Apathy Measures in Older Adults and People with Dementia: A Systematic Review of Measurement Properties Using the COSMIN Methodology

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Keywords

Apathy · Measurement · Scale · Systematic review · Consensus-based Standards for the selection of health Measurement INstruments

Abstract

Background: Apathy is highly prevalent in dementia and is also seen in mild cognitive impairment and the general population. Apathy contributes to failure to undertake daily activities and can lead to health problems or crises. It is therefore important to assess apathy. However, there is currently no gold standard measure of apathy. A comprehensive systematic review of the measurement properties of apathy scales is required. **Methods:** A systematic review was registered with PROSPERO (ID: CRD42018094390). MEDLINE, Embase, PsycINFO, and CINAHL were searched for studies that aimed to develop or assess the validity or reliability of an apathy scale in participants over 65 years, living in the community. A systematic review was conducted in line with the Consensus-based Standards for the selection of health Measurement INstruments procedure for reviewing patient-reported outcome measures. The studies' risk of bias was assessed, and all relevant measurement properties were assessed for quality. Results were pooled and rated using a modified Grading of Recommendations Assessment, Development, and Evaluation procedure. **Results:** Fifty-seven publications regarding 18 measures and 39 variations met the eligibility criteria. The methodological quality of individual studies ranged from inadequate to very good and measurement properties ranged from insufficient to sufficient. Similarly, the overall evidence for measurement properties ranged from very low to high quality. The Apathy Evaluation Scale (AES) and Lille Apathy Rating Scale (LARS) had sufficient content validity, reliability, construct validity, and where applicable, structural validity and internal consistency. **Conclusion:** Numerous scales are available to assess apathy, with varying psychometric properties. The AES and LARS are recommended for measuring apathy in older adults and people living with dementia. The apathy dimension of the commonly used Neuropsychiatric Inventory should be limited to screening for apathy.

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opment, and Evaluation procedure. **Results:** Fifty-seven publications regarding 18 measures and 39 variations met the eligibility criteria. The methodological quality of individual studies ranged from inadequate to very good and measurement properties ranged from insufficient to sufficient. Similarly, the overall evidence for measurement properties ranged from very low to high quality. The Apathy Evaluation Scale (AES) and Lille Apathy Rating Scale (LARS) had sufficient content validity, reliability, construct validity, and where applicable, structural validity and internal consistency. **Conclusion:** Numerous scales are available to assess apathy, with varying psychometric properties. The AES and LARS are recommended for measuring apathy in older adults and people living with dementia. The apathy dimension of the commonly used Neuropsychiatric Inventory should be limited to screening for apathy.

Introduction

Apathy is a multidimensional construct, defined as quantitatively reduced behavioural, cognitive, emotional, or social (goal-directed) activity which may include reduced motivation, initiative, effort, interest, concern about self or others, and affect [1]. Apathy is the most

common neuropsychiatric symptom of dementia [2] and is reported in 15–92% of people with dementia [3] and 12–40% of people with mild cognitive impairment (MCI) [4, 5]. Apathy is associated with important outcomes in dementia and MCI, including disabilities in everyday functioning [6], increased carer burden [7–10], worse adherence to interventions [11, 12], and worse quality of life [13]. Prevention or management of apathy in dementia has been identified as a priority area for research [14]. Apathy in older adults is associated with increased likelihood of subsequent cognitive impairment [15], conversion from MCI to dementia [5, 16], and worse disease progression [17, 18]. It is therefore important to research across the spectrum of cognitive impairment [19], including older adults who otherwise appear cognitively unimpaired.

There is no gold standard measure of apathy [20]. Two systematic reviews of apathy scales have been published; the first examined scales developed for people with neurodegenerative conditions such as Parkinson's disease, amyotrophic lateral sclerosis, and dementia [21], whilst the second examined evidence for measurement properties in people with dementia [22]. The first systematic review only included studies that assessed both validity and reliability of a scale within a single publication. Whilst a scale should be both valid and reliable, separately published studies of reliability and validity can collectively offer sufficient evidence for both. The latter review used limited search criteria and it is unclear when the search was conducted. Therefore, important studies regarding the quality of apathy scales may have been missed.

Both of these systematic reviews used the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) tool, designed for studies of diagnostic accuracy [23], not other measurement properties, such as reliability. It is not clear how these reviews rated properties such as reliability using the QUADAS criteria that refer to a “reference standard,” which is only relevant to properties such as criterion validity. The Consensus-based Standards for the selection of health Measurement INstruments (COSMIN) programme of work has since published guidance for conducting and reporting systematic reviews of health measures, with methodological quality standards and measurement property quality criteria that enables a systematic and standardized critical examination of all key measurement properties of scales [24, 25]. The aim of this study was to assess and compare the quality of measurement properties (i.e., the reliability and validity) and characteristics, of apathy scales and to analyse the quality of the evidence in healthy older adults and people with dementia, in accordance with COSMIN guidance.

