Measures of everyday competence in older adults with cognitive impairment: a systematic review

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Abstract

Background: the issue of safety of the cognitively impaired elderly people living alone has been continuously raised. Traditional psychometric measures of cognitive abilities may not adequately reflect older adults’ functioning in a real everyday context.

Objectives: to conduct a systematic review on instruments available for evaluating the everyday problem-solving or everyday competence of the elderly with cognitive impairment and to critically review the measurement properties of the identified instruments.

Methods: we searched the databases such as CINahl, Medline, PsycINFO, AARP Ageline, ProQuest and the Cochrane Library for the time period between January 1995 and December 2010. Reference lists of the included papers were also manually searched.

Results: five instruments were included. All the instruments focused their framework on Instrumental Activities of Daily Living (IADL) domains which meet well with suggestions from other studies on the importance of IADL in determining an elderly individual’s capability to live independently in the community. No available instruments for the moderate to severe impairment group were identified under this review.

Conclusions: few existing instruments to assess the ability of everyday problem-solving of the elderly with cognitive impairment can be identified in the literature. Further research validating them against functional, real-world outcomes is needed.

Keywords: cognition, measures, problem-solving, everyday competence, elderly, systematic review

Background

Cognitive impairment increases in occurrence with age with or without the presence of pathology [1]. Research has consistently shown that cognitive impairment contributes to increased hospital use [2] and is a key risk factor for institutionalisation of this population [3].

Studies have found that the elderly with cognitive impairment will have a high risk of functional decline during hospitalisation, affecting their level of independence at discharge [4]. Assessment to determine whether patients are still capable of meeting the cognitive challenges of everyday living at home are crucial for timely interventions and safe discharge planning. However, traditional psychometric measures of cognitive abilities may not adequately reflect older adults’ functioning in a real everyday context, whereby individuals have the opportunity to apply the experience and knowledge they have been accumulating over a lifetime [5]. Functional assessments may only inform about the potential problems in specific functional areas. Nevertheless, these measures are still important and widely used as part of a team approach to discharge planning in clinical practice.

Studies can be found focusing on a single aspect of competence, such as driving or medication management [6]. However, the corresponding result would have limited generalisation on the overall competence which is multidimensional...
in context and requires the ability to function in multiple domains [5, 7]. An occupational therapist may conduct an in-home functional assessment or a home trial as the least restrictive option to promote a safe discharge.

Everyday problem-solving involves the application of multiple cognitive processes and is important for maintaining independent living in the community [8]. Measures of everyday cognition and everyday problem-solving, examining the cognitive performance of older adults on tasks that are experienced in everyday situations, are considered to be more ecologically valid to adequately reflect older adults’ everyday functioning in the real world. [9].

This review aims to identify the different instruments available for evaluating the everyday problem-solving or everyday competence of the elderly person with cognitive impairment. It will further critically review the measurement properties of the published instruments in order to give reference for researchers or clinicians to better assign priority for their outcome measure selection in clinical practice or research.

Methods

Search strategies

A systematic computer-based search of Cinhå, Medline, PsycINFO, AARP Ageline, ProQuest databases and the Cochrane Library was conducted for the time period between January 1995 and December 2010. The search terms used are as follows: scale or assessment or measure* or test combined with dementia* or Alzheimer* or cognitive impairment and everyday cognition*, everyday cognitive, functional cognition*, everyday problem-solving, everyday functional competence, cognitive competence, everyday competence and everyday decision-making.

The search was limited to publications in English. Additional searches of Medline, PsycINFO and AARP Ageline databases using the full name of the identified instruments was conducted to ensure maximum inclusion of potential articles. All reference lists in selected journal articles were screened for further potentially relevant articles.

Instrument identification

Studies were firstly screened based on title and abstract for names and data of potential instruments. Articles were included in this review if they described development, validation or application of instruments assessing everyday competence or problem-solving in elderly people with cognitive impairment. Studies that described traditional neuropsychological assessments or only functional assessments were excluded due to their limited ecological validity as mentioned already. After screening, the name of potential instruments were identified from the included articles and further screened with selection criteria to be included in this review.

