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The association between cultural connectedness and health-related quality of life among Indigenous peoples in the CANZUS countries: a systematic review

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Abstract

Background Cultural connectedness–the extent to which individuals feel connected to their culture through practices, language, traditions, and identity– is increasingly recognized as a key determinant of health among Indigenous peoples across the life course. High levels of cultural connectedness have been associated with improved health-related quality of life (HRQoL). Although several studies have examined this relationship, the evidence has not yet been comprehensively synthesized.

Methods A comprehensive search of six databases was conducted from database inception to June 2024. Searches were updated up to September 2025 to identify observational studies examining associations between cultural connectedness and HRQoL, mental health, or physical health among Indigenous populations in Australia, Canada, Aotearoa New Zealand, and the United States. Two independent reviewers conducted screening, data extraction and risk of bias assessment. Risk of bias was assessed using the Newcastle-Ottawa Scale for cohort studies and its adapted version for cross-sectional studies. Effect direction plots and vote counting were used for synthesis.

Results From 7,444, records, 12 studies met the inclusion criteria (Canada $n=3$; Australia $n=1$; Aotearoa New Zealand $n=3$; United States $n=5$). Studies examined HRQoL ($n=2$), mental health/well-being ($n=9$) and physical health ($n=4$), and included infants ($n=1$), youth ($n=2$), adults ($n=7$), and Elders ($n=2$). For HRQoL, one study reported a positive association with cultural connectedness and one reported no evidence of association. For mental health-well-being, three studies reported positive associations and six reported no evidence of association. For physical health, three studies reported positive associations and one reported no evidence of association.

Conclusions Across countries with similar histories of colonialism, evidence suggests that cultural connectedness may be associated with better physical health and, for some Indigenous populations, better mental health/well-being. Evidence for mental health/well-being and HRQoL remains less consistent across studies. Further research using culturally grounded measures and rigorous designs is needed to strengthen the evidence base and inform culturally responsive policies and programs that support Indigenous health and well-being across the life course.

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Keywords Cultural connectedness, Indigenous peoples, Quality of life, Health status, Life cycle stages, Systematic review

Background

Canada, Australia, Aotearoa New Zealand, and the United States, also referred to as the CANZUS countries, share a history of colonization that has contributed to enduring health and social inequities among their Indigenous Peoples [1]. Among these inequities are marked disparities in health related quality of life (HRQoL) [2, 3], defined as an individual's perceived mental, physical and social well-being [4].

Although HRQoL is a widely used construct in public health research, it is largely grounded in Western biomedical conceptions of health and may not fully capture Indigenous worldviews. For many Indigenous Peoples, well-being is understood as holistic, collective, and spiritual, encompassing relationships with family, community, land, and ancestors [5]. While existing measures of HRQoL provide important insights into inequities, they capture only part of Indigenous perspectives on health.

Colonialism is recognized as a structural social determinant of health for Indigenous Peoples, manifesting through displacement from traditional lands, residential schools, and the imposition of European cultural, religious, and political systems. These colonial processes disrupted Indigenous social structures and marginalized cultures, languages, and ways of life [6]. In this context, cultural connectedness –the engagement and participation in cultural practices, traditions, and identities– [7], has emerged as a critical protective factor for health and well-being [8]. Cultural connectedness may involve participation in ceremonies and dances, land-based activities such as hunting and fishing, creation of traditional arts, consumption of traditional foods, and preservation of Indigenous languages and knowledge systems [8, 9].

Recognizing culture as a determinant of health has led to a growing emphasis on strength-based approaches in Indigenous health research [10]. In recent years, numerous individual studies have explored associations between cultural connectedness and outcomes such as HRQoL, mental health, and broader measures of well-being. Previous systematic reviews have examined HRQoL of Indigenous populations globally [11], and the association between cultural engagement and psychological well-being among Indigenous youth [12], no comprehensive synthesis of the literature to date has specifically focused on the association between cultural connectedness and HRQoL among Indigenous Peoples. In the CANZUS countries across the lifespan.

This systematic review aimed to,1) identify and summarize the evidence from observational studies examining the association between cultural connectedness and HRQoL among Indigenous Peoples in the CANZUS countries, 2) synthesize evidence on related health outcomes, including mental and physical health, and 3) highlight knowledge gaps to guide priorities for future research, the development of culturally grounded programs and policy initiatives that promote Indigenous well-being.

Methods

This systematic review aimed to synthesize the evidence on the association between cultural connectedness and HRQoL and related outcomes in mental and physical health, among Indigenous peoples in the CANZUS countries. The protocol was registered in the PROSPERO International Prospective Register of Systematic Reviews (CRD42024566110), conducted according to Cochrane standards [13] and reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [14].

Data sources and searches

A comprehensive search of six electronic databases (MEDLINE, Embase, PsycINFO, CINAHL, Web of Science, and Global Health was conducted from database inception to June 2024. Searches were updated up to September 2025. Additional searches were undertaken in Google Scholar, ProQuest Dissertations and Theses, and the Indigenous Studies Portal (iPortal). A research librarian from the Bracken Health Sciences Library at Queen's University provided guidance in developing and refining the search strategy. The search strategy combined terms for HRQoL (adapted from a validated search strategy developed by Canada's Drug Agency [15]), cultural connectedness [12], and Indigenous populations [16]. The search did not place any restrictions on language, year, or publication type. The full strategy for MEDLINE is available in Additional File 1.

