Received: 22 September 2023 | Accepted: 5 June 2024

DOI: 10.1002/trc2.12492

Alzheimer's & Dementia
Translational Research & Clinical Interventions

REVIEW ARTICLE

Assessing social connection for long-term care home residents: Systematic review using COnsensus-based Standards for the selection of health Measurement INstruments guidelines

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Funding information
Canada Brain Research Fund; Alzheimer's Association, Grant/Award Number: ARCOM-22-875327; Brain Canada Foundation

Abstract

Social connection is important for long-term care (LTC) residents' quality of life and care. However, there is a lack of consensus on how to measure it and this limits ability to find what improves and impairs social connection in LTC homes. We therefore aimed to systematically review and evaluate the measurement properties of existing measures of social connection for LTC residents, to identify which, if any, measures can be recommended. We searched eight electronic databases from inception to April 2022 for studies which reported on psychometric properties of a measure of any aspect(s) of social connection (including social networks, interaction, engagement, support, isolation, connectedness, and loneliness) for LTC residents. We used COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) guidelines to evaluate the measurement properties reported for each identified measure and make recommendations. We identified 62 studies reporting on 38 measures; 21 measured quality of life, well-being or life satisfaction and included a social connection

subscale or standalone items and 17 measures specifically targeted social connection. We found there was little high-quality evidence on psychometric properties such as sufficient content validity ($n = 0$), structural validity ($n = 3$), internal consistency ($n = 3$), reliability ($n = 1$), measurement error ($n = 0$), construct validity ($n = 4$), criterion validity ($n = 0$) and responsiveness ($n = 0$). No measures demonstrated satisfactory psychometric properties on all these aspects, so none could be recommended for use. Thirty-four measures have the potential to be recommended but require further research to assess their quality and the remaining four are not recommended for use. Our review therefore found that no existing measures have sufficient evidence to be recommended for assessment of social connection in residents of LTC homes. Further validation and reliability studies of existing instruments or the development of new measures are needed to enable accurate measurement of social connection in LTC residents for future observational and interventional studies.

KEYWORDS
COSMIN, dementia, long-term care home, nursing home, outcome measures, psychometric properties, reliability, social connection, social engagement, validity

Highlights

- Social connection is fundamental to person-centered care in long-term care homes.
- There is insufficient evidence for the reliability and validity of existing measures.
- No current measures can be recommended for use based on existing evidence.
- A reliable and valid measure of social connection is needed for future research.

1 | INTRODUCTION

Social connection is an umbrella term that encompasses aspects of how individuals connect to each other,[1] and includes the existence, roles, and qualities of relationships as well as the perceived sense of connection in these relationships.[2] Social connection is a basic human need which is associated with health outcomes[3] and quality of life.[4] It is influenced by context and setting and may differ in long-term care (LTC) homes compared to the community as residents, who are mostly older adults with complex health needs, share space, take part in congregate activities, and receive daily care from staff.[5]

In LTC homes, social connection is linked to mental health outcomes including depression, cognitive decline, and behavioral symptoms of dementia,[5] as well as physical health outcomes,[6] including mortality[7] and self-rated health.[8] Social connection is also an important determinant of quality of life[9,10] and a marker of quality of care.[11] LTC residents, including those with cognitive impairment,[12] can thrive when the need for social connection is met.[7,8,13] Relationships among residents, staff, and family have been ranked as the most important concept for person-centered care.[14] However, qualitative evidence suggests that social isolation and loneliness are common in care homes[15] and the restrictions implemented during the COVID-19 pandemic worsened social connection for residents.[5,16]

Measures of social connection are embedded in some LTC routine data collection instruments[17,18] as unidimensional scales and subscales in tools assessing concepts such as quality of life.[19–22] Social connection measures have been used as outcomes in intervention studies[23–25] and in studies testing the impact of LTC home-level characteristics on social connection,[26] but there is no consensus on the best approaches to measure social connection for LTC residents.

Measuring social connection is challenging due to inconsistent conceptualization and operationalization of the concept and constructs it represents.[27,28] Furthermore, the characteristics of the LTC population and setting present distinct challenges and opportunities.[29] Measures to assess social connection among people living in LTC homes should therefore be evaluated in these settings to determine their psychometric properties. A more consistent approach to measuring social connection would advance understanding of how social connection can be targeted to influence the health and well-being of LTC residents by improving the accuracy of research evaluating the effectiveness of social connection interventions. Overall, identifying reliable and valid measures of social connection can help researchers, practitioners, and policymakers to employ consistent and robust measurement of social connection.[30,31]

To our knowledge, there is no systematic review of social connection measurement tools specific to LTC residents. The purpose of this study was therefore to identify and systematically evaluate the measurement properties of measures of social connection evaluated in LTC residents, including dementia-specific measures, and those developed for broader use.

2 | METHODS

2.1 | Design

This review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement[32] and COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) methodology for systematic reviews of outcome measures[33] and for assessing content validity.[34] The study was registered in PROSPERO (registration number: CRD42022303526).

2.2 | Search strategy

Eight computerized bibliographic databases (MEDLINE ALL [Ovid], Embase Classic and Embase [Ovid], Emcare Nursing [Ovid], APA PsycInfo [Ovid], Scopus, CINAHL Complete [EBSCOhost], AgeLine [EBSCOhost], and Sociological Abstracts [ProQuest]) were searched for published research studies on psychometric properties of a measure of any aspect of social connection, tested in LTC home residents.

Two searches were conducted (see Appendix A for detailed search strategies). Search 1 was conducted from inception to November 18, 2021, and consisted of the following:

1. Construct of interest: Broad search terms were used to identify aspects of social connection highlighted for older adults and residents of LTC homes, including social networks, engagement, support, isolation, and connectedness as well as loneliness.[1,28]
2. Population: Residents of LTC or nursing homes. The underlying search strategy[35,36] was used without modification and intentionally broad to account for differences in terminology while searching for studies conducted in settings that overlap with the international consensus definition of nursing home.[36]
3. Measurement properties: The COSMIN filter, which has been shown to have a sensitivity of 97.4% and precision of 4.4% for finding studies on properties of measurement instruments,[37] was applied. Non-validated translations for the COSMIN filters were used when available.[38]

When possible, limits were applied to focus on human adult studies and journal articles. No date or language limits were applied.

To avoid missing any relevant studies, we conducted a targeted second search as recommended by De vet et al.[39] for studies from inception to April 5, 2022 using the following:

1. Construct of interest: The list of measures identified from search 1, supplemented with a list of measures of social connection used in previous research in this population, identified from systematic reviews of psychometric measurement of linked concepts in care homes, or reviews of psychosocial interventions in care homes[2,3] (full list in Appendix B).

RESEARCH IN CONTEXT

1. **Systematic review**: We searched eight electronic databases (MEDLINE ALL, Embase Classic and Embase, Emcare Nursing, APA PsycInfo, Scopus, CINAHL Complete, AgeLine, and Sociological Abstracts) for studies reporting psychometric properties of measures of any aspect of social connection in long-term care (LTC) home residents. We used COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) guidelines to evaluate measures.
2. **Interpretation**: To our knowledge, this is the first systematic review of measures of social connection for LTC residents and the first using COSMIN, a validated approach, to appraise their quality. These results will inform researchers and health care settings about the reliability and validity of measures to test individual-, home- and system-level interventions to improve social connection.
3. **Future directions**: No existing measures have sufficient evidence to be recommended. Further validation of the existing measures and/or the development of new measures is needed to assess social connections among residents living in LTC homes.

2. Population: Residents of LTC homes.
3. Measurement properties: The COSMIN filter.

Reference lists of pertinent review articles were also scanned to identify potential additional relevant studies.

2.3 | Study selection criteria

2.3.1 | Constructs of interest

Studies were included if they reported on the development of a measure or where the aim was to evaluate one or more psychometric properties of a measure of any aspect(s) of social connection, including social networks, social interaction, social engagement, social support, social isolation, social connectedness, or loneliness (as defined in Appendix C). Studies of measures with summary scores, subscales, or standalone items assessing any aspect(s) of social connection were included if the measurement properties of the subscales or standalone items were analyzed and reported separately as a distinct construct. However, studies of measures that provided only the summary scores of other concepts (eg, overall quality of life) were excluded. Each included summary score, subscale, or standalone item (hereafter collectively referred to as "measure") was considered separately in the analysis.

2.3.2 | Population

Studies of older adults, with or without cognitive impairment, or dementia, with a mean age of 65 years or older (or at least two-thirds of participants were 65 years or older) were included.

2.3.3 | Context

Studies that reported that at least two-thirds of participants were LTC home residents or, if the proportion was lower, presented results for LTC home residents separately. We used the international definition of a nursing home to identify if studies were in LTC homes.[36] Our decision to include studies with at least two-thirds LTC residents rather than only from LTC settings reflected our pragmatic approach to considering findings from other relevant congregate settings and thus providing a comprehensive systematic review. Despite differences in terminology and systems in which they operate, there are commonalities to the settings and populations who live in them. Studies conducted exclusively in other congregate settings (eg, assisted living, hospice, independent living, retirement homes, etc.) were excluded.

2.3.4 | Types of sources

Sources were primary research publications with no language restrictions; however, consistent with COSMIN recommendations, secondary texts, literature reviews, conference abstracts, editorials, and dissertations were excluded.

2.4 | Study selection process

Results were exported from each database into Endnote and were then imported into Covidence for duplicate removal and study selection.

A pilot test screening of 15 papers (titles and abstracts) was conducted to familiarize reviewers with eligibility criteria. Following the pilot test, titles and abstracts were screened, and full-text review was conducted independently by two reviewers (J.B., A.S., or M.L.). Non-English papers were assessed by additional reviewers with relevant language and research expertise. Reasons for exclusion at full-text review were recorded. Reviewers met regularly to compare results. Any disagreements that arose in screening or full-text review were resolved through discussion.