Instrument selection

Instruments were included if they measured everyday cognitive competence or everyday problem-solving and were disease-specific, i.e. developed and/or validated for use in older adults with dementia or cognitive impairment. In addition, the instruments had to be structured and described in adequate detail, with information published on their measurement properties to enable critical review of the instruments. Diagnostic instruments were excluded due to the predominant difference in focus from outcome measures. For example, the sensitivity to change or assessment of individual differences would be the key focus for an outcome measure but may not be the key focus for diagnostic tools. Instruments that focused on a single domain were excluded due to their limited generalisation. Further, self-reported or informant-based instruments were excluded, as the aim of this review was to identify instruments that assess actual performance. Studies have shown that older adults tend to overestimate their ability or reported level of functioning [10], and informant-based instruments are potentially subject to various biases [11].

As recommended in the Cochrane Handbook of Systematic Review of Interventions, two reviewers (L.L. and EB) independently screened the titles and abstracts to identify relevant articles and potential instruments, using the inclusion/exclusion criteria. Disagreements between the reviewers were resolved through discussion [12].

Quality rating of instruments

A limited number of articles exist demonstrating guidelines on outcome measure evaluation, particularly for tools measuring health-related quality of life (HRQOL) [13]. However, recent reviews on tools other than HRQOL using similar sets of instrument evaluation properties and criteria can be found [14]. The framework offered by Andresen [15] provides a more structured and clear definition of instrument rating criteria and was further adapted by Terwee et al. [16] in her review of HRQOL tools. A list of instrument properties with the corresponding rating criteria based on Terwee’s work was adapted for use in this review (Please see Supplementary data in Age and Ageing online, Appendix 1).

The clinimetric properties of the included instruments were evaluated on the following eight quality criteria: (i) reliability, (ii) validity, (iii) interpretability, (iv) measurement model (floor/ceiling effect), (v) item/instrument bias, (vi) responsiveness, (vii) respondent burden (time to complete) and (viii) administrative burden (ease to administer, score and interpret).

All instruments meeting the inclusion criteria outlined earlier were incorporated into the review. Instruments were evaluated and compared on relevant properties using the checklist by two independent reviewers (L.L. and EB).

Results

The initial database search identified a total of 136 potentially relevant citations. After excluding duplicated articles, 78 citations were left. All titles and abstracts were screened
according to the inclusion/exclusion criteria. Full texts of 23 articles were retrieved and carefully examined and 10 instruments were identified. The additional search using the name of the included instruments disclosed seven more potential instruments. Cross-referencing led to four more articles. After further screening of the potential instrument with the inclusion/exclusion criteria, seven instruments were excluded. A summary of the selection process is illustrated in Figure 1.

Five instruments were included in this comprehensive review: Assessment of Capacity for Everyday Decision Making (ACED), Everyday Cognition Battery Memory Test (ECB), Everyday Problems Test (EPT), Everyday Problems for Cognitively Challenged Elderly (EPCCE) and Problems in Everyday Living Test (PEDL).

**Instrument description**

A summary of the characteristics of the instruments [17–21] included in this review is presented in Table 1.

The ACED and EPCCE were developed specifically as a functional cognition assessment for the elderly with cognitive impairment. The ECB and EPT were developed on a sample of elderly persons without dementia. The PEDL was developed on patients with multiple sclerosis but validated on patients with Alzheimer’s disease.

The ACED focuses on the decision-making capacity relating to everyday problems. The ACED interviewer needs to collect information on the participant’s functional problem from an informant and tailor the interview content based on a structured format.

The ECB, EPT and EPCCE focus on Instrumental Activities of Daily Living (IADL) domains and encompass paper-and-pencil-performance-based problem-solving measures using real-world printed stimuli. Participants are asked to answer questions based on these stimuli. The EPCCP is a simplified version of EPT. The PEDL is a 14-item practical problem-solving test. Examples from the ACED, ECB, EPCCE and PEDL as adapted from the corresponding publications are provided in Supplementary data in *Age and Ageing* online, Appendix 2.

**Instrument properties**

**Validity**

The dimensional structures of two instruments (ECB and EPT) have been confirmed by factor analysis [22, 23]. The EPCCE followed the same factorial structure of the parent measure EPT [19]. The ACED has the dimensions adapted from a validated tool, the MacArthur Competency Assessment Tool for Treatment (MacCAT-T) [17].

The PEDL reported to have their structure based on WAIS-R Comprehension Test [24].