Study selection

Eligibility criteria were defined a priori. Studies were included if they: (1) were observational epidemiological studies employing a cohort or cross-sectional design; (2) included Indigenous populations from Australia (Aboriginal and Torres Strait Islander peoples), Canada (First Nations, Métis, and Inuit), Aotearoa New Zealand (Māori), and/or the United States (American Indian and Alaska Native peoples); (3) examined cultural connectedness as the exposure; and (4) reported quantitative

outcomes related to HRQoL (defined as an individual's perceived rating of their overall health [17], or one of its components (i.e., mental health/psychological well-being and physical health). In this review, "First Nations" refers to First Nations Peoples in Canada, and "Aboriginal and Torres Strait Islander peoples" refers to Indigenous populations in Australia. Title and abstract screening were independently conducted by two independent reviewers (SB and AB) using Covidence systematic review software (Veritas Health Innovation, Melbourne, Australia). Studies deemed relevant or lacking sufficient information based on title and abstract were retrieved in full for further assessment. Full text assessment was independently conducted by the same two reviewers (SB and AB), with disagreements resolved by consensus or in consultation with a third reviewer (MO). Full texts were re-reviewed by a third reviewer (MO) to confirm eligibility. A PRISMA 2020 flow diagram [14] documented the selection process.

Data extraction

One reviewer (SB) extracted data from all included studies using a standardized form, and a second reviewer (MO) independently verified all entries for accuracy and completeness. Extracted data included study characteristics (authors, year), study design, country, population details (age, sex/gender), exposure definition and measurement tool, outcome measures, and quantitative results (e.g., odds ratios [OR], relative risks [RR], mean differences, regression coefficients, correlations, p-values and confidence intervals [CI]). Consistent with HRQoL conceptualizations [4], data were organized by outcome domain (HRQoL, mental health/well-being, and physical health).

Risk of bias assessment

Risk of bias of included studies was assessed using the Newcastle-Ottawa Scale (NOS) for cohort studies [18] and its adapted version for cross-sectional studies [19]. The NOS scales evaluate study quality across three domains, selection of study groups, compatibility of groups, and ascertainment of the outcome or exposure, using a start system to indicate risk of bias in each domain. The cohort version contains eight items and the cross-sectional version seven items, with a maximum possible score of nine stars. For cohort studies, overall quality was classified as good (5–9 stars), Fair (3–4 stars), or Poor (< 3 stars). For cross-sectional studies, quality was classified as Good (7–9 stars), Fair (4–6 stars), or Poor (< 4 stars). Summary numeric scores were converted to an overall assessment of "low", "unclear", or "high" bias. Risk of bias assessments were conducted independently by two reviewers (SB and AB), with disagreements solved by consensus. Traffic-light plots of risk of bias judgements for individual studies and summary bar charts of risk of bias judgements across domains were prepared in Robvis to visualize results [20]. Data extraction and risk of bias assessment were completed using Microsoft Excel (Microsoft Corporation, Redmond, WA).

Data synthesis

Given heterogeneity in study populations, exposures, and outcome measures, studies were not pooled for meta-analyses. Instead, a narrative synthesis approach was conducted following the Synthesis Without Meta-Analysis (SWiM) reporting guidelines [21]. Studies were grouped by outcome domain rather than Indigenous group due to limited number of studies available per specific populations and because several studies included multiple Indigenous groups [22–25], or Indigenous populations from both Canada and the United States [26]. Because of variation in measurement tools and insufficient data to transform outcomes into a common measure, effect direction plots were used as standardized method of synthesis. Effect direction plots were created following Cochrane guidance [27, 28]. Vote counting summarized the direction of reported associations (positive, negative, no evidence of association) by domain (HRQoL, mental health/well-being and physical health) [27, 28]. When directions differed across studies within a domain, this was described as inconsistent direction across studies. Where sufficient numbers of studies reported classifiable positive and negative associations, a two-tailed sign test (binomial test) was planned to assess whether directions differed from that expected by chance. Heterogeneity among studies was explored descriptively, considering differences in Indigenous group, outcomes assessed, and subpopulations (e.g., by age category). Only studies judged to have low or unclear risk of bias were included in the primary synthesis. The certainty of evidence was assessed using the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) framework [29], considering risk of bias, consistency, directedness, precision, and publication bias. Evidence tables, risk of bias summary plots, and effect direction plots were used to present the results.

Results

Search results

The search strategy identified 9,339 records. After removing 1,895 duplicates, 7,444 records were assessed at the title and abstract stage. Of these, 310 full texts were assessed for eligibility, of which 12 studies [8, 22–26, 30–35] were included in the review. The study selection process and reasons for exclusion are shown in the PRISMA 2020 flow diagram (Fig. 1). A detailed list of excluded studies is available from authors on request.