2.5 | Data extraction

Data were extracted independently by two of the three reviewers listed (J.B., A.S., or M.L.) using the COSMIN data collection template (available at: www.cosmin.nl) and a data extraction form which contained the following fields: record ID, author(s), study publication year, study title, population (country, race/ethnicity, inclusion criteria, exclusion criteria, sample size—number of residents and homes, sex, age), measure name, response options, mode of administration, original language, and recall period. Measures were classified as dementia-specific if they were designed exclusively for assessing individuals with dementia or classified as non-dementia-specific otherwise.

2.6 | Assessment of methodological quality and assessment of measurement properties

The psychometric properties of measures identified in included studies were examined using the COSMIN taxonomy of measurement properties: content validity including measure development, structural validity, internal consistency, cross-cultural validity, reliability, measurement error, criterion validity, hypotheses testing for construct validity, and responsiveness.[40] Following COSMIN guidelines,[33] the evaluation of each measurement property comprised three steps.

2.6.1 | Step 1: Evaluating methodological quality of studies against COSMIN standards

Using the COSMIN risk of bias (ROB) checklist, each study was rated as very good, adequate, doubtful, or inadequate for each psychometric property that it reported.[41,42] To determine the overall rating of the methodological quality of each study on a specific measurement property, the lowest rating (ie, "the worst score counts" principle) was used.[41,43]

2.6.2 | Step 2: Evaluating psychometric properties of measures against COSMIN criteria of good measurement properties

Content validity, relevance, comprehensiveness, and comprehensibility were rated using ten criteria for good content validity.[34,44] These ratings were based on methods and results of the measure development study and any content validity studies and then reviewer ratings of the measure content; only those whereby the measure development study and/or one or more content validity studies was located were included in the assessment of content validity.[44] Indirect evidence from studies performed in other, non-LTC populations was not considered because of the unique context in LTC homes. For the reviewer ratings, measures were obtained from the included papers, internet searches, or contact with authors that developed or used the measures (authors were emailed up to five times before search efforts ceased); those that could not be obtained were not rated by reviewers but otherwise retained for assessment of the measure development study or any content validity studies. Acknowledging the diverse and sometimes ambiguous operationalizations and conceptualizations of aspects of social connection,[27] the reviewer ratings of relevance considered the construct of interest as the domain of social connection as defined by the study authors (rather than social connection as a whole)

and comprehensiveness was assessed in this context. Relevance, comprehensiveness, and comprehensibility were then each categorized as sufficient, insufficient, inconsistent, or indeterminate.

Details for the remaining eight measurement properties were extracted, assessed against the COSMIN updated criteria for good measurement properties[33,43] and evaluated as sufficient, insufficient, or indeterminate.

2.6.3 | Step 3: Summarizing and grading the quality of evidence on psychometric properties from multiple studies of the same measure

For content validity, all ratings from the measure development study, any content validity studies, and the reviewers' ratings were summarized to determine overall relevance, comprehensiveness, comprehensibility, and content validity of the measure, based on COSMIN criteria for good content validity and categorized as sufficient, insufficient, or inconsistent.[34,44]

For the remaining eight psychometric properties, ratings were pooled to summarize the overall rating per measurement property for each measure as sufficient, insufficient, inconsistent, or indeterminate.[33,43] If the results were inconsistent, we looked for explanations and summarized results separately per subgroup (eg, mild to severe dementia vs very severe dementia) or per subscale (eg, social relationships and social isolation subscale from the QUALIDEM measure) for consistent results or based the conclusion on the majority (>75%) of consistent results, and downgraded for inconsistency.[43]

The quality of the evidence was graded using a modified Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) approach.[33,43,45] This approach[33,43] considers the ROB (ie, the methodological quality of the studies), inconsistency (ie, unexplained inconsistency of results across studies), imprecision (ie, total sample size of the available studies), and indirectness (ie, evidence from different populations than the population of interest in the review) to provide a rating of the quality of the evidence as follows: *high quality* = "We are very confident that the true measurement property lies close to that of the estimate of the measurement property"; *moderate quality* = "We are moderately confident in the measurement property estimate: the true measurement property is likely to be close to the estimate of the measurement property, but there is a possibility that it is substantially different"; *low quality* = "Our confidence in the measurement property estimate is limited: the true measurement property may be substantially different from the estimate of the measurement property"; and *very low quality* = "We have very little confidence in the measurement property estimate: the true measurement property is likely to be substantially different from the estimate of the measurement property."[33,43] The details on overall relevance, comprehensiveness, and comprehensibility for content validity; overall ratings; and grading quality of evidence for psychometric properties can be found in the COSMIN manuals.[43,44]

2.7 | Recommendation for measures

The overall ratings and quality of evidence for each psychometric property per measure were used to formulate recommendations about the available measures for assessing social connection in LTC residents.[33] The recommendations were classified as follows.[43] Recommendation A was for measures "with evidence for sufficient content validity (any level) AND at least low-quality evidence for sufficient internal consistency. Measures categorized as 'A' can be recommended for use and results obtained with these measures can be trusted." Recommendation B was applied for measures "categorized not in A or C. Measures categorized as 'B' have potential to be recommended for use, but they require further research to assess the quality of these measures." Recommendation C was for measures "with high quality evidence for an insufficient measurement property. Measures categorized as 'C' should not be recommended for use."[43(p45)]

The assessment of methodological quality of included studies and the data extraction for all measurement properties (content validity, structural validity, internal consistency, test-retest reliability, intra-/inter-rater reliability, measurement error, criterion validity, construct validity, and responsiveness) was independently completed by two authors (N.D. and H.C.), who then discussed their results and reached consensus. When unable to reach a consensus, a third author (J.B. or A.S.) was consulted for a final decision.

3 | RESULTS

3.1 | Search results

The searches identified 8753 abstracts (after removing duplicates). Studies were excluded at the screening and review phases if they did not meet criteria for each type of source (ie, primary research publication), construct of interest (ie, study of psychometric properties of a measure of any aspect[s] of social connection), population (ie, older adult residents), and context (ie, some residents in LTC home). Ultimately, 59 studies met the inclusion criteria. Three[46–48] additional studies were identified from other sources including a reference list of included studies. These 62 studies reported and analyzed psychometric properties of 38 measures that were included in this review. The reference list of included studies and identified measures are listed in Appendix D. A PRISMA flowchart of the selection process and reasons for exclusion are presented in Figure 1.

3.2 | Characteristics of included studies and measures

The characteristics of included studies are summarized in Table 1. The studies were conducted between 1979 and 2021, in North America

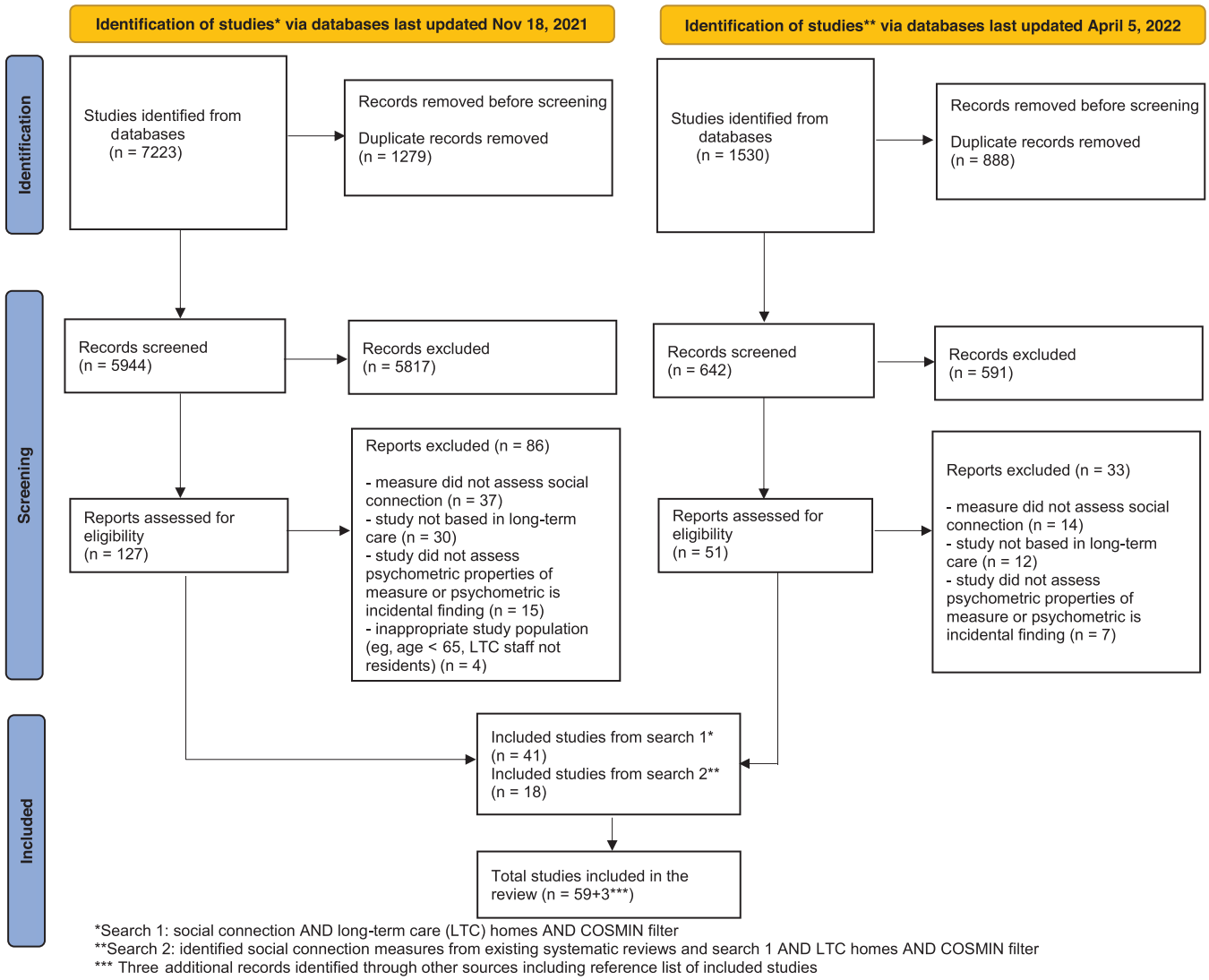

FIGURE 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram showing identification and selection of included studies. COSMIN, COnsensus-based Standards for the selection of health Measurement INstruments.

