Health Promotion International, 2025, **XX**, daaf055
https://doi.org/10.1093/heapro/daaf055
Review

Review

Self-report physical activity and sedentary behaviour assessments validated for Indigenous populations globally: a scoping review

Melissa Kilburn[1,2,3,*], Yvonne Hornby-Turner[1], Valda Wallace[1], Dympna Leonard[2], Sarah G. Russell[1,2,3], Rachel Quigley[1,2,3], Edward Strivens[1,3], Rebecca Evans[1]

[1]College of Medicine and Dentistry, James Cook University Nguma-Bada Campus, Smithfield, Australia
[2]Australian Institute of Tropical Health and Medicine, James Cook University, Nguma-Bada Campus, Smithfield, Australia
[3]Cairns and Hinterland Hospital and Health Service, Queensland Health, Cairns, Australia

[*]Corresponding author. HART—James Cook University, PO Box 6811, Cairns, QLD 4870, Australia. E-mail: Melissa.kilburn@jcu.edu.au; X: @HART_Australia.

Abstract

Chronic disease prevention programs that target physical inactivity and sedentary behaviour are often evaluated using self-report assessment tools. However, these tools may require additional validation to ensure relevance and efficacy for Indigenous peoples. The scope to which this occurs is yet to be systematically assessed within the literature. This review aimed to explore and define the range of self-report physical activity and sedentary behaviour assessment tools validated for Indigenous adults globally. Searches were conducted across seven electronic databases; resultant articles were screened against the inclusion and exclusion criteria by two reviewers. Analysis of the 15 included articles suggests that self-report physical activity and sedentary behaviour assessment tools have achieved varying levels of validity amongst Indigenous populations globally. Most studies rated as low cultural appropriateness on a 14-item Indigenous research quality appraisal tool, however, there was a significant moderate upward trend over time ($P = 0.0328$). Digital physical activity or sedentary behaviour assessment tools have not yet been validated within Indigenous adult populations and constitute an apparent gap in the literature. Established validation methods for other populations were commonly found to be inappropriate for Indigenous population groups. There were no evident trends regarding validation study methodology identified, signifying a more bespoke approach within Indigenous population groups. Therefore, meaningful consultation and project co-design may help to prevent the potential methodological redundancy when developing and validating physical activity assessment methods within Indigenous populations globally.

Keywords: Indigenous peoples; sedentary behaviour; physical activity; assessment; surveys and questionnaires; reliability and validity

Contribution to Health Promotion

- Cultural, linguistic, and geographic diversity between and within Indigenous population groups requires physical activity and sedentary behaviour assessment tools to undergo population-specific validation to ensure equitable performance for Indigenous population groups and avoid the misrepresentation of lifestyle behaviours.
- This is the first review to systematically explore the range of physical activity and sedentary behaviour tools that have been validated for Indigenous adult populations worldwide.
- The findings of this review can be used to inform culturally appropriate physical activity assessment tool development and validation as well as the evaluation of health promotion programs within Indigenous population groups.

INTRODUCTION

It is estimated that there are over 476 million Indigenous peoples globally. Although no universal definition exists, the WHO defines Indigenous peoples as being custodians and practitioners of unique cultures and ways of relating to people and the environment. Indigenous peoples possess distinct social, cultural, economic, and political characteristics (World Health Organisation 2024). The traditional subsistence lifestyles of Indigenous populations globally, characterized by co-nurturing relationships with lands and waterways were inherently healthy (Johannes and Macfarlane 1991, Gracey and King 2009, Ride and Burns 2020). Western colonization through the dispossession of ancestral lands, waterways, and food systems from Indigenous peoples (Armitage 1995), significantly altered previously stable lifestyle and activity patterns and is one factor that has resulted in the over-representation of chronic disease for Indigenous peoples worldwide (Gracey and King 2009). Other contributing

factors include forced adoption of unfamiliar foods and cooking practices, suppression of traditional food, environmental and medicine practices, and the ability to hand down these knowledge systems to future generations. This is further compounded by logistical challenges with modern health care provision and access in rural and remote regions where Indigenous peoples are more likely to reside than non-Indigenous peoples (Armitage, 1995; Gracey and King, 2009; Goettke and Reynolds, 2019; Australian Institute of Health and Welfare, 2023b).

Non-communicable chronic diseases such as diabetes, kidney disease, cardiovascular disease, certain cancers, and dementia are leading causes of morbidity and mortality worldwide (Australian Institute of Health and Welfare, 2023a). The burden of these conditions is disproportionately shouldered by Indigenous populations globally. Within Australia, 46% of Indigenous peoples are living with at least one chronic disease (Australian Bureau of Statistics 2019). With similar trends in Canada, the USA, and New Zealand (Villarroel et al., 2020; New Zealand Ministry of Health Manatu Hauora et al., 2023). The United Nations reports that 50% of global Indigenous adults aged 35 years and over are now living with type 2 diabetes (Department of Economic and Social Affairs: Indigenous Peoples 2024).

Many of these conditions are lifestyle mediated. However, the traditional lifestyles of Indigenous peoples were largely protective, especially when examined in the context of current health recommendations to reduce chronic disease risk. Traditional diets tended to be rich in high-fibre plant foods and moderate intakes of lean, high-protein animal products (Johannes and Macfarlane 1991, Schraer 1994). The procurement of these foods and the maintenance of food systems among other activities, required consistent incidental exercise and minimal sedentary time (Johannes and Macfarlane 1991, Shephard and Rode 1996, Gray et al. 2013). Physical inactivity and excessive sedentary time are key risk factors for the development of chronic disease (Australian Institute of Health and Welfare 2012). The impact of colonization is clearly apparent in the disproportionate numbers of Indigenous peoples globally who are now living with chronic diseases that pre-colonization lifestyles effectively prevented and avoided for generations.

Many contemporary health promotion programs aim to reduce chronic disease by addressing behavioural risk factors, including physical inactivity and sedentary lifestyles (Alston et al. 2016, Rice et al. 2016, Taafaki et al. 2023). Tools that assess lifestyle behaviours play an important role in measuring and categorizing participant risk, as well as monitoring health program outcomes. Health promotion programs are often evaluated with self-report measures due to their portability, low participant burden, and low cost (Sushames et al. 2016, Kokenge et al. 2022, Pedersen et al. 2022, Cambridge Biomedical Research Centre 2023). However, the tools utilized are commonly euro-centric in design (Sushames et al. 2016, Kokenge et al. 2022). Therefore, physical activity (PA) and sedentary behaviour (SB) assessment methods must be appropriately validated for use within the Indigenous populations they aim to assess. This ensures that traditional practices and culturally relevant activities are adequately captured, and the data collected accurately and reliably reflects the diversity of lifestyle behaviours of Indigenous peoples. Failing to consider the cultural appropriateness of such tools has the potential to introduce measurement bias and misrepresent actual levels of PA and SBs. Consequently, this risks contributing further to health inequities experienced by Indigenous peoples.

Technology is evolving at a rapid pace within all fields of health research. This includes novel platforms and user interfaces for subjective assessment methods such as questionnaires and diaries that are administered via personal smart devices. These interfaces differ from the interviewer or paper-based tools in many ways that may influence the accessibility, acceptability, and reliability of user responses (Evans and Mathur 2018). This may be particularly relevant within Indigenous populations where languages are often spoken rather than written (UNESCO 2022), and where social desirability bias may be amplified by cultural norms or distrust of research and researchers due to historical injustices against Indigenous peoples within western colonial research (Smith 2021). Despite the rapid evolution of technology, the scope and validity of digital self-report PA and SB tools are yet to be systematically explored in the literature.

Health-related assessment and diagnostic methods should routinely undergo rigorous testing to determine their suitability for use with the intended population, and that they are providing an accurate measure to support diagnosis and/or treatment outcomes (Friedman et al. 2022). This includes considerations and adaptations relevant to the cultural, linguistic, and geographical diversity of Indigenous populations globally. Within these cultural contexts, due consideration should be given to Indigenous concepts and definitions of PA which may differ from western definitions and concepts. The published literature on the topic is varied, highlighting the spectrum of meaning and concepts of PA for Indigenous peoples. Some studies note a lack of delineation of activities and exercise as standalone concepts for Indigenous peoples but rather align these with socialization or neutrally viewed activities (Hermansen et al. 2002, Nelson et al. 2010, Gray et al. 2013). Conversely, in their qualitative article exploring Indigenous perspectives on active living in remote Australia, Thompson et al. (2013) found through artwork and focus groups, that participants identified activities that would not necessarily be captured within traditional western definitions such as erecting bark structures and collection of food resources, signifying deep and complex understandings of PA. A qualitative systematic review exploring Indigenous Australians perceptions of PA (Dahlberg et al. 2018) found that PA was commonly associated with maintaining kinship and connections to land and natural resources and was broadly viewed in three categories: exercise, everyday activities, and sport. The authors reported differing definitions of PA between Indigenous men and women, however, where men's understanding focussed on sport and exercise and women viewed PA as anything physical including domestic activities. This is contrary to observations reported by Hanashiro (2012), who explored the perceptions of PA among older Native Hawaiians where PA was viewed collectively by men and women as anything that made you move, including but not limited to, structured sports, exercise, domestic activities, and walking for transport. This highlights that whilst Indigenous definitions of PA generally differ from western definitions, understanding specific population or community definitions and interpretations is imperative for PA assessment tool design or adaptation and subsequent validation thereof.