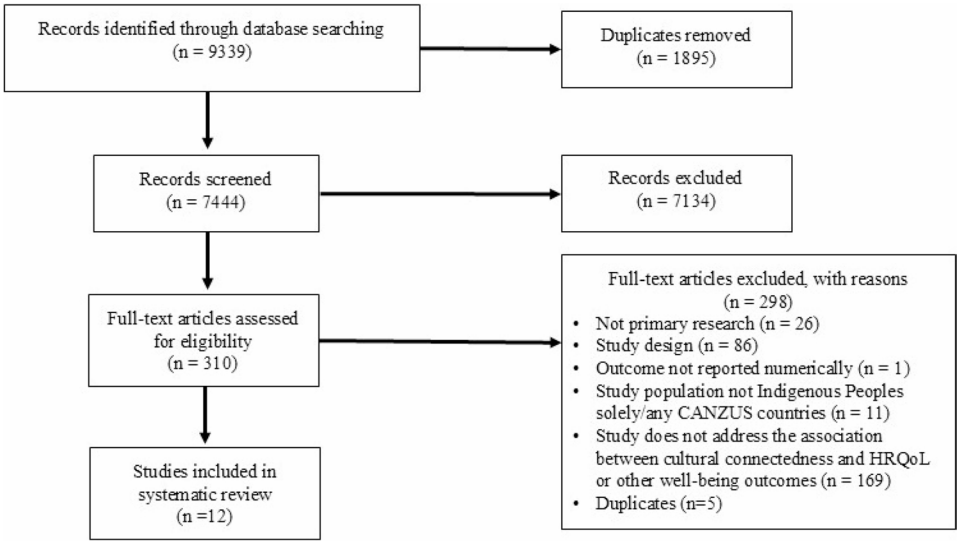

Fig. 1 PRISMA 2020 flow diagram of study selection

Characteristics of included studies

Twelve studies met the inclusion criteria (Table 1) [8, 22–26, 30–35]. Three were conducted in Canada [8, 23, 24], one in Australia [35], three in Aotearoa New Zealand [30, 31, 34], four in the United States [22, 25, 32, 33], and one spanned both Canada and the United States [26]. The studies were published between 2011 and 2023 (median publication year 2019; interquartile range 6 years). Ten studies used cross-sectional designs [8, 22–26, 30–33], and two were prospective cohort studies [34, 35].

Participants represented Indigenous populations from all four CANZUS countries. The studies varied by age groups: one study focused on infants and young children [35], two on youth and adolescents [24, 34], seven on general adult populations [8, 22, 23, 26, 30, 32, 33], and two on Elders [25, 31].

Exposure measurement

All exposure measures were based on participant self-report, except for one study [35] that used parental reporting because of participants' young age. Measures of cultural connectedness varied across studies. Although all assessed participation in traditional cultural activities, terminology and measurement approaches differed. The term "cultural connectedness" was used in six studies [8, 22–24, 31], with tools including the Cultural Connectedness Scale (CCS) [36] used in two studies [23, 24] and an adapted version (CCS-California) used in one study [22]. Other approaches included a single Likert item [8], a five-item scale [31], a binary indicator of cultural practices [25], and "Connection to Country" to reflect the frequency of participation in cultural activities [35]. The construct of "cultural engagement" was evaluated in one study [30] using the Multidimensional Model of Māori Identity and Cultural Engagement measure [30]. The construct of "ethnic engagement" was measured using a five-item Māori engagement scale [34]. "Enculturation" was used in three studies [26, 32, 33], including a 23-item enculturation measure designed for the Yup'ik cultural context [32], a standardized composite of traditional activity involvement, language fluency, and spirituality (activities, frequency, and importance) [26] and the use of the American Indian Enculturation Scale (AIES) [33].

Outcome measurement

Outcomes across the included studies fell into three domains HRQoL, mental health/ well-being, and physical health. Two studies [25, 31] assessed HRQoL using a five-point Likert scale and a 7-item measure of HRQoL, based on the SF-8, respectively. Nine studies [8, 22, 24, 26, 30, 31, 33–35] examined mental health or broader well-being, using instruments such as the Satisfaction with Life Scale used in three studies [22, 24, 33]), the Flourishing Scale [26], the Strengths and Difficulties Questionnaire [35], the Personal Well-Being Index [30, 37], the modified Herth Hope Index [22], the modified Ryff Well-Being Scale [34], a single-item life satisfaction measure [31], and a 1-item Likert scale [8]. Four studies [8, 22, 23, 32] evaluated physical health, with measures that included self-reported daily steps [32], a 1-item Likert scale on physical health [8], and the Godin Leisure-Time Physical Activity Questionnaire [23]. Except for one study that used parental reporting due to participants' young age [35], all outcomes were self-reported.