Methods

Design

This systematic review protocol was registered with PROSPERO (ID: CRD42018094390) and published prior to analysis [26]. The COSMIN methodology for conducting systematic reviews of patient-reported outcome measures [24, 25, 27] was followed. Properties were assessed in relation to both people with dementia and older adults. Some additional decisions were required for this review, which were based on literature, discussions with the review team, and PPI input. For example, there is no gold standard time interval for test-retest reliability studies [28] though a time interval of 2 weeks is common [29]. Apathy is a relatively stable, but not an enduring trait, so a time interval that exceeded 28 days or 1 month was considered inappropriate. A time interval of <3 days for people with memory problems and <7 days for people without memory problems was also considered inappropriate as memory of previous answers may inflate reliability estimates. These were arbitrary numbers chosen in lieu of guidance but was deemed acceptable by the review team and PPI members.

Searching, Screening and Selection

MEDLINE (In-process, Other nonindexed citations and 1946 onwards), Embase (1980 onwards), PsycINFO (1806 onwards, via Ovid), and CINAHL (1937 onwards) were searched using the specified search strategy on April 18, 2018, and the search was re-run in the same databases on May 6, 2020. The reference lists of the included studies and of any relevant review articles were also examined for relevant publications. The COSMIN search strategy for identifying research on the development, validity, or reliability of health-related outcome measures [30] formed part of the search strategy, along with apathy-related terms (e.g., apathy; lack of or diminished motivation; interest; initiative; emotional blunting; emotional responsiveness; abulia; anhedonia; frontal symptom; asocial; avolition; and lassitude). The search strategy was first created for MEDLINE (see online suppl. Additional File 1; for all online suppl. material, see www.karger.com/doi/10.1159/000515678; [99, 100, 104–107]), then the subject headings and syntax were adapted for the other databases.

Inclusion criteria: studies that aimed to develop or assess the measurement properties of an apathy scale based on patient or informant reports or interviewer or clinician ratings; primary research; full-text publication; majority of participants living in the community; majority of participants aged 65 or over. Exclusion criteria: studies assessing scales of apathy in a specific context such as work performance or following an event, such as in posttraumatic stress disorder and postnatal depression. Additionally, development studies were included regardless of eligibility criteria if they pertained to an apathy scale that was included in one of the eligible studies.

The titles and abstracts of articles were screened (by ClB) to assess whether they met the eligibility criteria. All included full-text articles were assessed against eligibility criteria (by ClB), and a randomly selected 10% of articles were independently assessed by a second reviewer (Ca.B.). Articles for which there was disagreement between reviewers were discussed, and an agreement was reached.

Data Extraction and Assessment

Data extraction was conducted (by ClB) into a data extraction table (online suppl. Additional File 2). Data extraction of 20% of publications was checked by second reviewers (Ca.B. and V.

Fig. 1. PRISMA diagram of study selection process.

vd.W.), and no errors were found. For each study included in the review, data relating to study characteristics and methods, participant characteristics, and measurement characteristics and properties were extracted. Measurement properties included those of reliability (internal consistency, measurement error, and test-retest and interrater reliability) and validity (content validity, structural validity, and hypothesis testing for construct validity), as defined by the COSMIN taxonomy [31]. Criterion validity and responsiveness were not reviewed, as there is no gold standard measure of apathy against which to assess the scales.

Risk of bias in individual studies was examined using the COSMIN risk of bias checklist [25, 27] (online suppl. Additional File 3). The results of studies were assessed using COSMIN criteria for good measurement properties [24, 25]. Publications were assigned a number and randomly selected for second reviewer ratings using a random number function in Microsoft Excel. Twenty-one percent ($N = 12$) of publications were independently rated by second reviewers for risk of bias and against criteria for good measurement properties (S.G. and V.vd.W.). Where there was disagreement, this was discussed between the 2 raters (C.I.B. and S.G.; C.I.B. and V.vd.W.) and any remaining disagreements were discussed with a third rater.

Synthesis of Results

Studies meeting the eligibility criteria were summarized using a narrative synthesis. For each scale, the measurement properties

reported in the corresponding studies were summarized, and the quality of these synthesized results was assessed using the criteria for good measurement properties [24, 32]. Where there were different versions of the scale, results were pooled, providing they were not contradictory. The COSMIN-modified GRADE approach [24, 25] was used to assess the quality of the cumulative evidence for each measurement property for each scale. The COSMIN procedure for the recommendations of scales in systematic reviews [24] was used to guide the recommendations made.