Several approaches may be considered when determining the validity and reliability of PA assessment tools (Friedman

et al. 2022): *Face validity and acceptability* determine whether a tool is satisfactory to the target demographic. *Content validity* aims to ensure the tool is communicating and gathering data as intended and typically involves evaluation by experts in the field. *Test–retest reliability* ensures that the tool measures consistently between administrations and involves testing the tool measures against itself within a short timeframe. *Inter-rater reliability* determines the consistency of the outcome measures between different administrators. *Concurrent validity* compares the tool to an established reference method and determines how closely the outcome measures align. *Reference method* refers to the established measure against which to compare the novel assessment instrument (Cambridge Biomedical Research Centre 2023). The strength of the correlation between the novel tool and the reference method then determines the concurrent validity of the tool. Clinical and population-level assessment tools are generally expected to have a comprehensive assessment of reliability and validity, including concurrent validity, against an established reference method from which to benchmark the accuracy of results (Cambridge Biomedical Research Centre 2023).

Existing evidence relating to PA assessment tools for use with Indigenous populations includes a 2016 literature review by the Sax Institute, which explored validated PA tools for Aboriginal and Torres Strait Islander children in Australia and identified just two studies (Flood et al. 2016). A second, recently published review by Johnson et al. (2024), explored methods used to assess PA in Australian, Canadian, and New Zealand Indigenous populations. Whilst their review found that adaptation of PA tools for Indigenous populations was increasing, they also found that partnering with the community was still severely lacking in the field. Johnson et al. (2024) did not consider the validity of the assessment tools explored in their review. Therefore, the extent to which self-report PA and/or SB assessment tools have been validated for use with Indigenous adults is yet to be systematically examined in the literature.

Aims

The primary aim of this scoping review is to identify and define the range of self-report PA and SB assessment tools that have been validated for use with Indigenous adult populations globally. The secondary aim is to evaluate the studies identified for inclusion in the review against criteria for determining the cultural appropriateness of the methods used to develop and validate the tool.

METHODS

The protocol for this scoping review was developed to align with the Joanna Briggs Institute (JBI) manual for scoping reviews (Joanna Briggs Institute 2020).

Research questions

The research questions were developed per the Participant, Concept, Context framework to fulfil the primary aim of this review and are set out in detail by eligibility criteria in Table 1 (Joanna Briggs Institute 2020) and include:

1. 'What is the scope of self-report PA and SB assessment tools that have been validated for use with Indigenous adult populations?'
2. 'What methods have been applied to determine the validity of these tools?'
3. 'How do the identified studies score against criteria for determining cultural appropriateness of the methods applied to the development and validation of the tools?'

Search strategy

The search strategy was developed by M.K. and Y.H.-T. with consultation from University Information Specialists (J.C. and S.A.). The search query included terms that described a self-report PA assessment method, as defined elsewhere (Cambridge Biomedical Research Centre 2023), and the process of determining any type of formal validation or reliability testing, within an Indigenous population. The list of search terms was generated through a search of PubMed MeSH terms and peer-reviewed articles relevant to each of these subjects. A list of full search terms is located in Supplementary Appendix A.

Seven electronic databases were searched in February 2023 including Medline, EmCare, CINAHL, PsychInfo, Scopus, Web of Science, Australian Indigenous Health InfoNET as well as the first 50 results from an advanced search of Google Scholar using the same search terms. No date or language restrictions were imposed. Backward citation searching was performed on all included articles. Database search alerts were enabled for the duration of the review to June 2024 in all databases that allowed this feature. This excluded Google Scholar and Australian Indigenous Health InfoNET for which searches were duplicated in June 2024 to capture any articles published since the initial searches were performed.

Source of evidence selection

EndNote v20.6 (Philadelphia, PA: Clarivate; 2013) was used to manage citations. Duplicates were removed and the titles of remaining articles were screened (M.K.), with irrelevant articles discarded. Two reviewers (M.K., Y.H.-T.) independently reviewed the abstracts of the remaining articles against the inclusion criteria. Full texts of the eligible articles were then retrieved and screened by both reviewers. When discrepancies between reviewers occurred, resolution was achieved via consensus or discussion with the third reviewer (D.L.).

Data extraction and synthesis

Data extraction was performed by two independent reviewers (M.K., Y.H.-T.). A data extraction tool was developed by the reviewers, adapted from the JBI sample data extraction tool (Joanna Briggs Institute 2020) and similar published scoping reviews (Prioreschi and Micklesfield 2016, Davies et al. 2023). For each included article, data pertaining to sample demographics, tool features, methods of administration, validation methods including reference method used, and the reported outcomes were extracted and charted. Data were analysed in tabular and graphical formats in Excel for descriptive purposes and contextualized through narrative synthesis. RStudio+ (2023.06.1 ed. Boston, MA: RStudio, PBC) was also used for descriptive and correlative statistics and to generate figures.

Quality appraisal

Quality and cultural appropriateness of the included articles were appraised by two reviewers: a non-Indigenous researcher (M.K.) and an Aboriginal researcher (V.W.),

Table 1. Search strategy inclusion and exclusion criteria

Domain	Inclusion criteria	Exclusion criteria
Participant	Indigenous populations, defined as: distinct social and cultural groups that share ancestral connection to lands and natural resources where they have inhabited for significant periods or been displaced from, often now comprising a minority population share (Cunningham and Stanley 2003).	Validation was not specific to the Indigenous cohort of the sample i.e. the sample also included non-Indigenous participants, and the data were not reported separately.
	Any location globally.	
	Restricted to adult samples due to marked differences in PA assessment and validation methods between children and adults.	Entire or majority sample was comprised of children or adult data was not reported separately.
Concept	Studies that determined and explained the validity or reliability of physical activity (inclusive of sedentary behaviours) self-report methods.	Studies with tools validated that assessed attitudes and perceptions of activity without assessment of behaviours were excluded.
		Validation of objective methods such as accelerometers, doubly labelled water
Context	Any setting: online, phone, community, health service.	
	No restrictions on participant health status	
Source type	All peer-reviewed primary data sources that report on the validity or reliability of PA or SB assessment tools in Indigenous populations	Government or other population-level surveys and grey literature were excluded unless there was an associated validation paper that could be retrieved.

utilizing the CREATE Aboriginal and Torres Strait Islander Quality Appraisal Tool (QAT) (Harfield et al. 2020). The QAT assesses domains pertaining to Aboriginal and Torres Strait Islander individual and community benefit, control, and governance, as well as Indigenous research paradigms and, cultural and intellectual property (Harfield et al. 2018). The 14 items were incorporated in their entirety into the data extraction tool and adapted for Indigenous populations globally (Supplementary Appendix B).

The QAT does not provide guidance on scoring strength within appraised articles however, scoring cut-off points have been utilized in similar reviews and were applied without modification in this review (Christidis et al. 2021, Davies et al. 2023), as follows: those that scored as 'yes' or 'partially' to 10 or more items were classified as high quality and cultural appropriateness, 6–9 items as moderate and 5 or less as low. QAT score was not considered in the inclusion/exclusion criteria for the review. This enables comparison with existing literature and provides structure to the reporting in this review.

RESULTS

The search yielded 1191 unique papers. Full-text review was undertaken on 64 articles with exclusions as detailed in Fig. 1. This resulted in 15 articles describing the validation of nine individual tools being included in the review (Kriska et al. 1990, Schulz et al. 1994, Brownson et al. 1999, Hermansen et al. 2002, Evenson et al. 2003, Whitt et al. 2003, Cuaderes et al. 2004, Dénommé 2006, Fahrenwald and Shangreaux 2006, Egeland et al. 2008, Moy et al. 2008, 2010, Dahl-Petersen et al. 2013, Sushames et al. 2015, Esgin et al. 2021).

Study demographics

Table 2 describes the sample and study characteristics of the included articles as well as the article identification number, which will be utilized hereafter when referencing the included articles. Publication dates ranged from 1999 to 2021. Studies were predominately conducted within Native American populations ($n = 7$) [1, 2, 7, 8, 10, 13, 15], followed by Indigenous populations in Canada ($n = 2$) [4, 5] and Aboriginal and Torres Strait Islander populations in Australia ($n = 2$) [6, 14]. The remaining populations were sampled in one study each. Sample sizes ranged from 18 to 1726 participants, with ages ranging between 10 and 91 years. Most studies sampled Indigenous adults, unrestricted by age or gender. Two studies had samples of females over 40 years [1, 15], one study exclusively sampled women under 40 years [8], and no studies restricted the sample to men.

Tool characteristics and features

Table 3 describes tool characteristics, validation methods, and study outcomes. Tools assessed time periods ranging between 24-hour and 12-month and comprised 2–92 items [1, 3, 4, 6, 8–12, 15]. The most common tool adapted for use was the International Physical Activity Questionnaire (IPAQ) (Craig et al. 2003). Five studies validated a version of this tool, which included the short form (IPAQ-SF) in two studies [4, 5] within Inuit and Cree peoples in Canada, respectively, the long form (IPAQ-L) in one study [3] among Inuit in Greenland, and two studies that validated both forms among Native Hawaiian and Pacific Islanders, and Māori populations [11, 12]. Several of these studies cited a previous attempt to validate the IPAQ within an Aboriginal population in Australia [4-6], which was ultimately abandoned due to insurmountable feasibility issues with the tool for the community. The report referenced by these studies is no longer in circulation and no full-text publication regarding the validation attempt could be located so it was not eligible for inclusion in this review.

Three articles assessed the validity of novel tools, developed specifically for the purposes of the study [2, 10, 15], 11 validated pre-existing tools that were not developed specifically for Indigenous populations [1, 3–9, 11, 12, 14]. Of these studies, eight undertook cultural adaptation of the tool prior to validation [1, 3–6, 11, 12, 14], whilst the remainder validated the pre-existing tool without modification [7–9]. One study validated an existing tool that had been developed previously for the same Indigenous population group without further adaptation [13].