(*n* = 15), Asia (*n* = 10), Europe (*n* = 29), Australia (*n* = 2), Africa (*n* = 1), South America (*n* = 1), and multiple countries (*n* = 4), and the sample size ranged from 10 to 441,398 LTC residents. Table 2 summarizes the characteristics of the 38 measures included in this review. Of these, 13 were originally developed specifically for people with dementia, and the remaining 25 measures were tested in LTC settings but had not been developed specifically for people with dementia. Among the measures, 17 were exclusively measures of social connection whereas the remaining 21 were multidimensional measures (eg, assessing quality of life) with one or more subscales or standalone items assessing social connection. Of these 21 multidimensional measures, social connection was assessed with one subscale (in 13 measures), two subscales (in 5 measures), or one to four items (in 3 measures). The measures used a range of terms to describe the aspects of social connection that they intended to assess.

3.3 | Methodological quality of the included studies

Some studies measured more than one psychometric property and included more than one measure. These studies were thus rated multiple times for each psychometric property and measure. For all 62 studies, an overview of all methodological quality ratings is displayed in Table 3. Most studies reported on internal consistency (46/62). Some studies reported on hypotheses testing for construct validity (22/62), structural validity (19/62), intra-/inter-rater reliability (19/62), outcome measure development (15/62), and content validity (12/62). Only a small number of studies included psychometric data on test-retest reliability (9/62), measurement error (3/62), responsiveness (2/62), and criterion validity (1/62). No information was reported on cross-cultural validity in any study.

TABLE 1 Characteristics of the included study populations.

Measures	Reference	*N* (number of LTC homes)	Country	Age in years Mean (SD) or range	Gender % female	Race/ethnicity	Eligibility criteria related to dementia/cognition/mental illness
Dementia-specific measures							
ADRQL 47-item version	Gräske, 2014	104 (36)	Germany	79.0 (9.5)	73%	Not reported	Inclusion: cognitive impairment (dementia diagnosis not required)
ADRQL 40-item version	Kasper, 2009	89 (12)	United States	>60%: age 80 or older	>80%	Not reported	Inclusion: AD diagnosis (based on ICD-9 codes from Medicare claims, medical record, or report of diagnosis by family member)
DCM	Sloane, 2007	1683 (73)	United Kingdom, United States	Not reported	Not reported	Not reported	None specified
DQOL	Adler, 2010	486 (12)	United States	83.8 (8.2)	80%	67% white	Inclusion: MMSE score ≥ 11
	Moyle, 2012	61 (4)	Australia	1.6%: 70–75; 11.5%: 76–80; 24.6%: 81–85; 39.3%: 86–90; 18.0%: 91–95; 4.9%: 96+	70%	Not reported	Inclusion: early to mid-stage dementia diagnosis, or probable dementia (MMSE score 10–24); or features consistent with AD as per DSM-IV
EPWDS	Jones, 2018	131 (9)	Australia	83.97 (8.29)	73%	Not reported	Inclusion: dementia diagnosis; RUDAS score 0–23
MEDLO-tool	de Boer, 2016	16 (1)	Netherlands	77	56%	Not reported	None specified
QoL-AD	Hylla, 2016	234 (9)	Germany	83.6 (7.4)	80%	Not reported	Inclusion: FAST score ≥ 2
	Dichter, 2018	73 (8)	Germany	87.38 (7.71)	72%	Not reported	Inclusion: dementia (Dementia Screening Scale score ≥ 3) Exclusion: primary diagnosis of schizophrenia or bipolar disorders
QoL-AD NH (participant)	Cousi, 2021	174 (7)	France	86.6 (7.6)	82%	Not reported	Inclusion: major neurocognitive disorder from mild to moderate stage (MMSE score ≥ 10) Exclusion: excessive cognitive-behavioral problems
QoL-AD NH (proxy)	Dichter, 2018	73 (8)	Germany	87.38 (7.71)	72%	Not reported	Inclusion: dementia (Dementia Screening Scale score ≥ 3) Exclusion: primary diagnosis of schizophrenia or bipolar disorders
QUALID	Mjorud, 2014	661 (16)	Norway	85.34 (8.63)	71%	Not reported	Inclusion: dementia diagnosis; CDR score ≥ 1
	Roen, 2015	222 (7)	Norway	83.2 (7.5) to 84.9 (6.7)	57% to 69%	Not reported	Inclusion: dementia diagnosis; CDR score ≥ 1
	Resnick, 2018	137 (14)	United States	82.00 (11.43)	69%	69% white; 30% black; 1% mixed	Inclusion: cognitive impairment (BIMS score 0–12)
	Leung, 2020	93 (6)	China	88.01 (7.9)	90%	Not reported	Inclusion: dementia diagnosis; severe cognitive impairment (CCDR score 3) Exclusion criteria: diagnosis of bipolar affective disorder or schizophrenia

(Continues)

TABLE 1 (Continued)

Measures	Reference	*N* (number of LTC homes)	Country	Age in years Mean (SD) or range	Gender % female	Race/ethnicity	Eligibility criteria related to dementia/cognition/mental illness
QUALIDEM	Ettema, 2007a	202 (10)	Netherlands	84.69 (6.85)	76%	Not reported	Inclusion: dementia diagnosis
	Ettema, 2007b	238 (10)	Netherlands	84.69 (6.85)	76%	Not reported	Inclusion: dementia diagnosis Exclusion: diminution of consciousness
	Bouman, 2011	973 (40)	Netherlands	82.9 (6.76) to 84.9 (7.33)	71% to 76%	Not reported	Inclusion: dementia diagnosis Exclusion: diminution of consciousness
	Dichter, 2011 ("Social relations" only)	486 (34)	Germany	84.0 (9.0) to 86.0 (8.0)	74% to 79%	Not reported	Inclusion: mild to moderate cognitive impairment (MMSE score $\leq$ 24) Exclusion: diagnosis of schizophrenia or other psychotic disorders
	Dichter, 2013	634 (43)	Germany	85.8 (8.0)	79%	Not reported	Inclusion: mild to moderate cognitive impairment (MMSE score $\leq$ 24, or FAST score $\geq$ 2) Exclusion: diagnosis of schizophrenia or other psychotic disorders
	Dichter, 2014	161 (9)	Germany	84.2 (9) to 85.2 (7)	75% to 91%	Not reported	Inclusion: mild to very severe dementia (FAST score $\geq$ 2)
	Gräske, 2014	104 (36)	Germany	79.0 (9.5)	73%	Not reported	Inclusion: cognitive impairment (dementia diagnosis not required)
	Dichter, 2016	91 (9)	Germany	84.1 (9.4) to 84.7 (8.3)	78% to 92%	Not reported	Inclusion: mild to very severe dementia (dementia diagnosis; FAST score $\geq$ 2)
	Husken, 2019	238 (12)	Germany	82.9 (8.9) to 85.7 (8.5)	71% to 79%	Not reported	Inclusion: dementia diagnosis (FAST score 2–7) Exclusion: diagnosis of schizophrenia or other psychotic disorders
SCI (from MDS)	Bova, 2021	441398 (not reported)	United States	5.4 to 6.5%: 40–64; 11.8 to 13.6%: 65–74; 28.3 to 34.2%: 75–84; 46.2 to 53.1%: > = 85	62% to 77%	6%–7% Hispanic—any race(s); 76%–80% Non-Hispanic white; 11%–14% % Non-Hispanic black; 1%–3% Non-Hispanic Asian; 0.6 to 0.8% non-Hispanic other	Inclusion: Alzheimer's disease and related dementias
SOBRI	Mabire, 2016	56 (1)	France	88.93 (5.65)	89%	Not reported	Inclusion: dementia diagnosis; moderate to moderately severe dementia (MMSE score 9–20)

(Continues)

TABLE 1 (Continued)