Results

Study Selection

The initial search resulted in 9,645 records and the re-executed search identified an additional 2,339 records (Fig. 1). Following removal of duplicates, there were 7,811 records. A further 24 records were identified through screening reference lists and manual searching. After screening of titles and abstracts, 185 remained for full-text screening. Following full-text screening, 57 publications of 18 distinct scales (and 39 variations) were identi-

Table 1. Overall findings and GRADE

Measure	Content validity		Structural validity		Internal consistency		Reliability		Measurement error		Hypothesis testing for construct validity	
	summary of findings	quality rating and GRADE	summary of findings	quality rating and GRADE	summary of findings	quality rating and GRADE	summary of findings	quality rating and GRADE	summary of findings	quality rating and GRADE	summary of findings	quality rating and GRADE
AD-RD	DS: indeterminate	?					$r = 0.72$					
AES	DS: indeterminate RR: sufficient	+ (very low; very low)	1 main apathy factor with smaller factors of various description	+ (moderate; moderate)	0.86–0.95	+ (moderate; moderate)	$r/ICC = 0.72–0.94$	+ (moderate; low)	SEM = 2.7–2.9	?	48/69 (70%)	+ ^b (moderate; ^d ; moderate ^e)
AI	DS: indeterminate RR: inconsistent	+/- (very low; very low)			0.83–0.96	?	Kappa/ICC = 0.96 to 0.99	+ (low; low)			5/8 (67%)	+/- ^b (moderate; high)
AMI	DS: indeterminate RR: sufficient	+ (very low; very low)			0.86	^a					0/2 (0%)	– (low; very low)
AS	DS: indeterminate CVS: indeterminate RR: sufficient	+ (very low; very low)	1–3 factors	+/- (high; high)	0.69–0.94	?	$r/ICC = 0.78–0.90$	+ (very low; very low)	SEM = 2.34	?	8/12 (67%)	+ ^c (low ^d ; moderate ^e)
BMDS	DS: indeterminate RR: mixed	+/- (very low; very low)					$r = 0.90$	+ (very low; very low)				
BSSD	DS: indeterminate RR: sufficient	+ (very low; very low)					ICC = 0.65–0.85	+/- (very low; very low)			1/2 (50%)	– ^b (very low ^d ; moderate ^e)
DAIR	DS: inconsistent CVS: inconsistent (OA); sufficient (PwD)	+/- (very low; low)	1 factor	+ (very low; moderate)	0.89	+ (low; moderate)	$r = 0.85$	+ (very low; very low)	100% agreement	+ (1; 1)	3/4 (75%)	+ (low; high)
DAS	DS: indeterminate RR: sufficient	+ (very low; very low)	3 factors: cognitive; behavioural; emotional	^a	0.81–0.93	^a	ICC = 0.84	+ (very low; very low)			10/13 (77%)	+ (moderate; high)
DEX	RR: inconsistent	+/- (very low; very low)					ICC = 0.93	+ (very low; very low)			2/4 (50%)	+/- (moderate; high)
FRSBE	CVS: indeterminate RR: inconsistent	+/- (very low; very low)	1 factor	?	0.80–0.88	?					4/5 (80%)	+ (very low; low)
GDS	GDS-3a: DS: indeterminate RR: inconsistent GDS-6a: DS: indeterminate RR: sufficient	GDS-3a: +/- (very low; very low) GDS-6a: + (very low; very low)			0.51	?					GDS-3a: 0/2 (0%) GDS-6a: 3/3 (100%)	GDS-3a: – (moderate; low) GDS-6a: + (moderate; low)
GIP	RR: inconsistent	+/- (very low; very low)					ICC = 0.72–0.83	+ (very low; very low)	MDD = 2.8–3.8	?		
IMD	DS: indeterminate	?									3/3 (100%)	+ (very low; low)
KBCI	DS: inconsistent RR: inconsistent	+/- (very low; very low)									6/7 (86%)	+ (low; very low)
LARS	DS: indeterminate RR: sufficient	+ (very low; very low)	4 factors	^a	0.81–0.87	^a	$r/Kappa/ICC = 0.93–1.00$	+ (low; moderate)			11/13 (85%)	+ (high; high)
NPI	DS: indeterminate RR: inconsistent	+/- (very low; very low)			0.82–0.83	?	$Rrs/ICC = 0.53–0.99$	+ (very low; low)			1/5 (20%)	– (high; high)
NPI-A			1 factor	+ (very low; moderate)	0.91	? (OA) + (moderate, PwD)						
NPI-C	CVS: indeterminate RR: sufficient	+ (very low; very low)					ICC = 0.87	+ (low; moderate)			1/2 (50%)	+/- (moderate; high)

Table 1 (continued)