Several dimensions of activity behaviour were assessed, including frequency, duration, and intensity of PA and/or SB

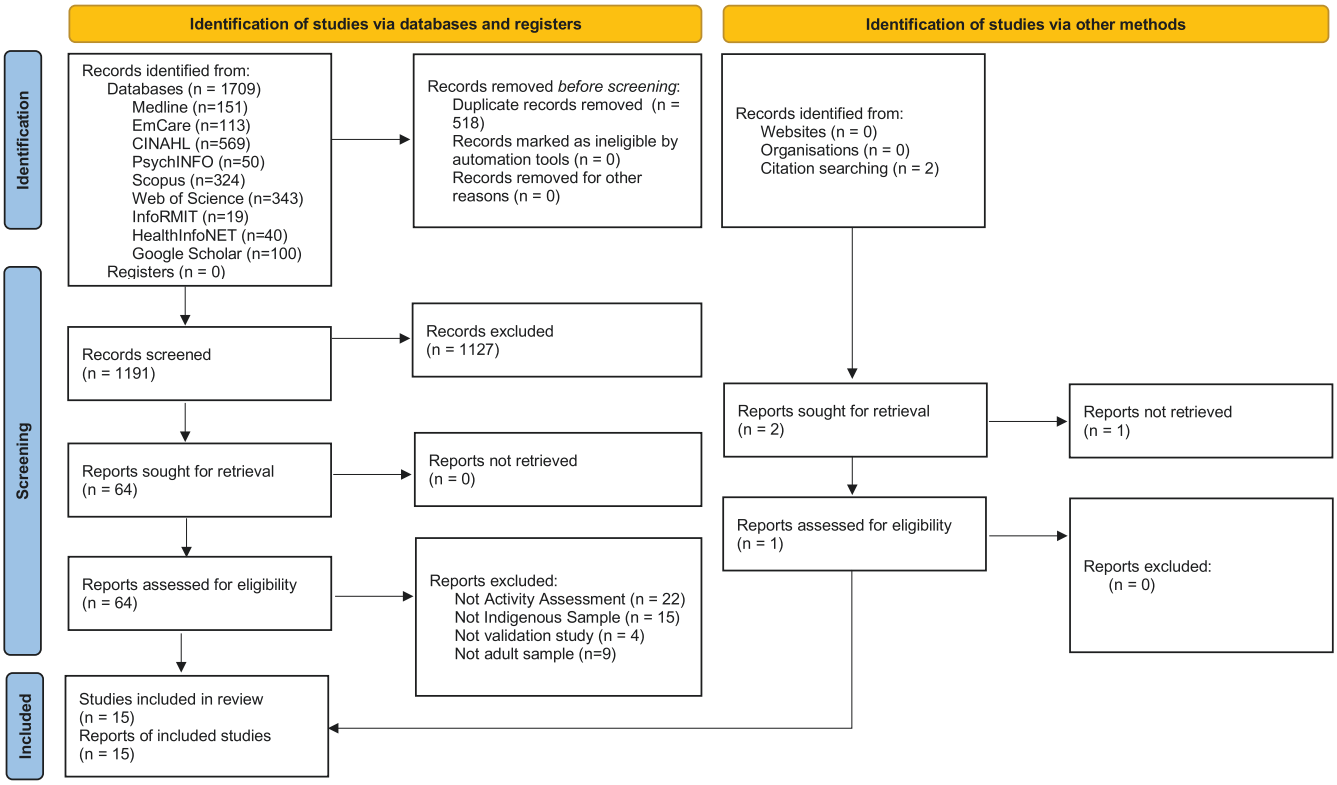

Figure 1. PRISMA flowchart of study selection.

(Table 3). Four studies used tools that exclusively assessed PA [1, 2, 7, 15], 10 studies assessed both PA and SB [3–6, 8–13] and 1 study exclusively assessed SB without PA [14]. The degree of assessment of SB varied from the inclusion of a single item about television viewing [9, 10], to a seven-item tool that exclusively assessed time spent in SB [14]. Seven tools assessed across thirteen studies captured activity behaviour frequency [1–8, 10–13, 15]. All the tools included questions on the duration of activity behaviour(n = 9) [1–15] and all but one captured activity behaviour intensity (n = 8) [1–13, 15]. The intensity was either used to categorize activities into levels for reporting [1, 2, 7–9, 11, 12, 15] or to quantify energy expenditure [3–6, 10, 13], most often utilizing metabolic equivalents from the *Compendium of Physical Activities* (Ainsworth et al. 2000).

Cultural relevance

Activities were reported in several overarching behavioural contexts: leisure time physical activity (LTPA), occupational, and domestic activities. Each of the nine individual tools captured LTPA, seven tools also captured occupational [1, 3–7, 9–15] and four captured domestic activities [1, 3–7, 11, 12, 15]. Less than half (n = 6) of the included studies reported the inclusion of culturally relevant activities in their tools. This included items such as berry picking, hunting, and fishing, however, was more often left unspecified [3–6, 11, 12]. Seven articles made recommendations for the inclusion of such cultural activities in future research [2, 4, 5, 9, 11, 12, 14].

Several studies reported on Indigenous meanings and concepts of PA that may influence tool validity. Sami participants in Norway did not define fishing, hunting, or berry picking as work-related or leisure-related activities compared to Norse participants [9], Inuit participants in the Arctic perceived the intensity of culturally relevant activities differently than objective measures [3] resulting in a notable deviation from validation trends reported in non-Indigenous samples. Furthermore, Dénommé [4] and Kriska [10] acknowledge the likelihood of PA misrepresentation for Inuit peoples in the Baffin region of Canada and Pima Indians in Arizona USA, in standard national PA measurement methods due to a lack of focus on occupational PA and culturally relevant activities as rationale for validation of alternate tools in their studies. Moy [11, 12] describes differing cultural and language interpretations of activity definitions such as resistance training and intensity levels among Native Hawaiians, Māori, and Pacific Islanders that were contrary to the intent of the questions on the IPAQ that required adaptation.

Tool administration

Four of the nine individual tools were interviewer administered [1, 3–5, 7, 8, 10–13] and five were self-administered [2, 6, 9, 14, 15]. No tools were administered electronically by computer or smart device. Measures to enhance understanding and suitability of the self-administered tools for the Indigenous population groups were reported in two studies [6, 9]. Esgin et al. (2021) reported that a researcher was required to assist with question clarification during data collection of the GPAQ, particularly with older participants. This was in addition to tool formatting modifications previously made based on community consultation prior to the validation. This was also the case in the study by Hermansen et al. (2002) where a trained nurse reviewed participant responses and corrected where necessary, despite the tool being translated into the local Sami language. Three studies did not report assisting participants with self-administered tool completion [2, 14, 15]. The study by Sushames et al. (2015)

Table 2. Study characteristics and participant demographics

Article ID	Reference	Study characteristics			
		Sample population	Age range (mean age m/f)[a]	Gender	Sample size
					n = (total *n*=), [% Indigenous])[b]
1	Brownson et al. 1999	Native American/Alaska Native, USA	40–70+ (n.r.[c])	Female	51 (199), [26%]
2	Cuaderes et al. 2004	Native American/Alaska Native, USA	n.r. (40/42)	All	483, [100%]
3	Dahl-Petersen et al. 2013	Inuit, Greenland	18–84 (43/45)	All	1508, [100%]
4	Dénommé 2006	Inuit, Canada	19–74 (45)	All	18, [100%]
5	Egeland et al. 2008	Cree, Canada	n. r. (38)	All	172, [100%]
6	Esgin et al. 2021	Aboriginal, Australia	18–71 (38)	All	129, [100%]
7	Evenson et al. 2003	Native American/Alaska Native, USA	20–50 (n.r.)	Female	30 (344), [9%]
8	Fahrenwald and Shangreaux 2006	Native American/Alaska Native, USA	19–40 (21)	Female	30, [100%]
9	Hermansen et al. 2002	Sami, Norway	20–62 (47)	All	1726 (9779), [18%]
10	Kriska et al. 1990	Native American/Alaska Native, USA	10–59 (n.r.)	All	69, [100%]
11	Moy et al. 2010	Pacific Islander / Native Hawaiian, USA	21–61 (40)	All	32, [100%]
12	Moy et al. 2008	Māori, New Zealand	19–86 (49)	All	121 (180), [65%]
13	Schulz et al. 1994	Native American/Alaska Native, USA	n.r. (31/35)	All	21, [100%]
14	Sushames et al. 2015	Aboriginal and Torres Strait Islander, Australia	n.r. (36)	All	61 (96), [64%]
15	Whitt et al. 2003	Native American/Alaska Native, USA	40–91 (54)	Female	129 (316), [41%]

[a]As reported in the published article, m = male, f = female.
[b]*n* = number of Indigenous participants in sample, (total sample size if multiethnic sample), [proportion of total sample that were Indigenous peoples].
[c]n.r., not reported in the included article.

reported that whilst there was similar participant adherence to the reference method accelerometer between Indigenous and non-Indigenous participants, there was a far lower completion rate of the self-administered tool among Indigenous participants (47%) than non-Indigenous participants (80%). Whitt et al. (2003) reported restricting participant eligibility during recruitment to those with competency to complete the detailed activity records in English and had a completion rate of 84%.

Validation methods and outcomes

Validation methods and outcomes of the included studies are outlined in Table 3. The most common form of validation assessed was concurrent validity (*n* = 9) [3–5, 8, 10, 12–15], followed by face validity/acceptability (*n* = 5) [6, 9, 10, 12, 14], and test–retest reliability (*n* = 5) [1, 2, 7, 8, 10].