Representation of Indigenous groups by outcome is summarized in Table 2. HRQoL were reported for American Indian [25] and Māori [31] participants. Mental health/well-being was examined among First Nations [8, 24], Inuit [24], Métis [22, 24], American Indian [22, 33], Alaska Natives [22], Aboriginal Australians and Torres

Table 1 Characteristics of included studies

Study, country	Study design	Indigenous group Population characteristics	Cultural connectedness measure	Outcomes assessed	Results	Interpretation
Adamsen 2018 [25] USA	Cross-sectional	Alaska Natives *N* = 18,134 Age group: Elders Mean age: NR Female (%): 61.1	Frequency of participation in cultural activities (binary indicator)	-HRQoL: self-rated perception of health (5-point Likert scale)	OR = 1.32 $p < 0.001$ Reference: those who did not participate in cultural practices	Alaska Natives who participated in cultural practices had higher odds of having better HRQoL compared to those who did not participate in cultural activities
Bersamin 2014 [32] USA	Cross-sectional	Alaska Natives *N* = 179 Age group: Adolescents and adults Mean age (yr): 38.3 (males); 33.6 (females) Female (%): 56.4	Enculturation (23-item enculturation Yup'ik specific measure)	-Physical health: mean steps per day	β = 0.17, t = 2.39, $p = 0.02$	Greater enculturation was linked to more steps taken per day
Dockery 2020 [35] Australia	Prospective cohort	Aboriginal Australians and Torres Strait Islander peoples *N* = 1,687 Age group: Infants (time 1) and children (time 2) Mean age: NR Female (%): NR	Connection to country, connection to kin	-Mental health/ well-being: Strengths and Difficulties Questionnaire (SDQ) – parental report	Connection to country: β = 0.028; CI: −0.07, 0.12 Connection to kin: β = 0.012; CI: −0.09, 0.111	Connection to country was not significantly associated with parent-reported child mental health/ well-being
Gonzalez 2022 [26] USA and Canada	Cross-sectional	Reserves in the upper Midwest and Canada *N* = 453 Age group: Adults Mean age (yr): 26.3 Female (%): 58.1	Enculturation	-Mental health/ well-being: Flourishing scale	β = −0.12, CI: -0.30, 0.04	Enculturation was not significantly associated (directly) with flourishing
Gray 2019 [8] Canada	Cross-sectional	First Nations *N* = 147 Age group: Adults Mean age (yr): NR Female (%): 56	Cultural connectedness (1-item Likert scale)	-Physical health: validated 1-item Likert scale -Mental health/ well-being: validated 1-item Likert scale	Physical health: 25%, CI: (9, 42%) Mental health: 8%, CI: (−16, 31%)	Physical health: greater proportion reporting a high level of physical health among those with a high level of cultural connectedness Protective effect of cultural connectedness among those with no family history of IRS was modest
Houkamau 2011 [30] Aotearoa New Zealand	Cross-sectional	Māori *N* = 93 Age group: Adults Mean age (yr): 37.03 Female (%): 78.5	Multidimensional Model of Māori Identity and Cultural Engagement	-Mental health/ well-being: Personal Well-being Index	β = 0.23, t = 2.03 $p = 0.04$	Stronger Māori identity and cultural involvement was positively associated with better personal well-being.
Ironside 2020 [23] Canada	Cross-sectional	First Nations, Métis and Inuit *N* = 99 Age group: Adults Mean age (yr): 29.9 Female (%): 73.7	Cultural Connectedness Scale (CCS)	-Physical health: Godin Leisure Time Physical Activity Questionnaire	$r = 0.208$, $p > 0.05$, not significant	Higher scores of cultural connectedness were positively but not significantly correlated with physical health
Masotti 2023 [22] USA	Cross-sectional	American Indian, Alaska Natives and Métis *N* = 344 Age group: Adults Mean age (yr): NR Female (%): 69.3	Cultural Connectedness Scale-California (CCS-CA)	-Physical health: HRQoL specific item (for physically healthy days) -Mental health/ well-being: modified Herth Hope Index (mHHI) and Satisfaction with Life (SWLS)	Physical health: $r = 0.13$, p = < 0.001 Mental health: 0.36, $p < 0.001$ (mHHI) 0.32, $p < 0.001$ (SWLS)	Higher scores of cultural connectedness were positively associated with more physically healthy days, greater life satisfaction and greater hope

Table 1 (continued)