Measure	Content validity		Structural validity		Internal consistency		Reliability		Measurement error		Hypothesis testing for construct validity	
	summary of findings	quality rating and GRADE	summary of findings	quality rating and GRADE	summary of findings	quality rating and GRADE	summary of findings	quality rating and GRADE	summary of findings	quality rating and GRADE	summary of findings	quality rating and GRADE
UPDRS	DS: indeterminate RR: inconsistent	+/- (very low; very low)										

Blank cells indicate no eligible studies or results. Quality of measurement property: +, sufficient; +/-, inconsistent; -, insufficient; ? indeterminate. GRADE: quality of evidence rating in parentheses first indicates quality of evidence for older adults, then people with dementia. AD-RD, Alzheimer's Disease and Related Dementias Mood Scale; AES, Apathy Inventory; AMI, Apathy Motivation Index; AS, Apathy Scale; BMDS, Behavioural and Mood Disturbance Scale; BSSD, Behavioural Syndromes Scale for Dementia; CYS, Content Validity Study; DAIR, Dementia Apathy Interview Rating Scale; DAS, Dimensional Apathy Scale; DEX, Dysexecutive Questionnaire; DS, Development Study; FrSBe, Frontal Systems Behaviour Scale; GDS-3a, Geriatric Depression Scale 3-item apathy subscale; GDS-6a, Geriatric Depression Scale 6-item apathy subscale; GIP, Behavioural Rating Scale for Psychogeriatric Inpatients; IMD, Index of Mental Decline; KRCI, Key Behaviours Change Inventory; LARS, Lille Apathy Rating Scale; MDS-UPDRS, Movement Disorder Society-Sponsored Revision of the Unified Parkinson's Disease Rating Scale; NPI, Neuropsychiatric Inventory; NPI-C, Neuropsychiatric Inventory Clinician; OA, Older Adults; PwD, People with Dementia and MCI; RR, Reviewer Rating; UPDRS, Unified Parkinson's Disease Rating Scale. *Not applicable due to formative model. ^a Greater emphasis placed on results of better quality (sub studies). ^b Greater emphasis placed on studies of convergent validity. ^c Marked down for inconsistency.

fied as meeting eligibility criteria (online suppl. Table 1 in Additional File 4). Many publications reported multiple studies, even for the same measurement property, for example, where the measurement property was assessed and reported for different populations or different versions of the same scale or where different methods were used to assess the same measurement property.

The measurement properties and study characteristics are reported in online suppl. Table 2 in Additional File 4. Seven apathy-specific scales were identified: the Apathy Evaluation Scale (AES) [46], Apathy Inventory (AI) [47], Apathy Motivation Index (AMI) [48], Starkstein Apathy Scale (AS) [49], Dementia Apathy Interview and Rating (DAIR) [50], Dimensional Apathy Scale (DAS) [51], and the Lille Apathy Rating Scale (LARS) [52]. Apathy subscales were present in eleven global scales designed to assess a variety of constructs (such as dementia severity and neuropsychiatric symptoms): Alzheimer's Disease and Related Dementias mood scale (AD-RD) [33, 34], Behavioural and Mood Disturbance Scale (BMDS) [35], Behavioural Syndromes Scale for Dementia (BSSD) [36], Dys-executive Questionnaire (DEX) [37]; Frontal Systems Behaviour Scale (FrSBe) [38], Geriatric Depression Scale (GDS) [39, 40], and Behavioural Rating Scale for Geriatric Inpatients (GIP) [41], Index of Mental Decline (IMD) [42], Key Behaviours Change Inventory (KBCI) [43], Neuropsychiatric Inventory (NPI) [44], and Unified Parkinson's Disease Rating Scale (UPDRS) [45]. Only the measurement properties of apathy subscales were assessed, not the overall global scale. Of the publications that met the inclusion criteria, there was one each that pertained to the AD-RD, BMDS, BSSD, DEX, GIP, IMD, KBCI, AMI, and DAIR, two regarding the FrSBe and GDS, 3 regarding the AI and LARS, 4 regarding the UPDRS, 5 regarding the DAS, 8 regarding the AS, 9 regarding the AES, and twelve regarding the NPI. The majority of scales required respondents to select responses from a Likert scale, in relation to various questions or items. Number of scored items in the scales ranged from 1 to 33. Recall periods ranged from 1 week to 1 month, with some scales not specifying a recall period or specifying since the onset of a disease.