Measures	Reference	N (number of LTC homes)	Country	Age in years Mean (SD) or range	Gender % female	Race/ethnicity	Eligibility criteria related to dementia/cognition/mental illness
Non-dementia-specific measures							
ICECAP-O	Makai, 2014	95 (2)	Germany	76.7 (8.5)	57%	Not reported	Inclusion: dementia diagnosis
	Sarabia-Cobo, 2017	217 (8)	Spain	87.05 (5.8)	81%	Not reported	Inclusion: dementia diagnosis with over 6 months of evolution (GDS score 4–6)
InterRAI QOL	Kehyayan, 2015	928 (48)	Canada	80.2 (11.1)	65%	Not reported	Inclusion: mild to moderate cognitive impairment (CPS score 0–3)
	Morris, 2018 ("Social quality" only)	16017 (355)	Belgium, United States, Canada, Estonia, Poland, Czech Republic, Australia, South Africa	Not reported	Not reported	Not reported	Exclusion: severe cognitive impairment (MMSE ≤ 10)
ISE	Mor, 1995	1848 (268)	United States	81.2	74%	Not reported	None specified
LSES	Duffy, 2005	307 (25)	United Kingdom, United States	80.88 (UK); 78.64 (US)	73% (UK); 77% (US)	Not reported	Inclusion: cognitive ability to participate (assessed by staff)
LSNS-R	Munn, 2018	64 (7)	United States	84.24 (7.85)	70%	White 89%	Inclusion: cognitively intact to mild cognitive impairment (assessed by staff)
	Kuru Alici, 2020	120 (1)	Turkey	78.84 (13.21)	64%	Not reported	None specified
LWIG 30-item version	van der Wolf, 2018	295 (15)	Netherlands	69.3 (11.19)	67%	Not reported	Inclusion: cognitive ability to participate (assessed by staff or researcher) Exclusion: dementia diagnosis (other than Korsakov dementia); psychiatric diagnosis
LWIG 19-item version	Schott, 2021	104 (5)	Germany	79.5 (9.11)	55%	Not reported	Inclusion: cognitive ability to participate (assessed by staff)
MOSES	Helmes, 1987	193 (6)	Canada	79.7 (11.3)	70%	97.9% White	None specified
	Pruchno, 1988	536 (1)	United States	86.3	72%	Not reported	None specified
	Diehl, 1997	273 (4)	United States	85 (7.7)	83%	Not reported	None specified
	Bidzan, 2005	43 (1)	Poland	76.72 (11.10)	67%	Not reported	Inclusion: ICD-10 criteria met for dementia diagnosis
NHAS	Lee, 2007	147 (5)	South Korea	12.5% in their 60s; 40.3% in their 70s; 40.3% in their 80s; 6.9% in their 90s	74%	Not reported	Inclusion: cognitive ability to participate (assessed by staff) Exclusion: unconsciousness
	Lee, 2015	193 (6)	United States	79.7 (11.3)	70%	97.9% white; 2.1% non-white	Inclusion: cognitive ability to participate (assessed by staff)
	Xiao, 2019	425 (10)	China	83 (52.3)	63%	Not reported	Exclusion: intellectual impairment (SPMSQ ≥ 3)

(Continues)

TABLE 1 (Continued)

Measures	Reference	*N* (number of LTC homes)	Country	Age in years Mean (SD) or range	Gender % female	Race/ethnicity	Eligibility criteria related to dementia/cognition/mental illness
Nursing Home Care-Related Quality of Life	Cho, 2019	667 (42)	South Korea	81.48 (6.94)	75%	Not reported	Inclusion: normal cognitive function (MMSE (Korean version) ≥ 24)
Nursing Home Outcomes	Kane, 1983	388 (4)	United States	Not reported	Not reported	Not reported	None specified
NHP	van Campen, 1998	243 (11)	Netherlands	74 (men); 80 (women)	66%	Not reported	Inclusion: cognitive ability to participate
	Tabali, 2012	286 (11)	Germany	83.5 (8.8)	69%	Not reported	None specified
	Simon, 2013	145 (7)	Germany	81.8 (10.29)	71%	Not reported	Inclusion: cognitive ability to participate (assessed by staff)
Quality of Life Scale	Kane R.A., 2003	1988 (40)	United States	85.3	77%	Not reported	Exclusion: comatose or in vegetative state
RISE	Gerritsen, 2008	2108 (Netherlands: 10; Canada: not reported)	Netherlands; Canada	Netherland: 80.5 (9.3) Canada: not reported	Netherland: (78%) Canada: not reported	Not reported	None specified
	Yoon, 2017	314 (10)	Korea	8%: <70; 31%: 70–79; 81%: 80+	76%	Not reported	None specified
	Tsuchiya-Ito, 2022	754 (8)	Japan	8.2%: 65–74; 33.2%: 75–84; 58.6%: 85+	78%	Not reported	Exclusion: comatose residents
SyCV-FSAR	Literas, 2010	475 (23)	Spain	82.1 (6.9)	60%	Not reported	Inclusion: no cognitive impairment (MMSE > 23)
Social interaction in elderly people	Frijters, 2003	550 (6)	Netherlands	Not reported	Not reported	Not reported	None specified
Satisfaction measure for elderly residents in Galicia	Iglesias-Souto, 2005	172 (13)	Spain	78.7 (8.8)	60%	Not reported	Inclusion: no cognitive impairment

(Continues)

TABLE 1 (Continued)

Measures	Reference	*N* (number of LTC homes)	Country	Age in years Mean (SD) or range	Gender % female	Race/ethnicity	Eligibility criteria related to dementia/cognition/mental illness
Sociability of Aged Persons	Neubauer, 1979	60 (3)	Germany	81	100%	Not reported	None specified
Social Quality (MDS)	Casten, 1998	733 (1)	United States	84.50 (6.46)	75%	Majority Jewish	None specified
SSAI	Hsu, 2011	10 (1)	Taiwan	79.60 (7.26)	50%	70% ethnically Chinese Province	Inclusion: competent intellectual function (SPMSQ score $\leq$ 3)
SSCII-TR	Senuzun Aykar, 2014	163 (2)	Turkey	76.56 (7.26)	36%	Not reported	None specified
SWON	Gerritsen, 2010	306 (3)	Netherlands	78.7 (range: 24–99)	70%	Not reported	None specified
Time Use (MDS)	Casten, 1998	733 (1)	United States	84.50 (6.46)	75%	Majority Jewish	None specified
	Powell Lawton, 1998	513 (not reported)	United States	86.12 (6.42) to 88.3 (5.53)	70% to 83%	Not reported	Inclusion: dementia diagnosis
WHOQOL-BREF	Lai, 2005	465 (62)	Taiwan	77.9 (7.2)	51%	Not reported	Inclusion: cognitive ability to participate (assessed by staff) Exclusion: unconsciousness
	Cardona-Aria, 2009	220 (4)	Colombia	76.7 (9.2)	56%	Not reported	Exclusion: presentation of cognitive-mental alterations
WHOQOL-OLD	van Biljon, 2015	176 (not reported)	South Africa	77 (8.1)	72%	Majority white South African	Exclusion: inability to give informed consent

Note: Bibliographic data for references in the table that are not included in the article are listed in Appendix D.

Abbreviations: AD, Alzheimer's disease; ADRQL, Alzheimer's Disease Related Quality of Life; BIMS, Brief Interview for Mental Status; CCDR, Chinese Clinical Dementia Rating; CDR, Clinical Dementia Rating; CPS, Cognitive Performance Scale; DCM, Dementia Care Mapping; DQOL, Dementia Quality of Life; DSM, Diagnostic and Statistical Manual of Mental Disorders; EPWDS, Engagement of a Person with Dementia Scale; FAST, Functional Assessment Staging Tool; GDS, Global Deterioration Scale; ICD-9, International Classification of Diseases, Ninth Revision; ICECAP-O, ICEpop CAPability measure for Older people; InterRAI QOL, InterRAI Self-Report Nursing Home Quality of Life Survey; ISE, Index of Social Engagement; LSES, Life Satisfaction in the Elderly Scale; LSNS-R, Lubben Social Network Scale Revised; LTC, long-term care; LWIG, Laurens Well-Being Inventory for Gerontopsychiatry; MDS, Minimal Data Set; MEDLO-tool, Maastricht Electronic Daily Life Observation tool; MMSE, Mini-Mental State Exam; MOSES, Multidimensional Observational Scale for Elderly Subjects; NHAS, Nursing Home Adjustment Scale; NHP, Nottingham Health Profile; QoL-AD, Quality of Life Alzheimer's Disease; QoL-AD NH, QoL-AD Nursing Home version; QUALID, Quality of Life in Late-Stage Dementia; RISE, Revised Index of Social Engagement; RUDAS, Rowland Universal Dementia Assessment Scale; SD, standard deviation; SCI, Social Connectedness Index; SOBRI, Social Observation Behaviors Index; SPMSQ, Short Portable Mental Status Questionnaire; SSAI, Socially Supportive Activity Inventory; SSCII-TR, Support Scale in Chronic Diseases-Turkish; SWON-scale, Social Well-being Of Nursing home residents-scale; SyCV-FSAR, SAR Foundation's Satisfaction and Quality of Life Scale; WHOQOL-BREF, World Health Organization Quality of Life; WHOQOL-OLD, World Health Organization's Quality of Life Questionnaire–version for older people.

TABLE 2 Characteristics of the included outcome measures.

Measure (acronym)	Date that scale was originally published	Mode of administration	Social connection (sub)scale(s) (number of items)	Response options/scoring	Recall period	Original language (available translations)
Dementia-specific measures						
Alzheimer's Disease Related Quality of Life-47 item version (ADRQL-47 item version)	1999	Proxy-reported (Family caregivers and LTC staff	Social interaction (12 items), awareness of self (8 items)	Dichotomous items (agree/disagree) with higher scores indicating greater quality of life	2 weeks	English
Alzheimer's Disease Related Quality of Life-40 item version (ADRQL-40 item version)	2009	Proxy-reported (Family caregivers and LTC staff)	Social interaction (12 items), awareness of self (8 items)	Dichotomous items (agree/disagree) with higher scores indicating greater quality of life	2 weeks	English
Dementia Care Mapping (DCM)	Unknown	Observer-reported	Articulation, borderline, cool, unresponded to	Two categories (high potential for wellbeing and low potential for wellbeing)	6-h observation period with scoring at 5-min intervals	English
Dementia Quality of Life (DQOL)	1999	Self-reported	Feelings of belonging (3 items)	5-point Likert scale with higher scores indicating greater quality of life	Recently	English
Engagement of a Person with Dementia Scale (EPWDS)	2018	Observer-reported	Social engagement (2 items)	5-point Likert with higher scores indicating greater engagement	10 min (observation period)	English
Maastricht Electronic Daily Life Observation tool (MEDLO-tool)	2016	Observer-reported	Social interaction (3 items)	5 category options for each item	20 min (observation period)	English
Quality of Life Alzheimer's Disease (QoL-AD)	1999	Self-reported/proxy-reported (nursing professionals and caregivers)	Living situation, family, marriage, friends (4 items)	4-point Likert scale with higher scores indicating greater quality of life	Lately	English (German)
QoL-AD Nursing Home version (QoL-AD NH) – Participant	2005	Self-reported	Intra & interpersonal environment-related QoL (8 items)	4-point Likert type scale with higher scores indicating greater quality of life	Not reported	English (French)
QoL-AD Nursing Home version (QoL-AD NH) – Proxy	2005	Proxy-reported (nursing staff)	Living situation, family, friends, people who work here (4 items)	4-point Likert type scale with higher scores indicating greater quality of life	Not reported	English (German)
Quality of Life in Late-Stage Dementia (QUALID)	2000	Proxy-reported (family or professional caregiver)	Social interaction (1 item)	5-point Likert scale with lower scores indicating greater quality of life	1 week	English (Norwegian, Chinese)