In all the studies that investigated validity of the reviewed instruments, hypotheses relating to the expected magnitude and direction of relationships with other instruments were presented. It was expected that correlation with basic cognitive abilities would be high. The ACED showed moderate to strong correlation with MMSE for all three decision-making abilities ($0.48 \leq r_s \leq 0.60$) [17]. However, only the reasoning and understanding subtests in ACED showed moderate associations with executive measures ($0.33 \leq r_s \leq 0.59$) [17]. The correlations between basic ability tests and the ECB memory test were moderate to high ($r = 0.47–0.70, P \leq 0.05$) [22]. The EPT had moderate correlations with cognitive tests ($r = 0.32–0.59$) and had the
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Study population</th>
<th>Largest validation sample size</th>
<th>Study setting</th>
<th>Goal</th>
<th>Domains</th>
<th>Mode of administration</th>
<th>Time to complete</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACED [17]</td>
<td>Very mild to moderate cognitive impairment</td>
<td>39 Community dwelling</td>
<td>Capacity to make decisions for solving everyday functional problems</td>
<td>Four decision-making abilities: problem understanding; problem appreciation; reasoning; expression of choice</td>
<td>Semi-structured interview to discuss the patient's problems in performing instrumental activities of daily living and the possible solutions to managing them</td>
<td>15–20 min</td>
<td>Scoring criteria are available. Compute score by summing up individual question score</td>
<td></td>
</tr>
<tr>
<td>ECB [18]</td>
<td>Mild cognitive impairment</td>
<td>555 Community dwelling</td>
<td>Ability to solve memory-related everyday problems</td>
<td>Three IADL domains: medication use; financial management; nutrition and food preparation. Everyday cognitive competence: inductive reasoning; memory; knowledge</td>
<td>30 items paper-pencil measure presented with two real-world printed materials (e.g. medication labels) on each of the three IADL domains and removed before asking questions</td>
<td>&gt;12 min</td>
<td>Compute score by summing up individual question score</td>
<td></td>
</tr>
<tr>
<td>EPT [19]</td>
<td>Mild cognitive impairment</td>
<td>291 Community dwelling</td>
<td>Measure competence in problem-solving related to daily living</td>
<td>Seven IADL domains: medication use; meal preparation; telephone use; shopping; financial management; household management; transportation</td>
<td>Paper-pencil performance-based measure. To solve two problems pertaining to each of 21 printed stimulus (e.g. medication label). 42 items</td>
<td>No time limit</td>
<td>Compute score by summing up individual question score</td>
<td></td>
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<tr>
<td>EPCCE [20]</td>
<td>Mild to moderate cognitive impairment</td>
<td>773 Community dwelling</td>
<td>Measure of competence in problem-solving with respect to cognitively demanding daily living tasks (a shorter version of EPT)</td>
<td>IADL domains: meal preparation; medication use; telephone use; shopping; financial management; household maintenance and transportation</td>
<td>Performance-based measure. To solve two problems pertaining to each of 16 printed stimulus (e.g. telephone bill) 32 items</td>
<td>No time limit</td>
<td>Compute score by summing up individual question score</td>
<td></td>
</tr>
<tr>
<td>PEDL [21]</td>
<td>Alzheimer's disease</td>
<td>22 Community dwelling</td>
<td>Measure ability to solve practical problems that occur in everyday life for predicting IADL performance</td>
<td>Cognitive domain: comprehension</td>
<td>Structured interview 14-item test of practical problem-solving</td>
<td>Not reported</td>
<td>Compute score by summing up individual question score</td>
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</tbody>
</table>
executive functions composite accounting for 11.4% of the variance [19]. The EPCCE showed a moderate to high correlation with cognitive measures \((r = 0.36–0.70)\). Results of a hierarchical regression analysis for variables showed performance on global cognitive measures and scores on executive abilities, each accounting for a significant amount of unique variance \((R^2 = 0.59, \text{adjusted } R^2 = 0.57 \text{ and } R^2 = 0.69, \text{adjusted } R^2 = 0.67, \text{respectively})\) in EPCCE performance [25]. The PEDL also showed a moderate correlation with MMSE \((r = 0.52)\) [21].