Risk of Bias

Results of the individual studies and their risk of bias ratings are reported in the online suppl. material (online suppl. Tables 3–5 in Additional File 4). No studies assessed cross-cultural validity, so this is not discussed nor included in the tables. Literature pertaining to development was obtained for all scales except the DEX, GIP, and

FrSBe. Few additional content validity studies were available that met the eligibility criteria. Most content validity and development studies had indeterminate results, due to a poorly reported or inadequate method. Twenty-seven studies of structural validity across 16 publications met the inclusion criteria [46, 50, 53–66]. Three studies had very good methodological quality, as most studies used exploratory factor analysis or principle component analysis to assess structural validity, instead of the preferred confirmatory factory analysis or item response theory methods. Internal consistency was assessed by 31 publications [36, 46, 47, 49, 50, 53, 55–79] and was considered a valid assessment (i.e. the scale was based on a reflective model) in 38 studies. Some results were indeterminate due to lack of evidence that the scale was unidimensional, and therefore, uncertainty regarding whether internal consistency should apply. There were 38 inter-rater or test-retest reliability studies [33, 35, 36, 46, 47, 49, 50, 53, 65, 70, 73, 76, 77, 79–88] from 23 publications. None were of very good methodological quality, and just one was of adequate quality. Methodological quality of reliability studies was mostly limited as a result of not using the optimal statistical method, such as the use of Kappa rather than weighted Kappa, or Pearson or Spearman correlation instead of intraclass correlation coefficient. Where the most appropriate method was used, the model or formula of intraclass correlation coefficient or weighted Kappa was often not reported. Six studies of measurement error were conducted across 4 publications [50, 56, 77, 82]. For all but one study, it was not possible to draw conclusions, due to lack of appropriate anchor-based estimates of minimal important change for any of the scales. One hundred and eighty studies of hypothesis testing for construct (including convergent, divergent, and known group) validity that met the eligibility criteria were found from 45 publications [36, 42, 44, 46, 47, 49, 50, 53–58, 60, 62, 65, 67–71, 73–75, 77–81, 83, 85, 87–100]. Most reported *p* values, but not effect sizes, and 21 studies had indeterminate results due to not reporting sufficient information.

Synthesis of Results

A synthesis of the results of measurement properties per scale, including quality rating and GRADE ratings for older adults and people with dementia, is provided in Table 1.

Apathy-Specific Scales

Apathy Evaluation Scale

The AES is an 18-item apathy scale based on informant report, self-report (AES-S), or clinician assessment. Nine

publications regarding the validity or reliability of the AES met the inclusion criteria. The AES had sufficient content validity, though like other studies, the evidence for this was very low. There was moderate evidence for sufficient hypothesis testing for construct validity and structural validity. The latter result limited the quality of evidence for sufficient internal consistency (Cronbach's $\alpha = 0.86$ – 0.95) to moderate also. There was low to moderate evidence for sufficient reliability, except of the AES-S in people with dementia, where test-retest reliability was insufficient. The only measurement property that the AES lacked evidence for was measurement error.

Dimensional Apathy Scale

The DAS is a 24-item scale, made up of 3 subscales: executive, emotional, and initiation. There is a self-rated and proxy version, and a shorter proxy version (b-DAS), which retains the 3 subscales across just 9 items. Five articles investigating the DAS (including b-DAS) met the inclusion criteria [62, 63, 74–76]. There was very low evidence of sufficient content validity of the DAS, including b-DAS, and sufficient test-retest reliability; however, this evidence came from a single study of the b-DAS, so conclusions may not be generalizable to the full version. There was moderate-to-high-quality evidence of sufficient hypothesis testing for construct validity. Structural validity and internal consistency were not relevant due to this scale's formative nature, and there was no evidence for measurement error.

Lille Apathy Rating Scale

The LARS was developed to screen for and assess changes in apathy in people with Parkinson's disease and was originally designed as a clinician-rated scale based on observations and answers provided in an interview with the participant. Three articles on the LARS met the inclusion criteria [65, 70, 83]. There was very low evidence of sufficient content validity, low to moderate evidence of sufficient reliability, and high-quality evidence for sufficient hypothesis testing for construct validity. As with the DAS, structural validity and internal consistency were not relevant due to this scale's formative nature, and there was no evidence for measurement error.

Dementia Apathy Interview and Rating

The DAIR was developed to assess apathy in people with dementia. One article met the inclusion criteria [50]. There was very low evidence for inconsistent content validity of the DAIR in older adults and low evidence for inconsistent content validity in people with dementia.

There was very low to moderate evidence for sufficient structural validity and low to moderate evidence of internal consistency. There was very low evidence for sufficient test-retest reliability and measurement error and low to high-quality evidence of sufficient hypothesis testing for construct validity.

Apathy Inventory

The AI is a 3-domain apathy scale, initially created as a self or informant report via face-to-face interview and developed for older adults and people with neurological disorders. Three articles on the AI met the inclusion criteria [47, 72, 80]. Evidence for content validity and hypothesis testing for construct validity was inconsistent. There was low evidence for sufficient reliability and no conclusive evidence for structural validity or internal consistency.