(Continues)

TABLE 2 (Continued)

Measure (acronym)	Date that scale was originally published	Mode of administration	Social connection (sub)scale(s) (number of items)	Response options/scoring	Recall period	Original language (available translations)
QUALIDEM	2007	Proxy-reported (LTC staff)	Social relations (6 items)[a]; Social isolation (3 items)	4-point Likert scale with higher scores indicating greater quality of life	2 weeks	Dutch
Social Connectedness Index (SCI) (from MDS 3.0)	2021	Proxy-reported (LTC staff)	5 items	Dichotomous items with higher scores indicating greater social connectedness	Not reported	English
Social Observation Behaviors Index (SOBRI)	2016	Observer-reported	126 behaviors assigned to 4 categories	Dichotomous items (yes/no)	Not reported	French
Non-dementia-specific measures						
ICEpop CAPability measure for Older people (ICECAP-O)	2008	Self-reported/proxy-reported (nursing professionals)	Love and friendship (4 items)	4-point Likert scale with higher scores indicating greater love and friendship	At the moment	English (German, Spanish)
InterRAI Self-Report Nursing Home Quality of Life Survey (InterRAI QOL)	2009	Self-reported	Staff-resident bonding (5 items), personal relationships (5 items)	4-point Likert scale with higher scores indicating greater quality of life	Not reported	English
Index of Social Engagement (ISE)	1990	Proxy-reported (nursing staff)	6 items	Dichotomous items (yes/no) indicating presence or absence of social behaviors	Not reported	English
Life Satisfaction in the Elderly Scale (LSES)	1994	Self-reported	Social contact (5 items)	5-point Likert type scale with higher scores indicating greater life satisfaction	Not reported	English
Lubben Social Network Scale-Revised (LSNS-R)	1988	Self-reported	family (6 items), resident friends (6 items), staff (5 items), non-resident friends (6 items)	5-point Likert scale with higher scores indicating greater social engagement	Not reported	English
30-item version Laurens Well-Being Inventory for Gerontopsychiatry (LWIG-30 item version)	2018	Self-reported	Social wellbeing (13 items)	4-point Likert scale with higher scores indicating greater wellbeing	1 week	Dutch
Laurens Well-being Inventory for Gerontopsychiatry (LWIG-19 item version)	2021	Self-reported	Social wellbeing (11 items)	4-point Likert scale with higher scores indicating greater wellbeing	1 week	Dutch (German)

(Continues)

TABLE 2 (Continued)

Measure (acronym)	Date that scale was originally published	Mode of administration	Social connection (sub)scale(s) (number of items)	Response options/scoring	Recall period	Original language (available translations)
Multidimensional Observation Scale for Elderly Subjects (MOSES)	1987	Observer-reported	Withdrawal (5 items)	4- or 5-point Likert scale with higher scores indicating greater impairment	1 week	English (Polish, German)
Nursing Home Adjustment Scale (NHAS)	2007	Self-reported	Relationship development (7 items)	5-point Likert scale with higher scores indicating greater levels of adjustment	Not reported	Korean (Chinese)
Nursing Home Care-related Quality of Life Scale	2019	Self-reported	Social interaction (4 items)	Dichotomous items (yes/no) with higher scores indicating greater quality of life	Not reported	Korean
Nursing home outcomes	1983	Self-reported	Social Contact (5 items)	0–6 indicating frequency of participation	Not reported	English
Nottingham Health profile (NHP)	1980	Self-reported	Social isolation (5 items)	Dichotomous items (yes/no) with lower scores indicating greater quality of life	Not reported	English (German, Dutch)
Quality of Life scale	Unknown	Self-reported	Relationships (5 items)	4-point Likert scale and dichotomous items (yes/no)	Not reported	English
Revised Index for Social Engagement (RISE)	1995	Proxy-reported (clinician)	6 items	6-point Likert scale with higher scores representing greater social engagement	3 days	English (Dutch, Korean, Japanese)
SAR Foundation's Satisfaction and Quality of Life Scale (SyCV-FSAR)	2010	Self-reported	Interpersonal relationships (7 items)	Dichotomous items (yes/no)	Not reported	Spanish
Social interaction in elderly people	2001	Proxy-reported (LTC staff)	Item form 2 (27 items)	Not reported	Not reported	Dutch
Satisfaction measure for elderly residents in Galicia	2005	Self-reported	Social interaction (4 items)	5-point Likert scale	Not reported	Spanish
Sociability of Aged Person	1979	Self-reported/proxy-reported (LTC staff)	Sociability (12 items)	Dichotomous items (yes/no)	Not reported	German
Social Quality (MDS)	1992	Proxy-reported (LTC staff)	Social quality (6 items)	Dichotomous items (yes/no)	1 week	English

(Continues)

TABLE 2 (Continued)

Measure (acronym)	Date that scale was originally published	Mode of administration	Social connection (sub)scale(s) (number of items)	Response options/scoring	Recall period	Original language (available translations)
Socially Supportive Activity Inventory (SSAI)	2011	Self-reported	8 categories of SSAs, 3 components for each: frequency, meaningfulness, enjoyment in participation	Frequency: 9-point ordinal scale; meaningfulness and enjoyment: 4-point Likert scale with higher scores indicating more frequent participation, greater life meaning and greater enjoyment in activity participation	Not reported	Chinese
Social Support in Chronic Diseases-Turkish (SSCII-TR)	1990	Self-reported	Positive social interaction (5 items)	6-point Likert scale with higher scores indicating more positive social support	Not reported	English (Turkish)
Social Well-being Of Nursing home residents-scale (SWON)	2010	Proxy-reported (nursing staff)	Affection (3 items), behavioral confirmation (3 items), status (3 items)	5-point Likert scale and dichotomous items (yes/no) response options with higher scores indicating greater social wellbeing	3 months	Dutch
Time Use (MDS)	1990	Proxy-reported (LTC staff)	Time use (7 items)	Dichotomous items (yes/no) and 4-point decision-making skill item	Not reported	English
World Health Organization Quality of Life (WHOQOL-BREF)	1998	Self-reported	Social relationships (3 items)	5-point Likert type scale with higher scores indicating greater quality of life	2 weeks	English (Chinese, Spanish and 18 other languages)
World Health Organization's Quality of Life Questionnaire-version for older people (WHOQOL-OLD)	2005	Self-reported	Social participation (4 items) and intimacy (4 items)	5-point Likert scale with higher scores indicating greater quality of life	2 weeks	English

Abbreviations: LTC, long-term care; MDS, Minimal Data Set.

[a]Social relation (three items) for people with very severe dementia.

TABLE 3 Methodological quality assessment of the included studies per measurement property and outcome measure.

Measure [subscale or item]	Reference (first author year)	Measurement properties									
		Measure development	Content validity	Structural validity	Internal consistency	Test retest reliability	Inter/intra rater reliability	Measurement error	Criterion validity	Hypotheses testing	Responsiveness
Dementia-specific measures/subscales/items											
ADRQL-47 item version [Social interaction; Awareness of self]	Gräske, 2014				Very good					Doubtful (known group validity	
ADRQL-40 item version [Social interaction; Awareness of self]	Kasper, 2009				Very good						
DCM [Items: Articulation, Borderline, Cool, Un-responded to]	Sloane, 2007							Doubtful			
DQOL [Feelings of belonging]	Adler, 2010			Doubtful	Very good	Adequate			Inadequate		
	Moyle, 2012				Very good					Very good (convergent), Adequate (known group)	
EPWDS [Social engagement]	Jones, 2018	Inadequate	Adequate			Doubtful	Doubtful			Adequate (convergent), doubtful (discriminant)	
MEDLO-tool [Social interaction]	de Boer, 2016	Inadequate	Adequate				Adequate	Doubtful			
QoL-AD [Items: living situation; family; marriage; friends]	Hylla, 2016 Dichter, 2018				Very good		Adequate				
QoL-AD NH (participant) [Intra & interpersonal environment-related QoL]	Cousi, 2021				Very good					Very good	
QoL-AD NH (proxy) [Items: living situation; family; staff; friends]	Dichter, 2018						Adequate				

(Continues)

TABLE 3 (Continued)

Measure [subscale or item]	Reference (first author year)	Measurement properties									
		Measure development	Content validity	Structural validity	Internal consistency	Test retest reliability	Inter/intra rater reliability	Measurement error	Criterion validity	Hypotheses testing	Responsiveness
QUALID [Item: social interaction]	Mjorud, 2014									Doubtful	
	Roen, 2015					Adequate					
	Resnick, 2018			Doubtful							
	Leung, 2020		Doubtful			Adequate	Adequate				
QUALIDEM [Social relations; Social isolation]	Ettema, 2007a									Very good (convergent); doubtful (discriminative)[c]	
	Ettema, 2007b	Inadequate		Inadequate	Very good		Adequate				
	Bouman, 2011			Inadequate			Doubtful				
	Dichter, 2011				Very good						
	Dichter, 2013			Doubtful	Very good						
	Dichter et al., 2014						Doubtful				
	Gräske, 2014				Very good					Doubtful	
	Dichter, 2016				Very good		Adequate				
	Husken, 2019				Very good					Very good	
SCI	Bova, 2021	Inadequate	Adequate	Adequate	Very good						Doubtful
SOBRI	Mabire, 2016	Inadequate		Inadequate	Very good						
Non-dementia-specific measures/subscales/items											
ICECAP-O [Love and friendship (also called attachment)]	Makai, 2014									Very good (Convergent validity)	
	Sarabia-Cobo, 2017									Very good (Convergent validity)	
InterRAI QOL [Staff-resident bonding; Personal relationships]; [Social life scale][a]	Kehyayan, 2015 Morris, 2018[b]				Very good Very good						
ISE	Mor, 1995			Doubtful	Very good					Inadequate	Doubtful
LSES	Duffy, 2005				Very good						