Acceptability

The five studies that assessed acceptability all concluded that the tools utilized were acceptable to their study population and predominantly utilized three methods in determining acceptability. Two studies assessed acceptability with participant interviews [9, 11], three studies through anecdotal observations during the study or pre-piloting [6, 10, 14], and two studies considered study compliance [6, 14]. Four of the studies reported adjusting the tool to improve acceptability based on pilot testing or interviews [6, 10, 11, 14]. These included formatting adjustments, inclusion of culturally relevant activities, or re-wording due to differing cultural definitions and understandings of concepts. Two studies reported assessing content validity of the tool [3, 9]. The remaining nine studies did not report assessing acceptability or content validity of the tool [1, 2, 4, 5, 7, 8, 12, 13, 15]. Of these, two reported community consultation for tool adaptation prior to validation [4, 5], one study used a tool that had been assessed for acceptability within the same sample population group in a previous study [13] and four were multi-ethnic sample studies [1, 7, 12, 15] where it may have not been feasible to consult with all the sample sub-groups.

Reliability

The most common assessment of reliability was test–retest reliability in five studies [1, 2, 7, 8, 10]. Inter-rater reliability was also assessed in one study [10]. Four of the five studies that conducted test–retest reliability reported strong correlation statistics ($r > 0.6$) [2, 7, 8, 10]. Tools with lower numbers of items appeared to report stronger test–retest correlations although these findings relate to a small number of studies where there was insufficient power for statistical confirmation of this trend.

Concurrent validity

Eight of the nine articles that assessed concurrent validity reported a statistically significant correlation with a range of reference methods [3–5, 8, 10, 13–15]. Three articles classified the strength of concurrent validity: two reported a low or limited association with the reference method [12, 14], one reported a moderate association for energy expenditure, however, a weak association for duration of activity [3], and no study reported a strong correlation. When the reported correlation statistics are stratified using a standardized

Table 3. Self-report physical activity and sedentary behaviour tool characteristics with reported validation methods and outcomes for Indigenous populations

Reference [Article ID]	Tool characteristics						QAT score	Validation methods and reported outcomes					
										Correlative methods and findings			
	Tool[a]	Novelty[b]	Behaviour type[c]	Activity dimension[d]	Context[e]	Admin[f]		Acceptability	Content validity[g]	Test–retest reliability[h]	Inter-rater reliability	Concurrent validity[i]	Reference method[j]
Brownson et al. 1999 [1]	BRFSS	Existing	PA	Freq Dur Int	LTPA Occ Dom	Interviewer	0			Slight to moderate correlation k = 0.18–0.52			
Cuaderes et al. 2004 [2]	n.r.[k]	New	PA	Freq Dur Int	LTPA	Self	2			Strong correlation r = 0.94			
Dahl-Petersen et al. 2013 [3]	IPAQ-L	Existing-Adapted	PA SB	Freq Dur Int	LTPA Occ Dom Cul	Interviewer	5		Interviews with interviewers (n = 5)			n = 1508 PAEE: Moderate correlation for PAEE: r = 0.2–0.35 Weak correlation for PA duration: r = 0.11–0.31	ACC HRM
Dénommé 2006 [4]	IPAQ	Existing-Adapted	PA SB	Freq Dur Int	LTPA Occ Dom Cul	Interviewer	9					Significant correlation for women only P < 0.05	ACC Anthro: BMI Bio: Cholesterol
Egeland et al. 2008 [5]	IPAQ	Existing-Adapted	PA SB	Freq Dur Int	LTPA Occ Dom Cul	Interviewer	10					Significant inverse correlations: r = –0.19 to –0.26	Anthro: BMI % body fat
Esgin et al. 2021 [6]	GPAQ	Existing-Adapted	PA SB	Freq Dur Int	LTPA Occ Dom Cul	Self	12	Observation/ Anecdotal Study Completion Rate					
Evenson et al. 2003 [7]	BRFSS	Existing	PA	Freq Dur Int	LTPA Occ Dom	Interviewer	0			ICC = 0.69			
Fahrenwald and Shangreaux 2006 [8]	SEA	New	PA SB	Freq Dur Int	LTPA	Interviewer	5			High agreement r = 0.91		Significant correlation: r = 0.69–0.74 P < 0.01	7-day recall
Hermansen et al. 2002 [9]	Finnmark	Existing	PA SB	Dur Int	LTPA Occ	Self	1	Interviews: narrative synthesis	Interviews: narrative synthesis				

Table 3. Continued

Reference [Article ID]	Tool characteristics						QAT score	Validation methods and reported outcomes					
										Correlative methods and findings			
	Tool[a]	Novelty[b]	Behaviour type[c]	Activity dimension[d]	Context[e]	Admin[f]		Acceptability	Content validity[g]	Test–retest reliability[h]	Inter-rater reliability	Concurrent validity[i]	Reference method[j]
Kriska et al. 1990 [10]	Kriska	New	PA SB	Freq Dur Int	LTPA Occ	Interviewer	2	Clinic pilot: Anecdotal		High agreement r = 0.62–0.92	High agreement r = 0.78–0.94	Significant for total PA, but not at domain-level r = 0.53–0.66 P < 0.05	ACC
Moy et al. 2010 [11]	PIPAQ	Existing-Adapted	PA SB	Freq Dur Int	LTPA Occ Dom Cul	Interviewer	5	Interviews: consensus					
Moy et al. 2008 [12]	NZIPAQ	Existing-Adapted	PA SB	Freq Dur Int	LTPA Occ Dom Cul	Interviewer	11					Total PA had strong significant correlations for non-Indigenous sample but low correlation and not significant for Māori participants r = 0.15–0.22	HRM
Schulz et al. 1994 [13]	Kriska	Existing	PA SB	Freq Dur Int	LTPA Occ	Interviewer	7					Significant correlation men only P = 0.01	DLW
Sushames et al. 2015 [14]	PAST	Existing-Adapted	SB	Dur	LTPA Occ	Self	6	Pre-piloting: Anecdotal Study compliance				Limited but significant correlation r = 0.17 P < 0.001	ACC
Whitt et al. 2003 [15]	CDC	New	PA	Freq Dur Int	LTPA Occ Dom	Self	1					Significant association P < 0.0001	ACC/ Ped/Diary

[a]IPAQ, International Physical Activity Questionnaire; IPAQ-L, IPAQ Long; IPAQ-SF, IPAQ Short Form; NZIPAQ, New Zealand IPAQ; PIPAQ, Pacific Islander IPAQ; BRFSS, Behavioural Risk Factor Surveillance System; GPAQ, Global Physical Activity Questionnaire; PAST, Past Day Adults Sedentary Time; CDC, Centre for Disease Control; Finnmark, Tool from the Finnmark Study; Kriska, untitled tool developed by Kriska et al.; SEA, Stages of Exercise Adoption Tool.
[b]New, newly developed tool; Existing, pre-existing tool not modified or adapted for the study; Existing-Adapted, pre-existing tool adapted for use in the study.
[c]PA, physical activity; SB, sedentary behaviour.
[d]Freq, frequency; Dur, duration; Int, intensity.
[e]LTPA, leisure time physical activity; Occ, occupational activity; Dom, domestic activity; Cul, culturally relevant activity.
[f]Tool administration method. Interviewer, interviewer administered; Self, self-administered.
[g]n = number of participants, only stipulated when sub-samples performed different components of the study.
[h]r = correlation coefficient; k = kappa statistic; P = P-value; ICC = intra-class correlation coefficient.
[i]As reported in the respective article. Only correlation findings for the PA or SB components of the tools (if applicable) are included in the table. PAEE, Physical Activity Energy Expenditure.
[j]ACC, accelerometer; DLW, doubly labelled water; Anthro, anthropometry; HRM, heart rate monitor; Bio, biomarker.
[k]n.r., not reported.

interpretation of correlation coefficients (Dancey and Reidy 2008), one rated as a strong correlation [8], two rated as moderate correlation [3, 10], and three rated as weak [5, 12, 14]. The remaining articles did not report the correlation statistics rather, the *P*-value so were unable to be stratified by correlation strength.

Reference methods

The most common reference method (Table 3) used for concurrent validation was an accelerometer, which was used in five studies [3, 4, 10, 14, 15]. This was followed by heart rate monitors (HRM) [3, 12] and anthropometry [4, 5], used in two studies each, and activity recall [8] and doubly labelled water (DLW) [13] used in one study each. Of the accelerometer studies, all reported significant results [3, 10, 14, 15], however, two of these were for reportedly weak correlations [3, 14]. One study abandoned the planned accelerometer validation due to feasibility issues and instead assessed correlation with anthropometric measures [4]. The two studies that used anthropometry as a reference method for validation reported a significant inverse correlation [4, 5], whereby higher activity levels correlated with lower body mass indices (BMI) or body fat percentage. A similar trend was also reported by Hermansen et al. (2002) although not used to assess concurrent validity but rather face and content validity. Several studies reported that more detailed and theoretically robust reference methods were preferred by researchers for the assessment of concurrent validity but were determined to be unsuitable by participating communities. Reported reasons for this include cost and participant burden [3, 4, 11, 12], incompatibility of methods to culture, lifestyle, and weather conditions [3, 4, 10, 14], participant discomfort [11], and access to technology or researchers [8].