Apathy Scale

The Apathy Scale (AS) is a 14-item apathy scale, administered through self-report or informant report, via interview. An 11-item paper and pencil version (AS-HC) without subquestions has also been produced [58]. Eight articles on the AS met the inclusion criteria [49, 58–61, 77, 90, 91]. Despite the high-quality studies, the results regarding structural validity were inconsistent. The AS-HC however had moderate to low evidence for sufficient structural validity and internal consistency. There was very low evidence of sufficient content validity and reliability and low to moderate quality evidence for sufficient hypothesis testing for construct validity of the AS. There was no conclusive evidence for internal consistency or measurement error.

Global Scales with an Apathy Subscale

Neuropsychiatric Inventory

The NPI is a well-known scale for assessing neuropsychiatric symptoms in people with dementia. Each subscale of the NPI represents a different symptom, of which apathy is one. Originally designed as a proxy assessment administered via interview, the NPI now has many variations, including those which score the screening or subquestions, as in the NPI-Alternate (NPI-A) and NPI-Clinician (NPI-C). The NPI was the most studied scale, with 12 articles meeting the inclusion criteria [44, 66, 73, 79, 84–88, 94–96]. Content validity of the original NPI apathy subscale was inconsistent, as the emotional domain was missing from the screening questions. In contrast, the NPI-C had sufficient content validity. The NPI-A had sufficient structural validity with moderate to very low evidence, and there was moderate evidence for sufficient internal consistency

in people with dementia. There was very low to low evidence of reliability for the original NPI. The NPI-C had better evidence of reliability, with low and moderate evidence for sufficient interrater reliability. Hypothesis testing for construct validity was found to be insufficient for the original NPI, supported by high-quality evidence, and for the NPI-C, evidence was inconsistent. The NPI-A lacked conclusive evidence for hypothesis testing for construct validity, and reliability, whilst the NPI-C and NPI had no conclusive evidence for structural validity, internal consistency, or measurement error of the apathy subscales.

Behavioural Syndromes Scale for Dementia

The BSSD is a measure of neuropsychiatric symptoms, which contains an apathy subscale consisting of 7 items, for which one publication met the inclusion criteria [36]. There was very low evidence for sufficient content validity and inconsistent reliability for face-to-face administration, with insufficient reliability when administered by telephone. There was very low to moderate evidence of sufficient hypothesis testing for construct validity; however, results should be interpreted with caution as no studies of convergent validity were included. There was no conclusive evidence for the remaining measurement properties (structural validity, internal consistency, and measurement error).

Dysexecutive Questionnaire

The DEX was developed as part of the behavioural assessment of the dysexecutive syndrome test battery. One publication on the DEX met the inclusion criteria [81]. There was inconsistent content validity, very low evidence for sufficient test-retest reliability, and moderate-to-high-quality evidence of inconsistent hypothesis testing for construct validity. There was no conclusive evidence for the remaining measurement properties (structural validity, internal consistency, and measurement error).

Scales with Limited Evidence

The AD-RD, IMD, and UPDRS all had evidence regarding just one measurement property. The AD-RD had very low evidence for sufficient test-retest reliability, the IMD had very low to low evidence of sufficient hypothesis testing for construct validity, and the UPDRS had moderate evidence for inconsistent hypothesis testing for construct validity.

There was low to very low evidence of insufficient hypothesis testing for construct validity of the AMI, and whilst there was low evidence for sufficient content valid-

ity, it is worth noting that some items were too conflated with cognition or disinhibition (e.g., “I get things done when they need to be done, without requiring reminders from others”).

The BMDS, FrsBe, GIP, KBCI, and three-item subscale of the GDS all had inconsistent content validity and evidence regarding one other measurement property, although for all cases evidence for content validity came from reviewer ratings only due to absent or indeterminate development and content validity studies. Both the BMDS and GIP had very low evidence for sufficient reliability and inconsistent content validity, with only 55 and 44% of items relevant to apathy, respectively. Items and response options of the BMDS created confusing double negatives, and the emotional domain of apathy was missing from both the BMDS and the GIP. There was very low to low evidence of sufficient hypothesis testing for construct validity, and in all 3 versions of the FrSBe rated by reviewers, none had the required $\geq 85\%$ of items relevant to apathy, due to items related to personal hygiene that could be conflated with other impairments. There was moderate to low evidence of insufficient hypothesis testing for construct validity for the three-item subscale of the GDS, and its inconsistent content validity was due to inclusion of items too conflated with physical ability and lack of comprehensiveness. Despite similar inclusion of items that could be conflated with physical ability and dysphoria, the 6-item subscale of the GDS (GDS-6a) had sufficient content validity, as comprehensiveness and comprehensibility were sufficient. The GDS-6a also had moderate to low evidence of sufficient hypothesis testing for construct validity. The KBCI had low to very low evidence of sufficient hypothesis testing for construct validity and inconsistent content validity due to some items not being sufficiently relevant to older adults and people with dementia (e.g., “has a lot of get-up-and-go”) and others lacking clear comprehensibility (e.g., “is enterprising”). The results regarding hypothesis testing for construct validity for the IMD, KBCI, GDS-6a, and FrSBe should be interpreted with caution, as no convergent validity studies met the criteria, and convergent validity is a superior indicator of construct validity than divergent or known-group validity [27].