(Continues)

TABLE 3 (Continued)

Measure [subscale or item]	Reference (first author year)	Measurement properties									
		Measure development	Content validity	Structural validity	Internal consistency	Test retest reliability	Inter/intra rater reliability	Measurement error	Criterion validity	Hypotheses testing	Responsiveness
LSNS-R	Munn, 2018	Inadequate	Doubtful		Very good			Inadequate			
	Kuru Alici, 2020		Doubtful	Very good	Very good	Adequate					
LWIG-30 item version [Social wellbeing]	van der Wolf, 2018	Doubtful			Very good					Very good (convergent); very good (known group)	
LWIG-19 item version [Social wellbeing]	Schott, 2021			Doubtful	Very good					Very good (convergent, discriminant, known group)	
MOSES [Withdrawal]	Helmes, 1987				Very good		doubtful				
	Pruchno, 1988				Very good						
	Diehl, 1997				Very good						
	Bidzan, 2005				Very good	Doubtful	Doubtful				
NHAS [Relationship development]	Lee, 2007	Inadequate			Very good						
	Lee, 2015				Very good						
	Xiao, 2019				Very good					Inadequate (convergent), adequate (discriminant)	
Nursing Home Care-related Quality of Life Scale [Social interaction]	Cho, 2019	Inadequate	Doubtful	Very good	Very good						
Nursing Home Outcomes [Social contact]	Kane, 1983	Inadequate		Doubtful	Doubtful	Doubtful					
NHP [Social isolation]	van Campen, 1998				Doubtful					Doubtful	
	Tabali, 2012				Very good		Adequate				
	Simon, 2013				Very good					Inadequate	
Quality of Life Scale [Relationships]	Kane R.A., 2003				Very good					Very good	

(Continues)

TABLE 3 (Continued)

Measure [subscale or item]	Reference (first author year)	Measurement properties									
		Measure development	Content validity	Structural validity	Internal consistency	Test retest reliability	Inter/intra rater reliability	Measurement error	Criterion validity	Hypotheses testing	Responsiveness
RISE	Gerritsen, 2008	Inadequate	Doubtful	Adequate	Very good		Doubtful			adequate	
	Yoon, 2017			Very good	Very good		Doubtful			adequate	
	Tsuchiya-Ito, 2022			Very good	Very good						
SyCV-FSAR	Literas, 2010	Doubtful			Very good						
Social interaction in elderly people [Item 2]	Frijters, 2003						Doubtful				
Satisfaction measure for elderly residents in Galicia [Social interaction]	Iglesias-Souto, 2005	Inadequate	Doubtful		Very good						
Sociability of Aged Persons	Neubauer, 1979						Inadequate				
Social Quality (MDS)	Casten, 1998			Doubtful			Doubtful				
SSAI	Hsu, 2011	Inadequate	Doubtful			Doubtful					
SSCII-TR	Senuzun Aykar, 2014		Doubtful	Doubtful	Very good						
SWON-scale	Gerritsen, 2010	Inadequate	Doubtful	Adequate	Very good	Adequate	Adequate				
Time Use (MDS)	Casten, 1998			Doubtful	Very good		Doubtful				
	Powell Lawton, 199									Adequate	
WHOQOL-BREF	Lai, 2005				Very good					Inadequate (convergent), doubtful (discriminant)	
	Cardona-Aria, 2009				Very good					Doubtful	
WHOQOL-OLD [Social participation; Intimacy]	van Biljon, 2015				Very good						

Abbreviations: ADRQL, Alzheimer's Disease Related Quality of Life; DCM, Dementia Care Mapping; DQOL, Dementia Quality of Life; EPWDS, Engagement of a Person with Dementia Scale; ICECAP-O, ICEpop CAPability measure for Older people; InterRAI QOL, InterRAI Self-Report Nursing Home Quality of Life Survey; ISE, Index of Social Engagement; LSES, Life Satisfaction in the Elderly Scale; LSNS-R, Lubben Social Network Scale Revised; LTC, long-term care; LWIG, Laurens Well-Being Inventory for Gerontopsychiatry; MDS, Minimal Data Set; MEDLO-tool, Maastricht Electronic Daily Life Observation tool; MOSES, Multidimensional Observational Scale for Elderly Subjects; NHAS, Nursing Home Adjustment Scale; NHP, Nottingham Health Profile; QoL-AD, Quality of Life Alzheimer's Disease; QoL-AD NH, QoL-AD Nursing Home version; QUALID, Quality of Life in Late-Stage Dementia; RISE, Revised Index of Social Engagement; SyCV-FSAR, SAR Foundation's Satisfaction and Quality of Life Scale; SCI, Social Connectedness Index; SOBRI, Social Observation Behaviors Index; SSAI, Socially Supportive Activity Inventory; SSCII-TR, Social Support Scale in Chronic Diseases-Turkish; SWON-scale, Social Well-being Of Nursing home residents-scale; WHOQOL-BREF, World Health Organization Quality of Life; WHOQOL-OLD, World Health Organization's Quality of Life Questionnaire – version for older people.

[a] Methodological quality completed only on social relation subscale.

[b] Methodological quality completed for only social life subscale.

[c] Applicable only for patients with mild to severe dementia.

The majority (44/62) of the studies received adequate or very good ratings for internal consistency. Very few studies were rated as adequate or very good for hypothesis testing (12/62), intra-/inter-rater reliability (8/62), structural validity (7/62), test-retest reliability (5/62), or content validity (3/62). None of the studies were rated as adequate or very good for measure development, measurement error, criterion validity, and responsiveness.

The quality rating for results of single studies on content validity (relevance, comprehensiveness, and comprehensibility) and other measurement properties for each measure are presented in Appendixes E and F, respectively (from Step 2). Of those studies that were included in the content validity analysis, only the Nursing Home Outcomes scale could not be located and thus reviewer ratings were not given for this measure.

3.4 | Overall ratings and quality of evidence

Table 4 presents the overall ratings and the grades for quality of evidence (from Step 3) for content validity evaluated for each measure. The overall ratings and grades for quality of evidence (from Step 3) for all other measurement properties and recommendations for use for each measure are presented in Table 5. The details on overall rating and quality of evidence for each measure are listed in Appendix G.

Of the 17 measures identified which reported content validity, only the Laurens Well-Being Inventory for Gerontopsychiatry (LWIG) 30 item version: Social wellbeing subscale received sufficient rating for all of relevance, comprehensiveness, comprehensibility, and content validity. However, the quality of evidence for content validity of the LWIG-30 item version: Social wellbeing subscale was low. The Nursing Home Outcomes: Social contact was the only measure that received an indeterminate rating for overall content validity and the remainder received inconsistent ratings for overall content validity. The Revised Index of Social Engagement (RISE) achieved high-quality evidence for sufficient rating on structural validity, internal consistency, and construct validity. Similarly, the Lubben Social Network Scale Revised (LSNS-R) achieved high-quality evidence for sufficient rating on structural validity and internal consistency. Other measures achieved high-quality evidence for sufficient structural validity (Nursing Home Care-Related QoL Scale: social interaction subscale), sufficient internal consistency (Index of Social Engagement [ISE]), or sufficient construct validity (ICEpop CAPability measure for Older people [ICECAP-O]: love and friendship subscale; LWIG-30 item version, Quality of Life Scale: relationships subscale).

For dementia specific measures/subscales, the social relations and social isolation subscales of QUALIDEM exhibited high-quality evidence for sufficient intra-/inter-rater reliability. Additionally, the social relations subscale achieved high-quality evidence for sufficient construct validity for people with dementia irrespective of severity. The social isolation subscale achieved high-quality evidence for sufficient construct validity for people with mild to severe dementia.

TABLE 4 Content validity rating of outcome measures assessing social connection in long-term care homes.

	Relevance		Comprehensiveness		Comprehensibility	
Measure [Subscale or item]	Overall rating	Quality of evidence	Overall rating	Quality of evidence	Overall rating	Quality of evidence
Dementia-specific measures/subscales/items						
EPWDS [Social engagement]	+	High	±	Very low	±	Very low
MEDLO-tool [Social interaction]	+	High	±	Low	±	Very low
QUALID [Item: social interaction]	±	Low	+	Moderate	±	Very low
QUALIDEM [Social relations; Social isolation]	+	Moderate	±	Low	±	Very low
SCI (from MDS)	±	Moderate	±	Very low	±	Very low
SOBRI	+	Moderate	+	Moderate	±	Very low
Non-dementia-specific measures/subscales/items						
LSNS-R	+	Moderate	+	Moderate	±	Low
LWIG-30 item version [Social wellbeing]	+	Moderate	+	Low	+	Low
NHAS [Relationship development]	+	Moderate	±	Low	±	Very low
Nursing Home-Care Related Quality of Life [Social interaction]	+	Moderate	+	Moderate	+	Moderate
Nursing Home Outcomes [Social contact]	±	Low	?	Very low	?	Very low
RISE	+	Moderate	+	Very low	±	Very low
SyCV-FSAR	±	Very low	±	Very low	±	Very low
Satisfaction measure for elderly residents in Galicia[Social interaction]	+	Moderate	+	Moderate	+	Moderate
SSAI	+	Moderate	+	Moderate	±	Very low
SSCII-TR	±	Moderate	±	Very low	±	Very low
SWON-scale	+	Moderate	+	Moderate	±	Low

Notes: sufficient (+); insufficient (−); inconsistent (±); indeterminate (?).
Abbreviations: EPWDS, Engagement of a Person with Dementia Scale; LSNS-R, Lubben Social Network Scale Revised; LTC, long-term care; LWIG, Laurens Well-Being Inventory for Gerontopsychiatry; MEDLO-tool, Maastricht Electronic Daily Life Observation tool; NHAS, Nursing Home Adjustment Scale; QUALID, Quality of Life in Late-Stage Dementia; RISE, Revised Index of Social Engagement; SyCV-FSAR, SAR Foundation's Satisfaction and Quality of Life Scale; SCI, Social Connectedness Index; SOBRI, Social Observation Behaviors Index; SSAI, Socially Supportive Activity Inventory; SSCII-TR, Social Support Scale in Chronic Diseases-Turkish; SWON-scale, Social Well-being of Nursing home residents-scale.