Study, country	Study design	Indigenous group Population characteristics	Cultural connectedness measure	Outcomes assessed	Results	Interpretation
Oetzel 2023 [31] Aotearoa New Zealand	Cross-sectional	Māori *N* = 75 Age group: Elders Mean age (yr): 69.8 Female (%): 60	Cultural connection (5-items)	-HRQoL: 7-items based on the SF-8 -Mental health/ well-being: life satisfaction (1 item)	HRQoL: $r = 0.05$, $p > 0.05$, not significant Mental health: $r = 0.13$, $p > 0.05$, not significant	Feeling more culturally connected was positively but not significantly correlated with HRQoL and life satisfaction
Santana 2015 [33] USA	Cross-sectional	American Indian *N* = 111 Age group: Adults Mean age (yr): NR Female (%): 69.4	American Indian Enculturation Scale (AIES)	-Mental health/ well-being: Satisfaction with Life (SWLS)	$r = 0.223$, $p = 0.019$	Higher scores of enculturation were positively associated with satisfaction with life
Snowshoe 2017 [24] Canada	Cross-sectional	First Nations, Métis and Inuit *N* = 290 Age group: Youth Mean age (yr): 14.4 Female (%): 48.3	Cultural Connectedness Scale (CCS)	-Mental health/ well-being: Satisfaction with Life for Children (SWLS-C)	$r = -0.22$, $p > 0.05$, not significant	Higher scores of cultural connectedness were not significantly association with satisfaction with life
Stuart 2014 [34] Aotearoa New Zealand	Prospective cohort	Māori *N* = 431 Age group: Youth Mean age (time 1) (yr): 11.83 Female (%): 59.2	Ethnic engagement (5-item Māori engagement scale)	-Mental health/ well-being: 11 items adapted from the Ryff Well-Being Scales	Time 1: $r = 0.06$, $p > 0.05$ Time 2: $r = 0.03$, $p > 0.05$ Time 3: r-0.05 $p > 0.05$	Higher ethnic engagement was not significantly associated with well-being

CI confidence interval, *HRQoL* health-related quality of life, *NR* not reported, *USA* United States of America, *yr* years

Table 2 Indigenous groups represented in included studies by health outcome

Indigenous group	Health-related quality of life	Mental health/ well-being	Physical health
First Nations		✓	✓
Inuit		✓	✓
Métis		✓	✓
American Indians	✓	✓	✓
Alaska Natives		✓	✓
Native Hawaiians			
Aboriginal Australians and Torres Strait Islander peoples		✓	
Māori	✓	✓	

Strait Islander peoples [35] and Māori [30, 34] participants. Physical health outcomes were reported for First Nations [8, 23], Inuit [23], Métis [22, 23], American Indian [22] and Alaska Natives [22, 32] (Table 2).

Engagement of Indigenous advisors

All included studies engaged Indigenous communities in some aspect of their research process. Five studies included participatory research approaches, where the researchers collaborated closely with the members of the respective Indigenous communities, as active members of the research process [22, 23, 26, 30, 32]. One study reported using decolonized approaches, where not only was the Indigenous community an active member of the research process, but they led the research process [25]. Four studies reported governance and oversight from Indigenous communities [8, 24, 33, 35]. One study conducted in Aotearoa New Zealand was explicitly grounded in Māori research frameworks [31] and another included Māori advisors [34].

Risk of bias of included studies

Of the 12 included studies, 10 were assessed as having a low risk of bias, and two were rated as having an unclear risk of bias. Figure 2 shows traffic-light plots for individual cohort (Fig. 2A) and cross-sectional studies (Fig. 2B), and Fig. 3 presents the corresponding summary plots. The two cohort studies demonstrated low risk of bias across most domains such as representativeness of the exposed cohort, selection of comparison groups, and adequacy of follow-up. However, both had some concerns regarding ascertainment of exposure and outcome assessment.

Among the ten cross-sectional studies, most domain were also rated low risk of bias. Recurrent limitations included insufficient justification of sample size and incomplete reporting of non-respondents, which limited assessment of potential response bias. All studies described statistical methods used; however, five studies did not clearly report adjustment for key confounders relevant to the analysis of interest, which contributed to concerns about comparability between groups. All

A. Cohort studies

Study	Country	Indigenous group	Risk of Bias D1	D2	D3	D4	D5	D6	D7	D8	Overall
Dockery 2020 (35)	Australia	Aboriginal Australian and Torres Strait Islander	+	+	+	+	×	+	+	+	+
Stuart 2014 (34)	NZ	Māori	+	×	+	+	×	+	+	+	+

D1: Representativeness of exposed cohort; D2: Selection of non-exposed cohort; D3: Ascertainment of the exposure; D4: Demonstration that outcome of interest not present at start of study; D5: Comparability of cohorts; D6: Assessment of outcome; D7: Follow-up enough for outcomes to occur; D8: Adequacy of follow-up of cohorts

NZ= Aotearoa New Zealand

Judgment: High = × Low= +

B. Cross-sectional studies

Study	Country	Indigenous group	Risk of Bias D1	D2	D3	D4	D5	D6	D7	Overall
Adamsen 2018 (25)	USA	Alaska Natives	+	+	+	−	+	−	+	+
Bersamin 2014 (32)	USA	Alaska Natives	+	+	×	+	+	−	+	+
Gonzalez 2022 (26)	USA and Canada	Reserves in the upper Midwest and Canada	+	+	+	+	+	−	+	+
Gray 2019 (8)	Canada	First Nations	+	+	+	+	−	−	+	+
Houkamau 2011 (30)	NZ	Māori	+	×	×	+	+	−	+	+
Ironside 2020 (23)	Canada	First Nations, Métis and Inuit	+	×	×	+	−	−	+	−
Masotti 2023 (22)	USA	American Indian, Alaska Natives and Métis	+	+	+	+	×	−	+	+
Oetzel 2023 (31)	NZ	Māori	+	×	×	+	×	−	+	−
Santana 2015 (33)	USA	American Indian	+	×	+	+	×	−	+	−
Snowshoe 2017 (24)	Canada	First Nations, Métis and Inuit	+	+	+	+	+	−	+	+

D1: Representativeness of exposed group; D2: Sample size; D3: Non-respondents; D4: Ascertainment of the exposure; D5: Comparability of groups; D6: Assessment of outcome; D7: Statistical test

NR = not reported; NZ= Aotearoa New Zealand; USA=United States of America

Judgment: High = × Moderate= - Low= +

Fig. 2 Traffic-light plots of risk of bias judgements for individual studies included in the review. **A** Cohort studies. **B** Cross-sectional studies

studies relied on self-reported outcome measures rather than independent or blinded assessment. Overall, the body of evidence was assessed as having moderate-to-low risk of bias.