Discussion

According to COSMIN guidelines, scales should be recommended if they have sufficient content validity, at least low-level evidence for sufficient internal consistency,

and no high-quality evidence for insufficient properties. The AES, AMI, AS, DAS, GDS-6a, LARS, and NPI-C all had sufficient content validity in older adults and people with dementia, but the AS, GDS-6a, and NPI-C did not have evidence for sufficient internal consistency. The AES had sufficient internal consistency, though the AMI, DAS, and LARS were based on a formative model, so internal consistency was not applicable. Therefore, the AES was the only scale that met the COSMIN criteria for a recommended scale. The (original) NPI was the only scale to meet COSMIN criteria for a scale that should not be recommended for use due to high-quality evidence for insufficient hypothesis testing for construct validity. All other scales could potentially be recommended, depending on further research. However, we argue that the BMDS and GIP are also inappropriate for assessing apathy in older adults and people with cognitive impairment due to inclusion of too many items that are not relevant and conflate apathy with cognition.

This review considered both apathy-specific scales and apathy subscales derived from a global assessment, as though the latter may be designed for screening purposes, as in the NPI, they are often used in place of full assessments, from which conclusions are drawn: for example, the NPI apathy subscale has been recommended as a primary outcome measure in clinical trials [101]. Therefore, it was deemed necessary to assess both types of measures to create a sufficiently comprehensive review of the evidence for all apathy measures available that may be used to assess apathy specifically in people with dementia and older adults. It is worth noting that the best-quality apathy measures were all apathy-specific scales, rather than those derived from a global measure. This highlights the importance of apathy-specific measures and may suggest that apathy subscales derived from global instruments (such as the apathy subscales of the BMDS, BSSD, GDS, IMD, KBCI, UPDRS, and NPI) should not be used to assess apathy in research or clinical practice, unless followed by further assessment. However, there is currently no sufficient evidence to make these conclusions, except for the NPI. The finding that the NPI should not be recommended for assessing apathy contrasts with its popularity and previous recommendations [20, 101]. Our study found that the NPI apathy subscale had insufficient construct validity and inconsistent content validity, suggesting it assesses something other than apathy, which expands previous studies which concluded it had uncertain validity [21]. Whilst this could be due to the low quality of convergent validity studies (which were all of inadequate quality), divergent validity studies also supported

this finding, as they showed a high correlation with depression, suggesting the NPI apathy subscale may confound apathy with depression. It is important to note that the NPI was designed as a quick assessment tool for numerous neuropsychiatric symptoms [44], and therefore it is perhaps not surprising that it does not offer a comprehensive and targeted assessment of apathy specifically. Therefore, the NPI may be best used as a screening tool but not as an outcome measure or full clinical assessment of apathy in older adults or people with cognitive impairment.

This systematic review applied a wider search strategy and eligibility criteria than previous systematic reviews [21, 22], resulting in the inclusion of a larger number of studies, allowing more evidence to contribute to the results. Despite the numerous studies of measurement properties identified by this review, evidence across all measurement properties was often of low or very low quality. In particular, many development and content validity studies failed to report a systematic process of how items were produced or refined; did not involve patients, carers, or members of the public; or did not provide sufficient detail (e.g., even when it was clear that participants were involved in assessing these properties, it was not clear what aspects [such as items, recall period, instructions, and response options] of the scale participants were consulted about). As such, the included publications offered little evidence for content validity, with all but 2 studies' results being indeterminate, and no study exceeding doubtful methodological quality. As a result, content validity was largely determined entirely by reviewer ratings of the scale itself. COSMIN's reviewer rating technique ensured a validity rating was possible, even in the presence of insufficient information from the development and content validity studies. However, this also meant that content validity conclusions were largely based on very low evidence.