Moreover, validations on specific functional domains of measure for individual instruments were found. Each ACED subtest showed moderate to strong correlations with its corresponding measure on the MacCAT-T, a validated measure for decision-making capacity \((r = 0.38–0.71)\) [17]. Only three instruments (EPT, EPCCE and PEDL) have reported associations with IADL and/or Activities of Daily Living (ADL). The EPT showed a strong association with observed IADL \((r = 0.67)\) [19] but weak to moderate association with self/informant reported IADL \((r = 0.19–0.36)\) [26]. The EPCCE showed a weak association with caregiver reported IADL \((r = 0.25)\) [27] but moderate association with self-reported IADL \((r = 0.36)\) [28]. The PEDL had a strong association with IADL \((r = 0.71)\) and moderate association with ADL \((r = 0.58)\) [21].

Except for the verbal fluency subtest of ACED, all instruments demonstrated good discriminant group differences by mean. Nevertheless, the ACED showed a ceiling effect [17] while the ECB reported a floor effect in pilot [22]. A possible floor effect was also reported in one of the studies on EPCCE [20].

Reliability

With regard to internal consistency, a Cronbach’s alpha was reported for all reviewed instruments, except PEDL, ranging from 0.84 to 0.92. Test–retest reliability was found for EPT [19] and EPCCE [20] using correlation coefficient \(r = 0.81–0.93\). Inter-rater reliability was reported for ACED and PEDL. Inter-rater ICC was reported only for ACED ranging from 0.85 to 0.99 for subtests [29]. Percentage of agreement was reported for ACED subset of choice [17]. Inter-rater reliability for PEDL was 0.944 [24].

Responsiveness

Change over time was addressed only in studies for EPCCE [20, 28]. However, it was found that the correlation between the rate of change and initial status was not significant \((r = 0.03)\), and the reliability of rate of change was low \((r = 0.26)\) [28]. No reported data on responsiveness were found for the other instruments from the articles under this review.

Interpretability

Information on score interpretation was found for all reviewed instruments. Mean and SD scores of control and study groups were presented for all instruments. Information on scores for different relevant subgroups was available for EPT [8, 19] and EPCCE [25]. One study showed that lower baseline scores on the EPCCE were a significant predictor of mortality [20].

Overall quality

An overview on the quality rating of included instruments is presented in Table 2, and the related data extracted from reviewed articles are listed in Supplementary data in Age and Ageing online, Table 3.

The EPCCE was the only instrument that reported on responsiveness although it was found that the rate of change in score was not significant \((r = 0.03)\) [28]. The EPT received the best positive rating for its clinimetric properties (10 out of 12). The ECB received the second highest rating at 9 out of 10 for its property rating in this review. Both ACED and PEDL received the best rating for administration (scoring by hand and no extra resources/special equipment or test materials needed). The PEDL reported only on 5 out of 12 clinimetric properties.

Discussion

Only five instruments that assess the ability of everyday problem-solving of the elderly with cognitive impairment were identified. All instruments attempted to adequately reflect older adults’ everyday functioning in the real world. The ACED allows for specific assessment on patient’s decisional abilities related to specific individual functional deficits. This information will be valuable in caring for persons with self-neglect. However, the presence of a knowledgeable informant is critical to obtain the participant’s information prior to the administration of ACED. Therefore, ACED is not applicable for clients living alone or those without a knowledgeable informant.

The ECB is an instrument that focuses on memory-related problem-solving. Participants are presented with real-world printed material, which is removed before they are asked the questions. Clinicians must be aware of the potential stress and degree of acceptance for clients with a memory problem.

The EPT requires participants to solve problems associated with seven IADL domains using real-life stimuli. This provides a comprehensive assessment of everyday competence. However, it was reported that the mean item difficulty of EPT was 0.64, suggesting that the measure is a moderately difficult scale [5]. The EPT may not be appropriate for individuals with a higher level of cognitive impairment.

The EPCCP, which was designed as a shorter version of the EPT, would be more appropriate for populations with lower levels of cognitive function [25]. However, a possible floor effect was reported for EPCCP [28]. Additionally, both EPT and EPCCP are untimed based on the rationale that there should be no time limit in performing everyday
tasks. A possible increase in the burden for the respondent and administrator needs to be considered.

The PEDL is simple to administer. However, limited information on its psychometric properties was identified from this review.