3.5 | Recommendation for measures

None of the measures/subscales reported overall ratings for all psychometric properties. Further, none of the measures were found to be most suitable (Recommendation A). We found 34 measures/subscales that have potential to be recommended for use (Recommendation B),

TABLE 5 Overall rating for each measurement properties and quality of evidence per outcome measure.

Measure [Subscale or item]	Structural validity		Internal consistency		Test retest reliability		Inter/intra rater reliability		Measurement error		Criterion validity		Hypotheses testing		Responsiveness		
Dementia-specific measures/subscales/items	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Recommendation
ADRQL-47 item version [Social interaction; Awareness of self]			?	H									?	L			B
ADRQL-40 item version [Social interaction; Awareness of self]			?	M													B
Dementia Care Mapping [Items: Articulation, Borderline, Cool, Un-responded to]									?	L							B
DQOL [Feelings of belonging]	+	L	–	H	?	M					?	VL	?	L			C
EPWDS [Social engagement]					?	L	+	L					+	L			B
MEDLO-tool [Social interaction]							±	VL	?	VL							B
QoL-AD			?	H			–	L									B
QoL-AD NH (participant)			?	H									+	L			B
QoL-AD NH (proxy) [Items: living situation; family; staff; friends]							–	L									B
QUALID	–	L			±	VL	+	L					?	L			B
QUALIDEM [Social relations; Social isolation]	?	L	?	H			+	H					+[a]	H			B

(Continues)

TABLE 5 (Continued)

Measure [Subscale or item]	Structural validity		Internal consistency		Test retest reliability		Inter/intra rater reliability		Measurement error		Criterion validity		Hypotheses testing		Responsiveness		
Dementia-specific measures/subscales/items	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Recommendation
SCI	?	M	?	H											?	L	B
SOBRI	?	VL	?	M													B
Non-dementia-specific measures/ subscales/items																	
ICECAP-O [Love and friendship]													+	H			B
InterRAI QOL [Staff-resident bonding; Personal relationships]			?	H													B
ISE	+	L	+	H									?	VL	?	L	B
LSES			?	H													B
LSNS-R	+	H	+	H	+	M			?	VL							B
LWIG-30 item version [Social wellbeing]			?	H									+	H			B
LWIG-19 item version [Social wellbeing]	?	L	?	H									–	H			B
MOSES [Withdrawal]			?	H	?	VL											B
NHAS [Relationship development]			–	H									?	VL			B
Nursing Home Care-Related QoL Scale [Social interaction]	+	H	–	H													C
Nursing Home Outcomes [Social contact]	?	L	?	L	–	L											B

(Continues)

TABLE 5 (Continued)

Measure [Subscale or item]	Structural validity		Internal consistency		Test retest reliability		Inter/intra rater reliability		Measurement error		Criterion validity		Hypotheses testing		Responsiveness		
Dementia-specific measures/subscales/items	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Overall Rating	QOE	Recommendation
NHP [Social isolation]			–	H			+	M					?	L			C
Quality of Life Scale [Relationships]			?	H									+	H			B
RISE	+	H	+	H			+	M					+	H			B
SyCV-FSAR			?	H													B
Social interaction in elderly people measure [Item 2]							±	VL									B
Satisfaction measure for elderly residents in Galicia [Social interaction]			?	H													B
Sociability of Aged Persons							?	VL									B
Social Quality (MDS)	?	L					?	VL									B
SSAI					?	VL											B
SSCII-TR	?	L	–	H													C
SWON-scale	?	M	?	H	+	M	–	M									B
Time Use (MDS)	–	L	?	H			+	L					–	M			B
WHOQOL—BREF			?	H									?	L			B
WHOQOL- OLD [Social participation; Intimacy]			?	H													B

Notes: sufficient (+); insufficient (–); inconsistent (±); indeterminate (?); high (H); moderate (M); low (L); very low (VL). Measures that have potential to be recommended for use, but they require further research to assess the quality of these measures (Recommendation B); measures that should not be recommended for use (Recommendation C).

Abbreviations: ADRQL, Alzheimer's Disease Related Quality of Life; DCM, Dementia Care Mapping; DQOL, Dementia Quality of Life; EPWDS, Engagement of a Person with Dementia Scale; ICECAP-O, ICEpop CAPability measure for Older people; InterRAI QOL, InterRAI Self-Report Nursing Home Quality of Life Survey; ISE, Index of Social Engagement; LSES, Life Satisfaction in the Elderly Scale; LSNS-R, Lubben Social Network Scale Revised; LWIG, Laure's Well-Being Inventory for Gerontopsychiatry; MDS, Minimal Data Set; MEDLO tool, Maastricht Electronic Daily Life Electronic Tool; MOSES, Multidimensional Observational Scale for Elderly Subjects; NHAS, Nursing Home Adjustment Scale; NHP, Nottingham Health Profile; QoL-AD, Quality of Life Alzheimer's Disease; QoL-AD NH, QoL-AD Nursing Home version; QUALID, Quality of Life in Late-Stage Dementia; QOE, quality of evidence; RISE, Revised Index of Social Engagement; SyCV-FSAR, SAR Foundation's Satisfaction and Quality of Life Scale; SCI, Social Connectedness Index; SOBRI, Social Observation Behaviors Index; SSAI, Socially Supportive Activity Inventory; SSCII-TR, Social Support Scale in Chronic Diseases-Turkish; SWON-scale, Social Well-being Of Nursing home residents-scale; WHOQOL-BREF, World Health Organization Quality of Life; WHOQOL-OLD, World Health Organization's Quality of Life Questionnaire – version for older people.

[a] Except for social isolation subscale for people with very severe dementia where ROB = ± and LOE = M.

but they still require further validation studies to assess their quality. Four measures—Dementia Quality of Life (DQOL), Nursing Home Care-Related QoL Scale, Nottingham Health Profile (NHP), and Support Scale in Chronic Diseases-Turkish (SSCII-TR)—were not recommended for use for assessment of social connection (Recommendation C).

4 | DISCUSSION

This study identified 38 measures that have been used to assess social connection in LTC residents. None of the measures received sufficient overall rating for content validity (each of relevance, comprehensiveness, and comprehensibility) along with sufficient internal consistency and thus none can be currently recommended for use. However, 34 measures were categorized as promising but require further psychometric evaluation.

4.1 | Methodological quality of the included studies

The 15 studies of measure development identified in our review received either doubtful or inadequate methodological quality ratings; frequently authors did not clearly describe the origin of the construct to be measured and there was no clear rationale, theory, or conceptual model provided. Also, most measure development studies used only survey methods for concept elicitation; cognitive interview or other pilot testing using appropriate qualitative methods were not conducted to evaluate comprehensibility and comprehensiveness. Findings from content validity studies further suggested that comprehensiveness of the final version of the measures was assessed only by professionals (not by residents) and similarly relevance and comprehensibility were rarely evaluated by the residents. For only three measures (Engagement of a Person with Dementia Scale [EPWDS]: Social engagement subscale, Maastricht Electronic Daily Life Observation tool [MEDLO-tool]: Social interaction subscale, Social Connectedness Index [SCI]), researchers asked professionals regarding the relevance of each item using appropriate methodology[33] and thus could be rated as having adequate content validity.

For structural validity, studies received very good or adequate methodological quality rating for only five measures (SCI, LSNS-R, Nursing Home-Care Related Quality of Life: Social interaction subscale, RISE, Social Well-being Of Nursing home residents-scale [SWON-scale]). The doubtful or inadequate rating for the studies from the remaining measures related to not using factor analysis or item response theory-based analysis for testing the hypothesized factor structure[41] or issues in the design or statistical methods of the study.[43]

None of the measures/subscales reported all three aspects of reliability (ie, internal consistency, reliability, and measurement error).[40] The methodological quality of studies reporting on internal consistency was rated as very good for 26 measures but two measures received doubtful rating due to their methodological and statistical approaches, such as using item-total correlation instead of Cronbach's alpha for internal consistency. For test-retest reliability, the methodological quality of included studies was rated as very good for four measures (DQOL: Feelings of belonging; Quality of Life in Late-Stage Dementia [QUALID]: Social interaction item, LSNS-R, SWON-scale) and doubtful for another four measures. Similarly, studies on five measures (MEDLO-tool: Social interaction subscale, Quality of Life Alzheimer's Disease (QoL-AD) participant, QoL-AD Nursing Home version (QoL-AD NH) proxy, QUALID: Social interaction item, NHP: Social isolation subscale) received adequate methodological quality rating and studies on eight measures received either doubtful or inadequate rating for intra-/inter-rater reliability. Doubtful or inadequate methodological quality ratings for reliability reporting were either due to the test-retest time interval used in the studies not being stated or being outside the test-retest interval recommended by COSMIN guidelines,[33] or studies not reporting clearly on whether test conditions were similar and if study participants were stable. Despite the clinical relevance of measurement error as a means to sensitively detect the minimal important change,[39,40] only three studies reported measurement error and received either doubtful or inadequate rating for the methodological quality as the time interval between the test-retest assessments was either not stated or not within the acceptable range.