Furthermore, COSMIN guidelines do not advise how to recommend studies of scales based on a formative model, which discounted 3 scales (the AMI, DAS, and LARS) from the recommendations. As such, the COSMIN-guided recommendations of measures are to be taken with caution in this study. Regardless of this, no single scale had overwhelmingly superior measurement properties. The AES, DAS, and LARS all had sufficient content validity, reliability, hypothesis testing for construct validity, and structural validity and internal consistency where applicable, in people with dementia and older adults. The LARS was the scale with the best evidence for good measurement properties and was the only scale to have high-

quality evidence for at least one measurement property in both older adults and people with dementia. However, the LARS may have less desirable measurement characteristics, as both the self and informant versions involve interviewer ratings, as well as respondent reports, and was the largest scale found by the review, with 33 items assessing apathy, so requires more resources and could be burdensome. The AES had the second most consistent quality evidence across measurement properties and may have preferable measurement characteristics, as there are versions that do not require trained raters and have fewer items. This is consistent with the recommendation of the AES made by others [20, 101]. The DAS is a promising scale, with good evidence for sufficient measurement properties, with the exception of reliability. The DAS also has desirable measurement characteristics, as the pencil and paper-based scale does not require interviews, and a short version is available.

Previous systematic reviews of apathy measures used QUADAS, which was designed only to assess studies of diagnostic accuracy and applied these to studies of a variety of measurement properties. COSMIN on the other hand provides guidance and criteria for assessing the quality of and evidence for a variety of measurement properties. The high standards set by the COSMIN guidelines and criteria were however sometimes unattainable. For example, in a development study, a lack of justification of recall period and response options can prevent the results of a development study being rated as sufficient, yet these aspects represent a small part of the scale and are rarely provided by even the best quality studies. As COSMIN quality criteria are binary, it risks oversimplifying the complexities of the true measurement properties and research evidence. Weighted criteria which place greater emphasis on the items may be preferable for content validity assessment. An alternative for assessing quality of the remaining measurement properties is that used by Radakovic and colleagues [21], which rated each result on a scale of 4–6 possible scores depending on the measurement property being assessed. However, this does not appear to have been developed in a systematic way, unlike COSMIN criteria that were created following a Delphi procedure.

Bias in systematic reviews can be minimized by duplicating all rating activities; however, due to the large number of studies found by this review, this was impractical in this study. The duplication of review for a portion of the included studies did however help discussions around what these flaws may be, limiting subjective decisions. Bias was further minimized by following COSMIN guide-

lines and creating additional criteria where required, informed by PPI when applicable, that could be followed for all scales.

This review did not restrict the eligibility criteria to people with a diagnosis of dementia or restrict the age criteria to all adults (instead choosing that at least 50% should meet the criteria). This meant that some studies included participants with various diagnoses, such as Parkinson's disease and depression, and included some participants that were younger than 65. Therefore, the results may be less applicable to the population we set out to study. However, populations do not neatly segment, and by opting for more liberal inclusion criteria, we were able to include a wide variety of studies that may not otherwise have been included. Furthermore, the GRADE approach to determining the quality of evidence for each measure takes into account the directness of the results, so evidence that was less direct (i.e., studies in other populations) was marked down accordingly.

Apathy is a multidimensional phenomenon, including behavioural, cognitive, social, or emotional domains [1, 102], and so it is expected that comprehensive apathy scales should assess all these aspects of apathy. For this reason, we did not include studies of scales that only assessed a part of the apathy construct, such as studies that investigated the separate subscales of the LARS and DAS. It is possible that the best assessment of apathy is through a combination of scales that assess different individual apathy subdomains, which could be used alongside direct observational methods, such as accelerometers and other experimental methods, that have recently been used to assess certain aspects of apathy such reduced goal-directed behaviour [103]. Future studies could consider the evidence for assessing each individual domain of apathy separately.

Conclusion

A number of apathy scales of varying quality are available and have been validated in an older adult and dementia community-dwelling population. The development of scales was generally poor, due to lack of transparency and systematic approach in eliciting and refining items and developing the other measurement aspects such as recall period and response options. Future development of scales should include a clear and systematic approach at all stages and involve patients or members of the public as well as professionals to ensure good content validity. The NPI is not recommended for apathy assessment, ex-

cept as a screening tool. The LARS has good measurement properties and so is recommended for use in older adults and people with dementia and MCI studies with sufficient resources. The DAS, in particular the resource efficient b-DAS, is a promising scale that requires more research into its properties, particularly reliability. The AES has good measurement properties and characteristics and is recommended for use in older adults and people with dementia and MCI especially in circumstances of limited resources and to limit responder burden.

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Statement of Ethics

As this was a systematic review of published studies, it was not necessary to gain ethical approval.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

C.B. conceived of the study with supervision from R.H., S.G., and V.vd.W. C.B. developed and conducted the search and pre-screening. C.B., V.vd.W., and Ca.B. screened the studies for eligibility, and C.B., S.G., and V.vd.W. reviewed the included studies for their risk of bias and quality. C.B. drafted the manuscript and all authors edited the text and approved the final manuscript.

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