QAT

QAT scores of each study are outlined in Table 3 with trend analysis over time in Fig. 2. As there was a small number of articles from each region, it was not possible to analyse geographical trends in the QAT scores. Three articles were rated as high in quality and cultural appropriateness [5, 6, 11], 3 as moderate[4, 5, 14], and 10 as low [1–3, 7–10, 12, 13, 15]. The frequency of scores for each QAT item are outlined in Fig. 3. Six studies scored 'Yes' or 'Partially' to appropriately inclusive cultural consultation and engagement on the QAT [2, 4–6, 11, 14]. Studies commonly reported the research benefiting the Indigenous participants or community, demonstration of capacity strengthening for Indigenous peoples, and taking a strength-based approach (QAT Items 12, 10, and 13, respectively). No study reported the negotiation of research agreements that protected the intellectual or cultural property of communities (QAT Items 6 and 7). It was also uncommon for studies to report if the research had been guided by an Indigenous research paradigm (QAT Item 9) with this only occurring in two studies [6, 11]. There was a moderate significant correlation ($r = 0.54$) between QAT score and year of publication with scores increasing by ~0.28 points per year ($P = 0.0344$).

DISCUSSION

With the increasing prevalence of non-communicable chronic diseases among the world's Indigenous populations, comes a corresponding increase in the proportion of Indigenous peoples accessing health programs or clinical intervention to prevent, treat, and manage these conditions. Programs and strategies that target lifestyle determinants of health, such as PA and SB are common within Indigenous populations globally (Alston et al. 2016, Rice et al. 2016, Taafaki et al. 2023). Within an Indigenous health paradigm, PA holds significance as the means in which to interact and nurture ancestral lands and natural resources, it enables the custodianship and passing down of cultural knowledge and traditions to younger generations as well as the provision and sharing of foods for family and community. All these practices are interconnected and rely on each other to enable a life of balance that compounds the health benefit of any individual factor alone as defined by a holistic understanding of health.

These holistic understandings of health are exemplified within the included studies and are consistent with existing literature. For example, Hermansen et al., (2002), found that Sami participants in Norway did not define fishing, hunting, or berry picking as work-related or leisure-related activities compared to Norse participants [9], consistent with the review literature by Nelson et al. (2010) and Gray et al. (2013) which describes similar phenomena for Indigenous Australians. Dénommé (2006) and Kriska et al. (1990) acknowledge the likelihood of PA misrepresentation due to a lack of focus on occupational PA, described as being sometimes deprioritized among PA assessment methods due to reduction in occupational physicality among non-Indigenous sample populations and an associated generalization of this across other cultures and contexts. This aligns with similar findings by Hanshiro (2012) among Native Hawaiians and resulted in a more complex and inclusive definition of total PA being utilized within the study. Having access to tools that support the assessment of culturally relevant lifestyle behaviours that align with cultural understandings of PA is key to providing an accurate and reliable evaluation of overall health status, categorizing risk for non-communicable chronic disease, and determining the effectiveness and impact of health promotion programs on lifestyle behaviour and health outcomes. Correspondingly, the overarching aim of this review was to scope the international literature to identify self-report assessment tools that have been validated for assessing PA and/or SB with adult Indigenous populations.

Evidence from this review indicates that despite a growing number of studies validating PA assessment tools for use with Indigenous populations, most studies validated pre-existing tools, rather than tools that had been developed specifically for, or with, Indigenous populations where the tools will be used. This is consistent with the review findings of Johnson et al. (2024) who explored community-specific PA measures developed and used in research with and for Indigenous peoples living in Canada, Australia, and New Zealand, albeit not restricted to validated tools. Within the 23 quantitative methods included in their review, 15 were adaptations of existing tools. Despite the frequent utilization of pre-existing tools in this review, it was not common for studies to report conducting face or content validity of the tool prior to reliability or concurrent validity assessment. This was more apparent in the multi-ethnic studies where consultation may not have been feasible, however was still a notable trend. Two studies did report community consultation to adapt the tool prior to validation which may equivocate to content validity, although it was not expressly reported as such.

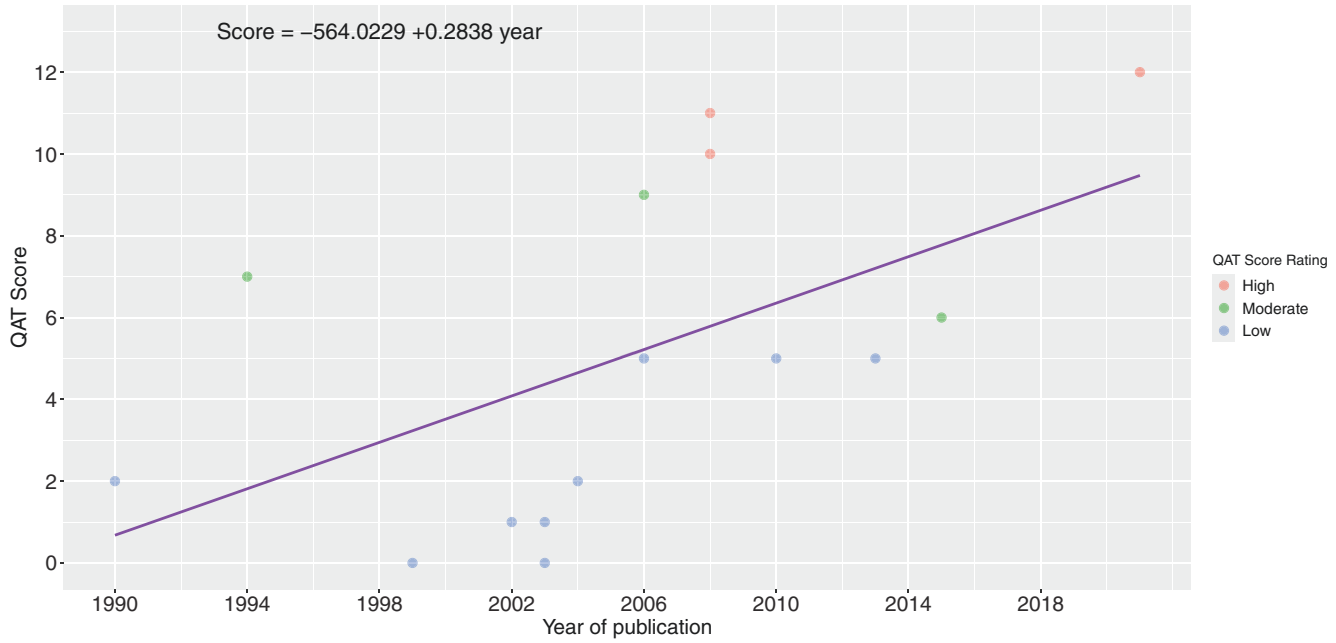

Figure 2. QAT results of included studies by year of publication, scatter plot with linear regression.

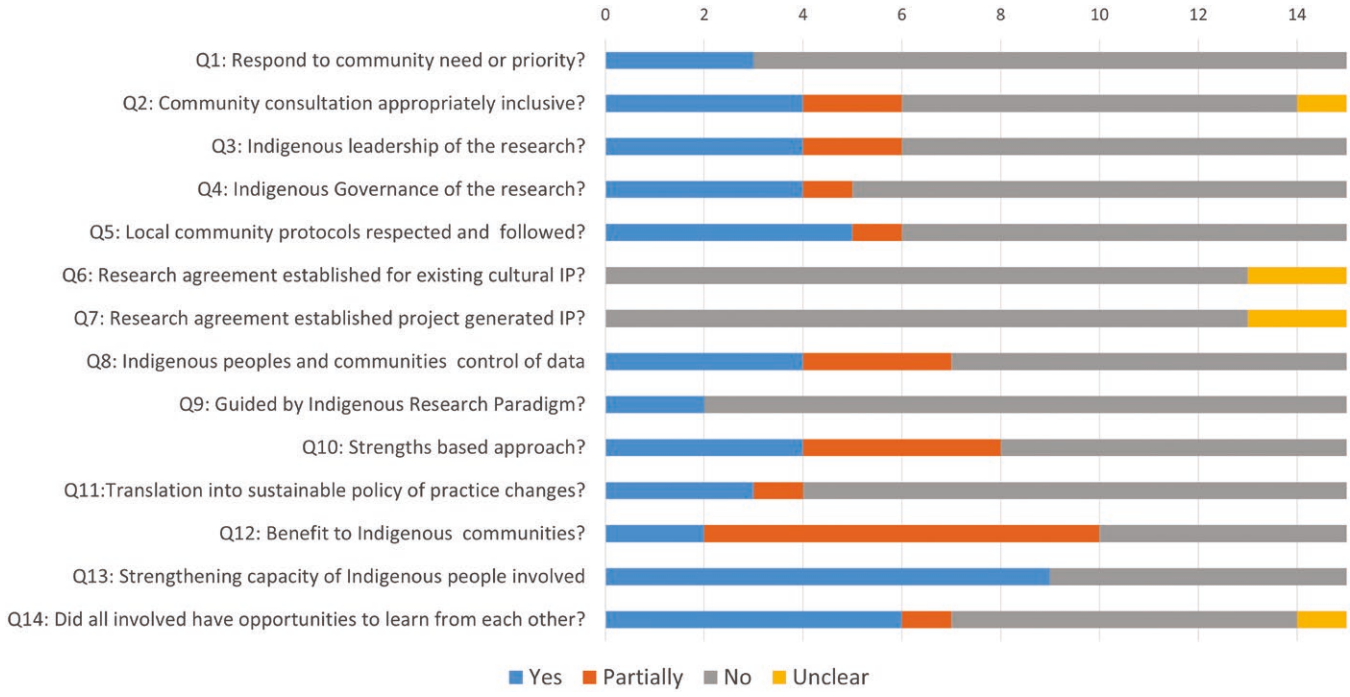

Figure 3. QAT score frequency by item*, stacked bar graph.

