL content validity has been supported (Oude Voshaar *et al*, 2017).[55]	A newly developed item bank for measuring complex activities of daily living. Superior measurement performance compared with traditional pen and paper questionnaire.	Time consuming. Limited construct validity.

PL, physical literacy.

Table 4 Instrument overview: knowledge domain

Instrument and authors	Tool description: target group, Items and Scales	Construct(s) assessed	Validation	Overall strengths	Limitations
Cognitive domain					
Level of knowledge of physical activity for health (adapted from Chapman's questionnaire of levels of smoking knowledge). Fredriksson, Alley, Rebar, Hayman, Vandelanotte and Schoeppe (2018).[56]	Target group is the general population. 11 items/ question divided in four subscales/levels.	The measure assesses the individual's level of knowledge concerning physical activity. The four levels assessed include: (1) knowing that physical activity is beneficial for health and physical inactivity is harmful to health; (2) knowing that specific health conditions are related to physical inactivity; (3) knowing exactly how much physical activity is needed for health and (4) the probabilities of developing Physical inactivity related health conditions, knowing and accepting that the risks and benefits of physical activity (inherent in levels 1–3) apply to one's own risk of developing such health conditions.	Not validated.	Relative new measurement, more research need.	No validation studies exist. May not be relevant to knowledge and understanding of physical activity.
Understanding Contemplators' Knowledge and Awareness of the Physical Activity Guidelines. Piercy, Bevington, Vaux-Bjerke, Hilfiker, Arayasirikul and Barnett. (2020).[57]	Target group is the general population. Seven items.	The measure assesses knowledge of health benefits from physical activity and knowledge of physical activity dosage recommendations.	Not validated.	Relative new measurement, more research need.	No validation studies exist. May not be relevant to knowledge and understanding of physical activity.

domains of PL based on theory-driven knowledge about PL and its domains.

An abundance of instruments in the affective domain was evident (15 out of 21 papers, 71%). The physical domain is represented with four self-reported instruments (19%), which is a low number compared with the large number of test instruments and assessment tests related to this domain (eg, tests delivered by professional health personal). As noticed earlier self-reported measurements can be seen as a limitation of this scoping review, but also equally important for pragmatically reasons with adults in mind as time and availability is key for large scale investigations (discussed further in the Discussion section).

For the cognitive domain, only two relevant instruments were identified (9%) and these have not been validated, nor do they measure knowledge about physical activity, but rather knowledge about diseases affected by lack of physical activity or official government guidelines for physical activity.

The ordering in all tables is by year and is not indicative of any preferred order.

Synthesis of results

The synthesis of results in shown in tables 1–4.

DISCUSSION

The aim of this scoping review was to review the existing instruments for measuring the different elements that contributed to PL. The review has identified relevant instruments for assessing and monitoring aspects of especially the affective, and physical domain of PL in adult populations, whereas no validated measures were found for the cognitive domain. The review found most instruments within the affective and physical domain concerned with motivation and competence. This was expected as motivation and competence are commonly used concepts within many research fields including psychology, sport science and health.[18] Hence, the affective domain of PL seems relatively measurable with present and existing instruments, also considering that many of the included instruments in this domain are widely used and have strong validity.[11] Based hereon, it seems that a PL measurement tool, with regard to the affective domain for adults may very well be created/developed on the already established foundation of these instruments.

Additionally, questionnaire-based measures of aspects of the physical domain were reviewed. However, these included instruments have several weaknesses as measures of the physical domain of PL. Self-reported physical competence instruments are often considered unreliable.[16] Usually, overestimation and underestimation based on confidence levels are considered problematic,[15 19–21] hence many researchers have suggested using more objective direct measures of physical competences.[20] Thus, most instrument tools for measuring physical abilities rely on a physical test (eg, agility), but these tests are resource-demanding, as they demand more staff/research hours to collect than a questionnaire based self-report.[22] Compared with the more resource-demanding physical testing, self-assessing instruments of physical competences are in many cases more applicable especially for adult populations, due to less demands and the ability to include them in surveys. Based on findings from this review, self-assessing instruments do exist on the physical domain as an alternative to physical tests.

For the knowledge and understanding elements of the cognitive domain, available measures were particular scarce. None of the included instruments were validated, nor do they measure enabling knowledge of physical activities (eg, tactics in ball games or understanding cultural and contextual aspects important for engaging in different physical activity contexts), but rather physical activity guidelines or health benefits of physical activity.[1 23] Knowledge on how to apply physical competencies in different contexts or knowledge of what contexts are beneficial for one's own physical activity are not measured in these existing instruments. Such forms of knowledge would be more relevant in relation to PL and considering the fact that knowledge of guidelines rarely leads to more physical activity in the population,[24] and from a public health perspective may be more compelling. Thus, valid measures of the knowledge and understanding elements of PL among adults are at the time not existing. Furthermore, the cognitive domain of PL implies a focus on context-specific knowledge of physical active (eg, tactics and organisation) and not generic as measurements focusing on physical activity guidelines. Such instruments exist within children and adolescents (eg, Canadian Assessment of Physical Literacy/CAPL-2 and Physical Literacy in Children Questionaire/PL-C Quest),[25 26] but currently not adults,[4 11] which makes the cognitive domain limited and difficult to access compared with the other domains.