Only one measure (DQOL: Feelings of belonging subscale) reported criterion validity and the study methodological quality was rated inadequate. The hypothesis testing studies of construct validity were rated as very good or adequate. The doubtful to inadequate rating in other studies was related to either insufficient measurement properties of comparator instrument or poor description for the subgroups. Only two measures (SCI, ISE) reported responsiveness, and both studies were rated as doubtful for study quality due to methodological flaws in design and statistical methods.

4.2 | Overall rating, quality of evidence, and recommendation for measures

Among all 17 measures evaluated for overall rating for content validity, the LWIG-30 item version: Social wellbeing subscale was the only measure with sufficient content validity, and the remaining measures received either inconsistent or indeterminate overall rating. However, the quality of evidence for content validity for this subscale was low as the measure development study received a doubtful rating and there were no additional content validity studies. The lack of studies assessing content validity of other measures—a fundamental property of good measurement—reflected the uncertainty of which specific

aspects of social connection these measures actually assess. Further, this could be related to the large number of measures included in our review that covered social connection as subscales or items,[49] in which case direct assessment of social connection was not the focus of the measure and thus received less attention in methods and reporting. While there was scant evidence for content validity, none of the measures had high-quality evidence of insufficient content validity; with this absence of evidence, the remaining measurement properties were evaluated.

Only three measures were found to have high-quality evidence for each of sufficient structural validity (Nursing Home Care-Related QoL Scale: Social interaction subscale, LSNS-R, RISE) and internal consistency (ISE, LSNS-R, RISE). Nursing Home Care-Related QoL Scale: Social interaction subscale displayed high-quality evidence for sufficient structural validity but insufficient rating for internal consistency as per the COSMIN quality criterion of Cronbach's alpha ≥ 0.70.[50] In comparison, ISE had sufficient structural validity and internal consistency but the level of evidence (LOE) for structural validity was downgraded to low due to "very serious" ROB (only one study of doubtful quality available).[18] Further, COSMIN guidelines stated structural validity or unidimensionality of a measure as a prerequisite for interpretation of internal consistency.[33] Due to this, many measures/subscales received an indeterminate rating for internal consistency despite Cronbach's alpha ≥ 0.70 for each unidimensional scale or subscale, as the condition of having at least low-quality evidence for sufficient structural validity was not met.

None of the measures/subscales had high-quality evidence for sufficient test-retest reliability (ie, intraclass correlation coefficient or weighted kappa ≥ 0.70). Two measures (LSNS-R, SWON scale) presented sufficient test-retest reliability but the LOE was downgraded to moderate due to "serious" ROB (only one study of adequate quality was available).[51,52] Only QUALIDEM: Social relations and Social isolation subscales exhibited high-quality evidence for sufficient inter-rater and intra-rater reliability. With regard to hypothesis testing, five measures (QUALIDEM: Social relations and Social isolation subscales, ICECAP-O: Love and friendship subscale, LWIG-30 item version: Social wellbeing subscale, Quality of Life Scale: Relationships subscale, RISE) exhibited high-quality evidence for sufficient construct validity (ie, results were in accordance with the hypothesis). For QUALIDEM, only the social relations subscale presented high-quality evidence for sufficient construct validity irrespective of severity of dementia. The social isolation subscale displayed high-quality evidence for sufficient construct validity only for those with mild to severe dementia. For people with very severe dementia, 75% of the results for the social isolation subscale could not meet the criteria for either sufficient or insufficient hypothesis testing, resulting in inconsistency. Prior studies suggested that factors such as severity of dementia and person rating the measure (proxy vs self-reported) could also impact the psychometrics of the measure.[53–55] In the future, researchers should evaluate whether these factors might impact construct validity for the QUALIDEM social isolation subscale. None of the measures/subscales presented sufficient overall ratings for measurement error (no information on smallest detectable change or minimal important change), criterion validity (not all information required for sufficient overall rating reported), and responsiveness (no hypothesis defined).

Prior reviews[56,57] identified QUALIDEM and QUALID as best quality-of-life measures to use for people with dementia in care homes due to the comprehensive assessment of their measurement properties but these findings were not specific to subscales related to social connection as in our review. Four measures (DQOL: Feelings of belonging subscale, Nursing Home Care-Related QoL Scale: Social interaction subscale, NHP: Social isolation subscale, SSCII-TR) however should not be recommended for assessing social connection due to high-quality evidence for insufficient internal consistency.

4.3 | Implications for future research

For the 34 measures that have potential to be recommended (Recommendation B), we suggest that content validity, structural validity, and internal consistency should be evaluated before testing other measurement properties. Among these measures/subscales, we found that ISE, RISE, and LSNS-R were more promising as they displayed high-quality evidence for sufficient internal consistency. However, ISE lacked any studies on measure development or content validity (and has been superseded by RISE), and measure development and content validity studies for RISE and LSNS-R were rated as inadequate and doubtful respectively, so further studies should evaluate these measures' content validity. Other than these measures, the LWIG-30 item version: Social wellbeing subscale presented sufficient content validity but with low-quality evidence due to the doubtful quality rating for the measure development study and no additional content validity studies. The scale was also tested in a population of LTC residents with psychiatric illnesses, and future studies specifically on content validity, structural validity, and internal consistency are needed to establish the potential of this measure for assessing social connection in a broader population of LTC residents.

Fundamental to any measure development is a construct theory (conceptual model).[58] Without an existing unifying conceptual model for social connection for residents of LTC homes, this review's search strategy and inclusion criteria took a broad approach to identifying measures. The measures/subscales capture distinct constructs which have been highlighted for research in this population[1,28,59]; however, it is unclear if these measures/subscales are consistent in their operationalization of these constructs or whether they actually assess a single construct. To address this gap, we have conducted a detailed evaluation of the content of all the measures which are included in this review against a unifying conceptual framework developed for this study; this is described in a linked review.[49]

Overall, our findings support the need for new measure development and more validation studies for existing measures to assess social connection among residents living in LTC homes. While social connection is widely recognized as a vital component of overall well-being and quality of life for people with dementia, there is less emphasis on measurement tools that specifically target it.[49] Of the currently available measures/subscales identified in our review none can be rec-

ommended as the best measure to assess social connection for LTC residents.

4.4 | Strengths and limitations

To our knowledge, this is the first systematic review of measures of social connection assessed in LTC residents and the first to implement the COSMIN methodology, which is a well-accepted and validated tool for appraising the quality of evidence. These results will enable researchers to prioritize the reliability and validity testing of existing measures or to develop a new measure of social connection that can be used to test the effect of interventions at the individual, home, and system levels to improve social connection. Our study used a systematic approach to identifying, describing, and evaluating measures of social connection tested in LTC homes. It builds on a previous review which described measures of social functioning but which did not follow a systematic approach.[60]

Our review should be interpreted in light of limitations. First, the majority of measures identified in our review were developed prior to the establishment of COSMIN standards which may have impacted study conduct and reporting, thus affecting the studies' methodological quality ratings. Relatedly, COSMIN methods, while based on expert opinion obtained through Delphi studies, prioritize aspects of measurement (such as classical test theory over item response theory) which other researchers have disputed.[58] In addition, we included only those measures that have undergone formal psychometric analysis in LTC settings and were published in research studies; it is possible that some clinically appropriate measures were thus excluded. Furthermore, our review included studies published up to April 2022 to allow for the detailed and time-consuming COSMIN analysis. While it is possible that our review has missed more recent evidence, given the objective of the review and volume of research identified, it is unlikely that any new studies would significantly alter the conclusions presented here. Lastly, feasibility and interpretability were not evaluated among the psychometric properties, as per the COSMIN taxonomy.[40] We recommend that researchers developing new measures should consider cognitive interviewing methodology and having the fewest number of items to ensure that it is acceptable to assess the complex but important construct of social connection among LTC residents.

5 | CONCLUSION

This systematic review identified 38 measures used to assess aspects of social connection in LTC residents and evaluated evidence for their psychometric properties. According to COSMIN guidelines used in our review, no single measure of social connection can currently be recommended for use due to lack of sufficient evidence for content validity and internal consistency; however, 34 measures have potential to be recommended. The research findings indicate the need for a new measure of social connection that utilizes more rigorous methodological approaches, including using adequate sample size, appropriate statistical analysis, and establishing content validity and internal consistency prior to evaluating other measurement properties.

ACKNOWLEDGMENTS

The authors thank Fiona Höbler, Martine Puts, Michal Misiak, Michaela Poppe, and Janin Goldman for their assistance with translating non-English literature. The authors would also like to extend their appreciation and thanks to Jessica Babineau, Information Specialist at the University Health Network, Toronto Rehabilitation Institute, for her assistance in developing and executing the search strategy for systematic review. This Project has been made possible with the financial support of Health Canada, through the Canada Brain Research Fund, an innovative partnership between the Government of Canada (through Health Canada) and Brain Canada, and of the Alzheimer's Association (Re: ARCOM-22-875327). To date, Health Canada has invested over $130 million through the CBRF which has been matched by Brain Canada Foundation and its donors and partners (Ce projet a été rendu possible grâce au soutien financier de Santé Canada, par le biais du Fonds canadien de recherche sur le cerveau, un partenariat novateur entre le gouvernement du Canada (via Santé Canada) et Brain Canada, et d'Alzheimer's Association [Re: ARCOM-22-875327]).

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest. Author disclosures are available in the Supporting information.

DISCLAIMER

The views expressed herein do not necessarily represent the views of the Minister of Health or the Government of Canada (Les opinions exprimées dans ce document ne représentent pas nécessairement le point de vue du ministre de la Santé ou du gouvernement du Canada.)

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Dewan N, Sommerlad A, Chapman H, et al. Assessing social connection for long-term care home residents: Systematic review using COnsensus-based Standards for the selection of health Measurement INstruments guidelines. *Alzheimer's Dement*. 2024;10:e12492. https://doi.org/10.1002/trc2.12492