Association between cultural connectedness and HRQoL, mental health/well-being and physical health

Across the 12 included studies, effect-direction findings are summarized in Table 3. Seven studies reported no evidence of association between cultural connectedness and at least one outcome domain [8, 23, 24, 26, 31, 34, 35], while six studies reported positive associations for at least one domain [8, 22, 25, 30, 32, 33]. Studies reporting positive associations represented populations from Canada (n = 1), Aotearoa New Zealand (n = 1), and the United States (n = 4) and included First Nations, Māori, American Indian, Alaka Native, and Métis groups (Table 3). A sign test was not calculated because no studies reported negative directions and few studies contributed within each outcome domain.

For HRQoL, two studies assessed the association with cultural connectedness: One among American Indian and Alaska Native participants reported a positive association [25], whereas one among Māori participants reported no evidence of association [31].

For mental health/well-being, three studies reported positive associations with cultural connectedness among American Indians, Alaska Natives, and Métis populations [22, 30, 33], and six reported no evidence of association [8, 24, 26, 31, 34, 35].

For physical health, three studies [8, 22, 32] reported positive associations among First Nations, American Indians, Alaska Natives, and Métis populations, and one reported no evidence of association [23].

Overall, positive associations were observed across regions and study designs with no clear geographic

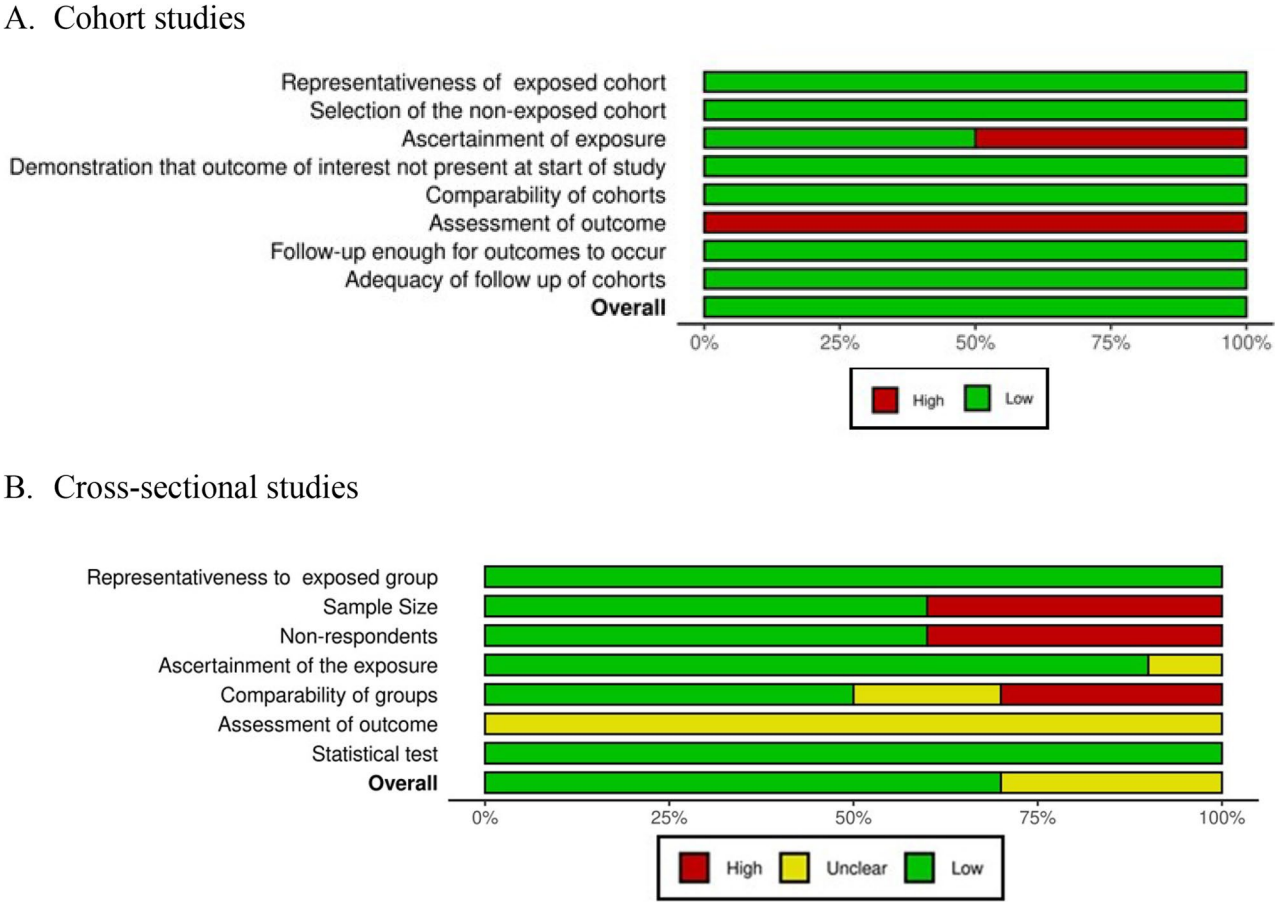

Fig. 3 Summary bar charts of risk of bias judgements across domains. **A** Cohort studies. **B** Cross-sectional studies

Table 3 Effect direction plot summarizing direction of health impacts from studies of the association between cultural connectedness and health-related quality of life, mental health, and physical health

Study	Study Design	Country	Indigenous Group	*N*	HRQoL	Mental Health/ Well-being	Physical Health	Risk of Bias
Adamsen 2018 (25)	Cross-sectional	USA	American Indian & Alaska Natives	18,134	▲			Low
Bersamin 2014 (32)	Cross-sectional	USA	Alaska Natives	179			▲	Low
Dockery 2020 (35)	Prospective Cohort	Australia	Aboriginal Australians and Torres Strait Islander peoples	1,687		◄►		Low
Gonzalez 2022 (26)	Cross-sectional	USA and Canada	NR	453		◄►		Low
Gray 2019 (8)	Cross-sectional	Canada	First Nations	147		◄►	▲	Low
Houkamau 2011 (30)	Cross-sectional	NZ	Māori	93		▲		Low
Ironside 2020 (23)	Cross-sectional	Canada	First Nations, Métis, Inuit	99			◄►	Low
Masotti 2023 (22)	Cross-sectional	USA	American Indian, Alaska Natives & Métis	344		▲	▲	Low
Oetzel 2023 (31)	Cross-sectional	NZ	Māori	75	◄►	◄►		Unclear
Santana 2015 (33)	Cross-sectional	USA	American Indian	111		▲		Unclear
Snowshoe 2017 (24)	Cross-sectional	Canada	First Nations, Métis, Inuit	290		◄►		Low
Stuart 2014 (34)	Prospective Cohort	NZ	Māori	431		◄►		Low

Effect direction: ▲= positive health impact, ▼= negative health impact, ◄►= no evidence of association