The overall findings from this scoping review indicate that in the affective domain, a range of valid and reliable instruments exist that should inform development of a tool to measure adults' PL. However, instruments available for the physical and the cognitive domains need adaptations and/or even new measurements to assess PL comprehensively among adults. We recommend the readers of this scoping review to critically evaluate the possible instruments, as PL definitions and understandings may vary from one country to another.[3–6 23 27] However, the author group do find more merit in some of the instruments compared with others, these include: affective domain (motivation); Behavior Regulation Exercise Questionaire/BREQ-3,[28] as it is based on self-determination theory,[29] which is commonly considered central in the understanding of motivation and is not only specific to sport to exercise more generally; affective domain (confidence): Perceived Competence Scale/PCS, as instrument of relevance to self-efficacy making it a good fit in PL; as a questionnaire-based measurement for the physical domain: the sports competence subscale of the physical self-perception profile has some interesting

properties. That said, it may not capture the essential basic movement skills (eg, balance, running and jumping)[1]; knowledge domain: the identified measures do not fully capture the PL knowledge/cognitive domain. BREQ-3, PCS and the physical self-perception profile all show some relevance, towards a comprehensive measurement of adults PL, as they cover domains of PL, are validated and used within PA. However, it is important to consider the lifelong perspective and the holistic nature of PL, whereas the above highlighted measurements needs to be considered thoroughly and maybe adjusted to fully fit the concept of PL. Hence, more research and measurement development is needed to develop such measures.

This review is a foundation from which future researchers can base the development of self-reported PL measurement tools for adults on. However, in order to adhere to the unique characteristics of PL as outlined by Whitehead[1] it could also be worthwhile to develop a more comprehensive (eg, including objective measures[9]) PL measurement tool for adults by adjusting and adding to the identified measures in this review. Such a tool should consider the holistic nature of PL that aligns more with the philosophical underpinnings of the concept as outlined by Whitehead.[1] We recommend more research and development of instruments before it is fully possible to generate a complete measurement of PL in adults. An important consideration when developing new measurements tools should be the importance of considering context, but also strive to develop instrument tools useful in large population surveys, if PL is to become important in public and population health research.[8] Thus, to fully understand PL in adults, we need comprehensive measurements with objectively measured tasks and questionnaires like CAPL for children, but we also need a more large-scale population surveys with the potential of monitoring and widening the use of PL among adults. Efforts in these two areas may move the area of PL and adults out of the shadows.

CONCLUSIONS

This review shows that a range of existing and validated instruments exist which cover important aspects of two out of the three domains of PL, that is, the affective and the physical domains. However, for the knowledge domain, no valid measurement tools could be found. This scoping review provides a critical and comprehensive set of tools that researchers who are interested in measuring PL in adults can draw on. It has identified gaps in the research (namely the cognitive domain) and also a gap in the research whereby there are no measures that consider the inter-relatedness of the three domains (holistic nature of the concept). We recommend conducting future research on measuring PL in adults to further develop measurements tools in a more holistic manner that consider the inter-relatedness of the three domains aligning with Whitehead's definition and philosophies.[1] This review is a foundation from which future researchers can base the development of self-reported PL measurement tools for adults on.

Author affiliations
[1]Department of Public Health, Aarhus University, Aarhus, Denmark
[2]Health Promotion Research, Steno Diabetes Center Copenhagen, Gentofte, Denmark
[3]Center for Clinical Research and Prevention, Bispebjerg Research Unit, Kobenhavn, Denmark
[4]Department of Sports Science and Clinical Biomechanics, Danish Centre for Motivation and Behavior Science, University of Southern Denmark, Odense, Denmark
[5]School of Health and Welfare, Halmstad University, Halmstad, Sweden
[6]Queensland University of Technology, Brisbane, Queensland, Australia
[7]Department of Nutrition, Exercise and Sports, University of Copenhagen, Kobenhavns, Denmark
[8]Department of Nutrition, Exercise and Sports, University of Copenhagen, Kobenhavn, Denmark

Twitter Knud Ryom @KnudRyom

Acknowledgements A special thanks to professor Stuart Biddle for his critical evaluations of instruments included (affective domain), positive comments and help with this article. A special thanks to assistant professor Lowri C Edwards, for her involvement and encouragement with this article.

Contributors KR conducted the review, analysed the data, prepared the first draft of the paper, revised the manuscript, approved the final submission and acted as guarantor. A-SH conducted the review, analysed the data, revised the manuscript and approved the final submission. PSM analysed the data, revised the manuscript and aproved the final submission. HTM analysed the data, revised the manuscript and approved the final submission. PB analysed the data, revised the manuscript and approved the final submission. NN conducted expert reviewing on motivation measurement, revised the manuscript and approved the final submission. SS conducted expert reviewing on knowledge measurement, revised the manuscript and approved the final submission. GN conducted expert reviewing on physical measurement, revised the manuscript and approved the final submission. PE analysed the data, revised the manuscript and approved the final submission.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available. Not applicable.

ORCID iD
Knud Ryom http://orcid.org/0000-0001-5947-3038

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