Tool features

More than half of the tools were self-administered [2, 6, 9, 14, 15]. Nonetheless, some studies validating self-administered tools required facilitator support during data collection, and thus were not strictly self-administered [2, 6, 9]. The remaining two studies either encountered issues with retention [14] or restricted participant eligibility based on literacy levels [15]. Many Indigenous languages are oral rather than written and it is not uncommon for Indigenous peoples to speak several languages, of which English (or other national languages internationally) may be third or fourth (UNESCO 2022). Historically, Indigenous peoples globally have had less access to formal education, however, rates of Indigenous peoples completing secondary and further education is increasing (Australian Institute of Health and Welfare and National Indigenous Australians Agency 2023). Therefore, a diverse range of literacy can be expected within Indigenous population groups. This has implications for questionnaire-based assessment and may partly explain the necessity of administrator involvement in many of the self-administered tools data collection phase. Questionnaire-based assessment tools are often deployed due to portability and cost, however,

these are not as pronounced if interviewers and interpreters are required for administration. Health promotion programs within Indigenous populations need to accommodate both language and literacy diversity to ensure accessibility and efficacy for their participants. Therefore, having tools that have been validated with diverse language abilities is an important consideration. Given that many of the self-administered tools in the included studies required administrator involvement or encountered issues with retention or restricted eligibility criteria, the applicability of self-administered tools without measures in place to reduce accessibility barriers within Indigenous population groups appears less appropriate than interviewer-administered formats and may conflate validation findings in some Indigenous population groups.

The IPAQ was the most frequently validated tool among global Indigenous populations. The IPAQ was developed by the World Health Organisation (WHO) in 1996 and has subsequently been validated in 12 different population groups (Craig et al. 2003). The IPAQ provides procedural instructions for cultural adaption (IPAQ 2022), which likely explains its popularity. This tool was successfully validated with the Indigenous peoples of Canada [4, 5] and Greenlandic Inuit [3]. As outlined in the results above, several of the included studies made reference to a previous attempt to validate the IPAQ for use within an Aboriginal population in Australia that was reportedly abandoned due to issues with feasibility and acceptability [4–6]. The Global Physical Activity Questionnaire (GPAQ) is a 16-item interviewer-administered questionnaire that was developed on the foundation of the IPAQ-LF and -SF, in response to such issues. The GPAQ was initially validated among nine developing nations and has subsequently been further validated in other population groups (Keating et al. 2019). However, the GPAQ had not been formally validated in any Indigenous population groups prior to the study by Esgin et al. (2021) included in this review, which was conducted with an Aboriginal community in Australia. This suggests that despite some commonalities such as traditional subsistence lifestyles and modern health experiences between global Indigenous population groups, standardized PA tools such as the IPAQ, are not necessarily generalizable across Indigenous populations globally. Therefore, a one-size-fits-all approach to activity assessment within Indigenous populations cannot be assumed and pre-existing tools should, at a minimum, be modified and validated with Indigenous populations, prior to use.

Validation methods

Findings from this review suggest that while there was some repetition in the tools being validated, there were few discernible trends that emerged regarding validation methodology. Wide variation in methods applied was apparent, even between studies validating the same tool. Concurrent validity studies that reported a significant correlation utilized a broad range of both objective and subjective reference methods. It was also common among the included studies to have diverged from the researchers preferred validation reference method due to barriers with acceptability and applicability for the Indigenous populations within the studies. DLW is an established gold-standard reference method for assessing energy expenditure (Cambridge Biomedical Research Centre 2023), however, was ultimately employed within just one study [13]. Similarly, Dénommé (2006) attempted to validate the most frequently assessed tool, the adapted IPAQ, for Inuit in Canada against accelerometer data but was ultimately unable to due to several practical issues. Instead, correlation with other health markers including anthropometry was used as an alternative validation reference method. Anthropometric measures such as BMI, cannot discern an individual's energy expenditure, type, or intensity of physical and SBs, therefore its place as a concurrent validity reference method is debatable (Cambridge Biomedical Research Centre 2023). Moreover, BMI was developed on a predominantly Anglo-Saxon population and therefore may not be as relevant for use among Indigenous population groups (Eknoyan 2008). The suitability of other commonly utilized reference methods to Indigenous population groups is also worth considering. Diaries and other recall methods (7-day, 24-hour) are established subjective PA methods however are noted to have high participant burden and literacy requirements (Cambridge Biomedical Research Centre 2023), which may introduce further risk of reporting bias for Indigenous populations above baseline.

Despite feasibility issues being commonly reported with these reference methods for Indigenous populations and the potential impact to study outcomes, this was raised as a limitation in only one study [3]. Consideration of this in tandem with concerns about the data accuracy and reliability of self-report measures more broadly likely explains the lack of discernible trends between study outcomes, with wide-ranging results reported even between studies assessing the same tool. These findings highlight an issue that researchers often face negotiating between established research methods for scientific inquiry and what is culturally and contextually appropriate for Indigenous communities. The impact of weighing these considerations is evident in the wide variations in study methodology deployed amongst the included studies and signifies a more bespoke approach than what may be expected in research among non-Indigenous population groups. Furthermore, validation of PA and SB assessment tools against established Indigenous research methods such as yarning approaches, have not yet been assessed in the published literature and are therefore unable to be included in this review. However, these methods have been recommended in published literature in similar fields such as dietary assessment (Davies et al. 2023). Consequently, exploring the potential for these methods in PA/SB tool validation, as well as developing purpose-built instruments and co-designed projects may be beneficial. The inclusion of content validation among both academic experts and local Indigenous community members, ensuring alignment with community-specific definitions and understandings of PA and SBs, may also help to prevent potential redundancy of project methods.

QAT

The secondary aim of this review was to evaluate the quality of the studies in applying culturally appropriate research methods. Adherence to gold-standard Indigenous research principles within the field of PA and SB assessment tool validation has moderately increased over the last 30 years. This finding clearly illustrates the impact of modern trends to enshrine Indigenous research principles into formal research methodology guidelines, as has gained substantial momentum over the last two decades (National Health and Medical Research Council (Australia), 2022; Lowitja Institute 2024; Social Sciences and Humanities Research Council (Canada), 2024). Despite this, the QAT item, being guided by an Indigenous research paradigm, was one of the least commonly reported domains among the included studies, along with

formalizing Intellectual and Cultural Property (IP, CP) agreements between researchers and Indigenous communities. This is consistent with the findings by Johnson et al. (2024) who reported high rates of population-specific tool adaptation but low rates of studies partnering with Indigenous communities for the tool development. It is also unknown how much of this trend towards increasing adherence to gold standard Indigenous research principles is attributable to actual change in methodology or to increased reporting of these factors over time due to the evolution of expectations for journal publications within the field of Indigenous research.

Technological advancements

Technological advancement and the increasing uptake of smart devices within Indigenous population groups (Dyson et al. 2015) have seen the emergence of digital health assessment tools (e-tools) in other disciplines such as dietary assessment (Ashman et al. 2017, Tonkin et al. 2018). Contrary to expectation, there were no validation studies of self-report PA or SB assessment e-tools in the global evidence base. The nature of e-tools means that presentation and user interaction may vary significantly from traditional paper-based or interviewer-administered tools, and thus may perform differently in validation studies. There is potential for digital tool interfaces to address some of the issues commonly encountered with questionnaire-based PA and SB assessment tools in Indigenous population groups such as the applicability of self-administered and written tools among predominately oral-based language groups. These include the ability to incorporate oral pre-recorded question administration, and visual or video question prompts, without the need for in-person administrator involvement as was required in some of the included studies. The consequence of this is two-fold: (i) it is currently unknown how PA or SB assessment e-tools perform among Indigenous populations, and (ii) the findings of this review are not directly generalizable to PA assessment e-tools. Rather, these findings highlight the opportunities digital tool formats provide to address long-standing limitations and barriers of self-report tools through design features that are unique to digital tools. Such features may include the ability to utilize audio, video, and interactive pictorial question formats, and skip logic whilst minimizing participant and administrator calculation burden (Evans and Mathur 2018). Condensing long format tools using skip and display logic to present only the relevant questions may address the potential concerns about long format tools having poorer reliability than shorter format tools. Despite the potential opportunities for digital tools, there remain contextual considerations that may also affect feasibility such as network signal coverage and data availability, particularly in geographically remote locations.

Strengths and limitations

This is the first review to explore self-report PA and SB assessment tools that have undergone formal validation among Indigenous adult populations globally. An Aboriginal researcher and lead author's PhD supervisor (V.W.) contributed to this review and an Aboriginal and Torres Strait Islander-specific appraisal tool adapted for global Indigenous populations was used to ensure the integration of Indigenous perspectives and worldviews. Nonetheless, there are limitations to this review. Searches were not restricted to English however, only English terms were included in the search query, therefore only articles mapped to English terms would have been retrieved, regardless of the primary published language. The authors recognize that the QAT was developed for research concerning Aboriginal and Torres Strait Islander peoples within Australia and this may affect cross-cultural reliability. However, Aboriginal and Torres Strait Islander population groups are also diverse and unique, despite some commonalities and gold-standard Indigenous research principles uphold many similar core constructs worldwide (Putt 2013). Therefore, the QAT may be useful to assess these constructs across other Indigenous populations in the absence of another suitable tool that explores these concepts. The QAT was published in 2018 and therefore may unintentionally benefit more recently published articles who may have accessed the QAT to guide article drafting compared to earlier articles. Despite this, the QAT scores still provide a meaningful appraisal of the methodology of the included articles in this review. Additionally, the findings of this review should be considered with an understanding that Indigenous populations are not homogenous, and each has distinct cultural, language, and geographic characteristics that may impact the applicability of the review findings across Indigenous population groups. Therefore, additional validation may be required to ensure applicability within relevant local contexts. Nevertheless, the findings of this review serve to highlight important considerations for PA and SB assessment in Indigenous populations.