N number of participants, *NR* not reported, *NZ* Aotearoa New Zealand, *USA* United States of America

Table 4 GRADE evidence profile by outcome

Number of studies	Indigenous groups	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication bias	Certainty of findings
Health-related quality of life							
2	AI, Māori	Not serious	Serious[a]	Not serious	Serious[bc]	No concern	●●○○ a, b, c
Physical health							
4	FN, Métis, AI, AN	Not serious	Serious[a]	Not serious	Serious[bc]	No concern	●●○○ a, b, c
Mental health/well-being (cross-sectional)							
7	FN, Inuit, Métis, AI, AN, Māori	Not serious	Serious[a]	Not serious	Serious[bc]	No concern	●●○○ a, b, c
Mental health/well-being (prospective cohort)							
2	AA&TSI, Māori	Not serious	Serious[a]	Not serious	Serious[bc]	No concern	●●○○ a, b, c

AA&TSI Aboriginal Australian and Torres Strait Islander peoples, *AI* American Indian, *AN* Alaska Native, *FN* First Nations

Certainty of evidence was assessed using the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) approach [29]. For observational studies, certainty begins at 'low' and may be rated down based on risk of bias, inconsistency, indirectness, imprecision, and publication bias

Certainty symbols indicate: ●●●● High; ●●●○ Moderate; ●●○○ Low; ●○○○ Very low

a = Inconsistency: direction of associations varied across studies within the outcome domain (positive vs. no evidence of association)

b = Imprecision: synthesis based on vote counting/effect-direction methods (no pooled effect estimates or confidence intervals)

c = Imprecision: limited number of studies per outcome

pattern. Studies with unclear risk of bias more frequently reported no evidence of association.

Certainty of evidence

The overall certainty of evidence for all outcomes was rated low (Table 4). All included studies were non-randomized (cross-sectional or prospective cohort), which the GRADE framework initially rates as low certainty by default. Risk of bias was generally moderate to low, but inconsistency was noted due to variation in the direction of associations across studies. Imprecision arose primarily from the vote-counting synthesis approach which does not incorporate confidence intervals and therefore limits precision. Publication bias could not be formally assessed because of available studies was too small for meaningful evaluation.

Discussion

This systematic review aimed to examine the association between cultural connectedness and HRQoL, mental health/well-being, and physical health among Indigenous peoples in the CANZUS countries. Overall, cultural connectedness showed more frequent positive associations with physical health, while evidence for mental health/well-being and HRQoL was more variable across studies. These findings align with qualitative syntheses [38] showing that cultural identity, participation in traditional practices, and connection to land and community act as protective factors for Indigenous health and well-being across generations.