All the instruments included in this review focused their framework on IADL domains. This focus is congruent with suggestions from other studies on the importance of IADL in determining an elderly individual’s capability to live independently in the community [30].

All the reviewed instruments allowed direct measures of everyday problem-solving performance, which is more reliable than other indirect methods, especially for use in populations with cognitive impairment. The measurement designs also allow the participants to apply their habitual experience and knowledge in the context of assessed everyday tasks without other constrains such as physical limitations.

With regard to providing information to promote the process of instrument selection, a critical review on the clinimetric properties was conducted; the key results were listed in Table 2 and Supplementary data in Age and Ageing online, Table 3. For the selection of an outcome measure, responsiveness would be of particular importance. However, limited information on responsiveness was found, except for the EPCCE.

Ease of administration and interpretability should also be of great concern in tool selection. When using ACED, the interviewer must administer and rate the score according to specific guidelines and rating criteria that are available from the developer. Similarly, prior to administration of ECB, EPT or EPCCP, copies of specific real-life stimuli are needed. The PEDL appears to be the simplest instrument. All instruments under review had good interpretability, with mean and SD scores presented for the general population and for persons with cognitive impairment.

Different strengths and limitations were found with all of the reviewed instruments. No single measure, either by traditional neuropsychological psychometric measures or these everyday problem-solving instruments, can unequivocally determine whether someone has the capacity to live independently. Input from multi-disciplinary healthcare team is needed for safe discharge planning. Previous studies have used these ecological test outcomes to compare performance between those with and without cognitive impairment or to associate ecological test outcomes with clinically meaningful outcomes (such as risk of dementia or mortality).

Further research is needed to compare assessment scores with real-life outcomes on how the cognitively impaired older people manage after discharge from hospital to their own home or a supported care setting.

**Conclusion**

Few existing instruments that assess the ability of everyday problem-solving of the elderly with cognitive impairment exist in the literature. Four out of the five instruments identified in this review (ECB, EPT, EPCCE, PEDL) capture
Further research is required in this area, especially for those with severe cognitive impairment. Clinicians are more likely to determine that individuals with severe cognitive impairment have a greater need to be assessed than those with mild to moderate impairment. However, no available instrument for the moderate to severe impairment group was identified in this review.

Further studies are needed on the development and validation of simple screening tools aimed at accurately predicting everyday competence, especially for those with moderate to severe cognitive impairment. This knowledge will be of special importance if clinicians are expecting to provide better care of patients with cognitive impairment, in order to ensure their well-being and that they can safely live in the community for as long as possible.

This review provides information for clinicians or researchers on existing instruments to assess the ability of everyday problem-solving of the elderly with cognitive impairment so as to facilitate the choice of an appropriate instrument. It is important to bear in mind that the selection process is a matrix of tactical decisions to meet the specific purposes for the specific application in the specific population under specific resources. Different measures provide valuable additional and objective information under certain circumstances, but will still need to be considered as one part of a team approach to discharge planning. These measures will still be considered as just one part of the assessment process, along with personalised functional assessment of IADLs and perhaps a home trial. It is suggested that future research involves the clinical trialling of tests as an aspect of a team approach to discharge and then validating them against functional, real-world outcomes.

Key points

- Competency assessments are crucial for timely interventions and safe discharge planning for patients with cognitive impairment.
- This review identified five instruments available for evaluating the everyday problem-solving or everyday competence in the elderly.
- All instruments focused their frameworks on IADL domains.
- Four out of the five identified instruments capture data by using hypothetical scenarios/problems.
- Further research is required in this area, especially for those with moderate to severe cognitive impairment.

Conflicts of interest

None declared.

Supplementary data

Supplementary data mentioned in the text is available to subscribers in Age and Ageing online.

References

16. Terwee CB, Bot SD, de Boer MR et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol 2007; 60: 34–42.
Older people’s participation in and engagement with falls prevention interventions in community settings: an augment to the Cochrane systematic review

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Abstract

Background: randomised controlled trials (RCTs) of fall prevention conducted in community settings have recently been systematically reviewed.

Objective: to augment this review by analysing older people’s participation in the trials and engagement with the interventions.

Design: review of the 99 single and multifactorial RCTs included in the Cochrane systematic review of falls prevention interventions.

Setting: community.

Participants: adults aged 60+/mean age minus one standard deviation of 60+.