Implications for practice

The findings of this review highlight the diversity of Indigenous peoples worldwide and that despite some shared history in the onset, history, and health consequences of western colonization this does not translate to the ability to generalize or translate PA and SB assessment methods cross-culturally. Therefore, to avoid misplacement of resources and ensure the benefit and efficacy of future research and health promotion evaluation, meaningful co-production and Indigenous-led initiatives are recommended. Ensuring meaningful co-production requires adequate investment. Investment of funding, time, and attention. Local Indigenous governance is recommended throughout the project life course as well as engagement with community members as co-researchers throughout conception, project, and resource design phases, and to ensure cultural safety throughout data collection. This includes but is not limited to incorporating Indigenous research methods such as yarning approaches to the content creation phases and cultural competency upskilling of relevant team members.

CONCLUSION

Self-report PA and SB assessment tools commonly used to evaluate health promotion initiatives have achieved varying levels of validity amongst adult Indigenous populations globally. Validation studies for self-report digital PA and SB assessment tools (e-tools) have not yet been validated within Indigenous adult populations and constitute an apparent gap in the literature.

There are no clearly defined trends of validation study methodology for self-report PA assessment tools in adult Indigenous populations, signifying a more bespoke approach. Methods established in other population groups are commonly found to be inappropriate among

Indigenous populations. Meaningful consultation and project co-production may help to prevent the potential redundancy of pre-planned methods when developing and validating PA assessment tools with Indigenous populations globally and enhance the acceptability and accuracy of PA and SB assessment tools. It may also benefit tool efficacy and validity to incorporate content validity assessment with Indigenous community members to ensure community-specific understandings of PA and SBs are reflected. Thereby improving the efficacy and ensuring equitable performance of assessment methods that are commonly utilized in health promotion programs for global Indigenous populations.

Supplementary data

Supplementary data is available at *Health Promotion International* online.

Acknowledgements

The authors acknowledge the Aboriginal and Torres Strait Islander peoples as the traditional custodians on the lands where this review was conducted and extends that acknowledgement to all Indigenous participants and researchers who contributed to the studies included in the review. The authors acknowledge University Information Specialists Stephen Anderson (S.A.) and Janet Catterall (J.C.) for their contributions to the search strategy design.

No funding directly supported this review, however, the lead author acknowledges the financial contributions and support of CSIRO, James Cook University Doctoral Cohort Program, and the JCU RTP Scholarship for the authors PhD as a whole.

Author contributions

All authors contributed to the concept and design of the review, critically reviewed, and provided final approval of the manuscript; and agree to be accountable to the work submitted. M.K. led the review design and drafted the protocol with significant input from Y.H.-T. M.K. and Y.H.-T. undertook the screening with input from the third reviewer D.L., M.K., and Y.H.-T. completed the data extraction process. V.W. oversaw the QAT appraisal process with M.K. and provided Indigenous Research methods expertise to the entirety of the review. M.K. authored the methods and analysed the data with guidance from all authors. M.K. and Y.H.-T. authored the background, results, and discussion with substantial review contributions from V.W., S.G.R., R.Q., E.S., and R.E.

Conflict of interest

None declared.

Funding

Whilst no funding was sought directly for this review, the lead author recognizes the financial support of the James Cook University RTP Scholarship, and CSIRO PhD Top-up scholarship.

Data availability

All data are incorporated into the article and its online supplementary material.

Ethical approval

Ethical approval was not sought for this scoping review as it solely utilizes previously published sources.

REFERENCES

Ainsworth BE, Haskell WL, Whitt MC *et al*. Compendium of physical activities: an update of activity codes and MET intensities. *Med Sci Sports Exerc* 2000;**32**:S498–516.

Alston LV, Peterson KL, Jacobs JP *et al*. A systematic review of published interventions for primary and secondary prevention of ischaemic heart disease (IHD) in rural populations of Australia. *BMC Public Health* 2016;**16**:895. https://doi.org/10.1186/s12889-016-3548-1

Armitage, A. *Comparing the Policy of Aboriginal Assimilation: Australia, Canada, and New Zealand*. Vancouver, BC: UBC Press, 1995.

Ashman AM, Collins CE, Brown LJ *et al*. Validation of a smartphone image-based dietary assessment method for pregnant women. *Nutrients* 2017;**9**:73. https://doi.org/10.3390/nu9010073

Australian Bureau of Statistics. *National Aboriginal and Torres Strait Islander Health Survey, 2018-19*. Canberra: ABS, 2019.

Australian Institute of Health and Welfare. *Risk Factors Contributing to Chronic Disease*. Canberra: AIHW, 2012.

Australian Institute of Health and Welfare. *Chronic Disease*. 2023a. https://www.aihw.gov.au/reports-data/health-conditions-disability-deaths/chronic-disease/overview (23 February 2023, date last accessed).

Australian Institute of Health and Welfare. *First Nations People*. 2023b. https://www.aihw.gov.au/reports-data/population-groups/indigenous-australians/overview (2 October 2024, date last accessed).

Australian Institute of Health and Welfare and National Indigenous Australians Agency. *Measure 2.05 Education Outcomes for Young People, Aboriginal and Torres Strait Islander Health Performance Framework Website*. Canberra: AIHW & NIAA, 2023.

Brownson RC, Eyler AA, King AC *et al*. Reliability of information on physical activity and other chronic disease risk factors among US women aged 40 years or older. *Am J Epidemiol* 1999;**149**:379–91. https://doi.org/10.1093/oxfordjournals.aje.a009824

Cambridge Biomedical Research Centre. DAPA measurement toolkit. *Physical Activity Assessment: Decision Matrix*, 2023. https://www.measurement-toolkit.org/physical-decision-matrix (2 October 2024, date last accessed).

Christidis R, Lock M, Walker T *et al*. Concerns and priorities of Aboriginal and Torres Strait Islander peoples regarding food and nutrition: a systematic review of qualitative evidence. *Int J Equity Health* 2021;**20**:220. https://doi.org/10.1186/s12939-021-01551-x

Craig CL, Marshall AL, Sjöström M *et al*. International Physical Activity Questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc* 2003;**35**:1381–95. https://doi.org/10.1249/01.MSS.0000078924.61453.FB

Cuaderes ET, Parker D, Burgin CE. Leisure time physical activity in adult Native Americans. *South Online J Nurs Res* 2004;**5**:18.

Cunningham C, Stanley F. Indigenous by definition, experience, or world view. *BMJ* 2003;**327**:403–4. https://doi.org/10.1136/bmj.327.7412.403

Dahl-Petersen IK, Hansen AW, Bjerregaard P *et al*. Validity of the international physical activity questionnaire in the arctic. *Med Sci Sports Exerc* 2013;**45**:728–36.

Dahlberg EE, Hamilton SJ, Hamid F *et al*. Indigenous Australians perceptions' of physical activity: a qualitative systematic review. *Int J Environ Res Public Health* 2018;**15**:1492. https://doi.org/10.3390/ijerph15071492

Dancey C, Reidy J. (2008). *Statistics Without Maths for Psychology: Using SPSS for Windows*. Prentice Hall International (UK) Ltd.

Davies A, Coombes J, Wallace J *et al*. Yarning about diet: the applicability of dietary assessment methods in Aboriginal and Torres Strait Islander Australians—a scoping review. *Nutrients* 2023;**15**:787. https://doi.org/10.3390/nu15030787

Dénommé, D. *Physical activity validation pilot project in Inuit of the Baffin region*. Master of Science, McGill University, 2006.

Department of Economic and Social Affairs: Indigenous Peoples. *Indigenous Peoples Health*. 2024. https://www.un.org/development/desa/indigenouspeoples/mandated-areas1/health.html (2 October 2024, date last accessed).

Dyson LE. Framing the indigenous mobile revolution. In: Dyson LE, Grant S, Hendriks M (eds.), *Indigenous People and Mobile Technologies*. Milton, UK: Taylor & Francis Group, 2015. p. 13–31.

Eknoyan G. Adolphe Quetelet (1796–1874)—the average man and indices of obesity. *Nephrol Dial Transplant* 2008;**23**:47–51.

Egeland GM, Dénommé D, Lejeune P *et al*. Concurrent validity of the International Physical Activity Questionnaire (IPAQ) in an liyiyiu Aschii (Cree) community. *Can J Public Health* 2008;**99**:307–10.

Esgin T, Hersh D, Rowley K *et al*. Physical activity and self-reported metabolic syndrome risk factors in the Aboriginal population in Perth, Australia, measured using an adaptation of the Global Physical Activity Questionnaire (GPAQ). *Int J Environ Res Public Health* 2021;**18**:13.

Evans JR, Mathur A. The value of online surveys: a look back and a look ahead. *Int Res* 2018;**28**:854–87. https://doi.org/10.1108/intr-03-2018-0089

Evenson KR, Eyler AA, Wilcox S *et al*. Test-retest reliability of a questionnaire on physical activity and its correlates among women from diverse racial and ethnic groups. *Am J Prev Med* 2003;**25**:15–22. https://doi.org/10.1016/s0749-3797(03)00160-0

Fahrenwald NL, Shangreaux P. Physical activity behavior of American Indian mothers. *Orthop Nurs* 2006;**25**:22–29. https://doi.org/10.1097/00006416-200601000-00007

Flood V, Gwynn J, Gifford J *et al*. (2016). *Evidence on Existing, Validated Short-Form Survey Instruments for Children's Diet, Physical Activity, and Sedentary Behaviour: An Evidence Check Review*. Sydney, AU: Sax Institute for the NSW Ministry of Health.