While the small number of included studies limits definite conclusions, the overall pattern of findings supports cultural connectedness as a potentially important Indigenous determinant of health and relevant to policies and programs in healthcare, education, and community development. Strengthening opportunities for cultural engagement (e.g., language revitalization, land-based activities, and intergenerational knowledge sharing) may support Indigenous health and well-being.

Although Indigenous peoples from all four CANZUS countries were represented in this systematic review, important gaps remain. Evidence for some Indigenous groups remains limited. Few studies focused specifically on HRQoL, and there is little research on Métis populations considered separately from First Nations or Inuit, as well as on Native Hawaiian communities and Aboriginal Australians and Torres Strait Islander peoples. Future research should intentionally include these populations, adopt distinction-based approaches, and culturally grounded measures of both cultural connectedness and health outcomes.

Strengths and limitations

A major strength of this systematic review was the comprehensive and rigorous methodology employed. The search strategy was developed using validated filters and in consultation with a research librarian to ensure broad coverage. The protocol was prospectively registered with PROSPERO to enhance transparency and avoid duplication. Methodological guidance from the Cochrane handbook was followed throughout, and reporting adhered to

the PRISMA guidelines. Steps to minimize bias included dual independent screening at both title /abstract and full-texts stages, independent verification of data extraction, structured risk of bias assessment, and a standardized framework for evidence synthesis. Despite these steps, some relevant studies may have been missed due to database, indexing, and search filters limitations.

Several limitations must be acknowledged. Although not inherent to the knowledge synthesis methods, heterogeneity in the definitions and measurement of cultural connectedness and health outcomes precluded meta-analysis and required synthesis through effect direction plots and vote counting, which provide only directional rather than quantitative synthesis. The small number of studies limited the strength of inference from vote counting and prevented formal assessment of publication bias. Many HRQoL and mental health/well-being measures used in the included studies were developed in non-Indigenous contexts, raising concerns about their appropriateness and cultural relevance [11]. The use of measures developed in non-Indigenous contexts in studies included in the review may have influenced findings in several ways. First, these instruments may not capture domains of well-being prioritized in Indigenous worldviews (e.g., relational, cultural, land-based, and spiritual dimensions), which could lead to measurement error and attenuate associations toward the null. Second, differences in cultural interpretation of items and response styles may affect comparability across populations and contribute to heterogeneity in the results. Thus, the observed associations may underestimate the health benefits of cultural connectedness, and findings should be interpreted with this limitation in mind. Notably, most included studies engaged Indigenous researchers or advisors, which may have supported cultural validity and interpretation of results.

Future research in this area would benefit from stronger methodological rigor and reporting. Priorities include clearer definition and measurement of cultural connectedness (including use of culturally grounded instruments or validation of existing measures within the participating Indigenous population), consistent reporting and adjustment for key confounders, and transparent reporting of missing data and non-response to better assess selection and information bias. Where feasible, longitudinal designs and appropriately specified analytic approaches could strengthen causal interpretation and reduce concerns related to reverse causality inherent in cross-sectional studies. Finally, adherence to Indigenous-specific research reporting guidance (e.g., the CONSIDER statement [39]) may improve transparency regarding governance, relationships, methods, analysis, and dissemination.

Conclusion

Current evidence suggests a positive association between cultural connectedness and physical health among Indigenous peoples in the CANZUS countries. Evidence for mental health/well-being and HRQoL is less consistent across studies. This pattern is observed across age groups in the included studies, highlighting the importance of cultural connection throughout the life course. Strengthening the evidence in this area can inform culturally responsive policies and programs that support Indigenous health and well-being.

Abbreviations

CANZUS	Canada, Australia, Aotearoa New Zealand, and the United States
CCS	Cultural Connectedness Scale
CCS-California	Cultural Connectedness Scale – California
CI	Confidence interval
GRADE	Grading of recommendations, assessment, development and evaluations
HRQoL	Health-related quality of life
iPortal	Indigenous studies portal research tool
mHHI	Modified Hearth Hope Index
NA	Not applicable
NOS	Newcastle-Ottawa Scale
OR	Odds ratio
PRISMA	Preferred reporting items for systematic reviews and meta-analyses
RoB	Risk of bias
RR	Relative risk
SWiM	Synthesis without meta-analysis
SWLS	Satisfaction with Life Scale
SWLS-C	Satisfaction with Life Scale for Children

Supplementary Information

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Supplementary Material 1.

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Authors' contributions

SB and MO conceived the study. SB designed the search protocol, conducted the searches, screened articles, extracted data, conducted risk of bias assessment and certainty of evidence evaluation, and drafted the manuscript. AB screened the articles and contributed to risk of bias assessment and certainty of evidence evaluation. AB and MO provided critical content and revisions to the manuscript. MO designed the search strategy, verified the data extraction, and drafted the manuscript. All authors read and approved the final manuscript.

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Data availability

All data generated or analysed during this study are included in this published article and its supplementary information files.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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