Friedman CP, Wyatt JC, Ash JS. Measurement fundamentals: reliability and validity. In: *Evaluation Methods in Biomedical and Health Informatics*. Cham: Springer International Publishing, 2022, 129–54.

Goettke E, Reynolds J. 'It's all interconnected... like a spider web': a qualitative study of the meanings of food and healthy eating in an Indigenous community. *Int J Circumpolar Health* 2019;**78**:1648969. https://doi.org/10.1080/22423982.2019.1648969

Gracey M, King M. Indigenous health part 1: determinants and disease patterns. *Lancet* 2009;**374**:65–75. https://doi.org/10.1016/s0140-6736(09)60914-4

Gray C, Macniven R, Thomson N. Review of physical activity among Indigenous people. *Austr Indig Health Bull* 2013;**13**:1–15.

Hanashiro VL. *The perception of physical activity and social support for physical activity among native Hawaiians 55 years and older*, ProQuest Dissertations & Theses, 2012.

Harfield S, Pearson O, Morey K *et al*. *The Aboriginal and Torres Strait Islander Quality Appraisal Tool: Companion Document*. Adelaide, Australia: South Australian Health and Medical Research Institute, 2018.

Harfield S, Pearson O, Morey K *et al*. Assessing the quality of health research from an Indigenous perspective: the Aboriginal and Torres Strait Islander quality appraisal tool. *BMC Med Res Methodol* 2020;**20**.

Hermansen R, Njolstad I, Fonnebo V. Physical activity according to ethnic origin in Finnmark county, Norway. The Finnmark Study. *Int J Circumpolar Health* 2002;**61**:189–200. https://doi.org/10.3402/ijch.v61i3.17452

IPAQ. *IPAQ - Adapt*. 2022. https://sites.google.com/view/ipaq/adapt (14 September 2024, date last accessed).

Aromataris E, Munn Z (eds.), *JBI Manual for Evidence Synthesis*. Joanna Briggs Institute, 2020. Available from: https://synthesismanual.jbi.global

Johannes RE, Macfarlane JW. *Traditional Fishing in the Torres Strait Islands*. Hobart: TAS, CSIRO. Division of Fisheries, 1991.

Johnson SR, Chilibeck P, Oosman SN *et al*. A scoping review of Indigenous community-specific physical activity measures developed with and for Indigenous Peoples in Canada, Australia, and New Zealand. *Appl Physiol Nutr Metab* 2024;**49**:599–613. https://doi.org/10.1139/apnm-2023-0380

Keating XD, Zhou K, Liu X *et al*. Reliability and concurrent validity of Global Physical Activity Questionnaire (GPAQ): a systematic review. *Int J Environ Res Public Health* 2019;**16**:4128. https://doi.org/10.3390/ijerph16214128

Kokenge MC, Ruppar TM, Buchholz S. Physical activity interventions among American Indian and Alaska Native Persons: a systematic review. *Am J Health Promot* 2022;**36**:1350–70. https://doi.org/10.1177/08901171221097687

Kriska AM, Knowler WC, LaPorte RE *et al*. Development of questionnaire to examine relationship of physical activity and diabetes in Pima Indians. *Diabetes Care* 1990;**13**:401–11. https://doi.org/10.2337/diacare.13.4.401

Lowitja Institute. *About Us*. 2024. https://www.lowitja.org.au/about-us/ (9 July 2024, date last accessed).

Moy KL, Sallis JF, Tanjasiri SP. Culturally-specific physical activity measures for Native Hawaiian and Pacific Islanders. *Hawaii Med J* 2010;**69**:21–4.

Moy KL, Scragg RK, McLean G *et al*. The New Zealand Physical Activity Questionnaires: validation by heart-rate monitoring in a multiethnic population. *J Phys Act Health* 2008;**5**:S45–61. https://doi.org/10.1123/jpah.5.s1.s45

National Health and Medical Research Council (Australia). *Ethical Guidelines for Research with Aboriginal and Torres Strait Islander Peoples*. 2022. https://www.nhmrc.gov.au/research-policy/ethics/ethical-guidelines-research-aboriginal-and-torres-strait-islander-peoples (9 July 2024, date last accessed).

Nelson A, Abbott R, Macdonald D. Indigenous Australians and Physical Activity: using a social-ecological model to review the literature. *Health Educ Res* 2010;**25**:498–509. https://doi.org/10.1093/her/cyq025

New Zealand Ministry of Health Manatu Hauora. *Annual Update of Key Results 2022/23: New Zealand Health Survey*. New Villarroel et al., 2020; New Zealand Ministry of Health Manatu Hauora, 2023 Zealand Ministry of Health Manatu Hauora, 2023. Accessed from: https://minhealthnz.shinyapps.io/nz-health-survey-2022-23-annual-data-explorer/

Pedersen M, Harris KJ, Brown B *et al*. A systematic review of interventions to increase physical activity among American Indian and Alaska Native older adults. *Gerontologist* 2022;**62**:e328–39. https://doi.org/10.1093/geront/gnab020

Prioreschi A, Micklesfield LK. A scoping review examining physical activity measurement and levels in the first 2 years of life. *Child Care Health Dev* 2016;**42**:775–83. https://doi.org/10.1111/cch.12382

Putt J. *Conducting Research with Indigenous People and Communities*. Sydney, AU: Indigenous Justice Clearinghouse, 2013.

Rice K, Te Hiwi B, Zwarenstein M *et al*. Best practices for the prevention and management of diabetes and obesity-related chronic disease among Indigenous peoples in Canada: a review. *Can J Diabetes* 2016;**40**:216–25.

Ride K, Burns J. *Summary of Nutrition among Aboriginal and Torres Strait Islander People*. Drew, N., Mount Lawley, AU, Australian Indigenous HealthInfoNet, 2020. Accessed from: https://healthinfonet.ecu.edu.au/nutrition

Schraer C. Chapter 6. Diabetes among the Alaska Natives – the emergence of a chronic disease with changing life-styles. In: R. J. Jennie

and S. Y. Robert (eds.), *Diabetes as a Disease of Civilization*. Berlin, Boston, De Gruyter Mouton, 1994, 169–94.

Schulz LO, Harper IT, Smith CJ *et al*. Energy Intake and physical activity in Pima Indians: comparison with energy expenditure measured by doubly-labeled water. *Obes Res* 1994;**2**:541–8. https://doi.org/10.1002/j.1550-8528.1994.tb00103.x

Shephard RJ, Rode A. The circumpolar habitat and its peoples: traditional lifestyle and early research findings. In: R. J. Shephard and A. Rode (eds.), *Peoples the Health Consequences of 'Modernisation': Evidence from Circumpolar*. Cambridge: Cambridge University Press, 1996, 1–42.

Smith LT. *Decolonising Methodologies* [Third Ed.]. London, England: Bloomsbury Academic. 2021.

Social Sciences and Humanities Research Council (Canada). *Indigenous Research*. 2024. https://www.sshrc-crsh.gc.ca/society-societe/community-communite/indigenous_research-recherche_autochtone/index-eng.aspx (24 September 2024, date last accessed).

Sushames A, Edwards AM, Mein J *et al*. Utility of field-based techniques to assess Indigenous Australians' functional fitness and sedentary time. *Public Health* 2015;**129**:1656–61. https://doi.org/10.1016/j.puhe.2015.07.024

Sushames A, van Uffelen JGZ, Gebel K. Do physical activity interventions in Indigenous people in Australia and New Zealand improve activity levels and health outcomes? A systematic review. *Int J Behav Nutr Phys Act* 2016;**13**:129.

Taafaki MR, Taira D, Braun KL. Scoping review of interventional studies in chronic disease for Native Hawaiian, Pacific Islander, and Filipino Populations in the United States. *Hawaii J Health Soc Welf* 2023;**82**:58–66.

Thompson SL, Chenhall RD, Brimblecombe JK. Indigenous perspectives on active living in remote Australia: a qualitative exploration of the socio-cultural link between health, the environment and economics. *BMC Public Health* 2013;**13**:473. https://doi.org/10.1186/1471-2458-13-473

Tonkin E, Kennedy D, Golley R *et al*. The relative validity of the Menzies Remote Short-Item Dietary Assessment Tool (MRSDAT) in Aboriginal Australian children Aged 6-36 months. *Nutrients* 2018;**10**:590. https://doi.org/10.3390/nu10050590

UNESCO. *State of the Art of Indigenous Languages in Research: A Collection of Selected Research Papers*. Paris, FR: UNESCO, 2022.

Villarroel MA, Clarke TC, Norris T. *Health of American Indian and Alaska Native Adults, by Urbanization Level: United States, 2014–2018*. CDC/National Centre for Health Statistics, U.S. Department of Health and Human Services. NCHS Data Brief No. 372, 2020.

Whitt MC, Levin S, Ainsworth AE *et al*. Observations from the CDC. Evaluation of a two-part survey item to assess moderate physical activity: the Cross-Cultural Activity Participation Study. *J Women Health (Larchmt)* 2003;**12**:203–12.

World Health Organisation. *Global Plan of Action for the Health of Indigenous Peoples*. 2024. https://www.who.int/initiatives/global-plan-of-action-for-health-of-indigenous-peoples (19 December 2024, date last accessed).