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RESEARCH ARTICLE

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Brief Assessment of Impaired Cognition Questionnaire (BASIC-Q)—Development and validation of a new tool for identification of cognitive impairment in community settings

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Objectives: Brief Assessment of Impaired Cognition (BASIC), which combines self- and informant report with cognitive testing, was previously found to be highly accurate in identification of dementia and cognitive impairment. The aim of the present study was to develop and validate a questionnaire version of BASIC, the BASIC-Q, for use in community settings.

Methods: In order to construct a questionnaire version of BASIC, we substituted cognitive testing with questions regarding orientation. BASIC-Q was validated based on further analysis of data from the primary BASIC validation study, where patients consecutively referred from general practice were tested at their first memory clinic admission prior to diagnosis. Control participants were primarily recruited among participating patients' relatives. Expert clinical diagnosis was subsequently used as reference standard for estimation of classification accuracy.

Results: A high discriminative validity (sensitivity 0.92, specificity 0.97) for cognitive impairment (n = 159) vs socio-demographically matched control participants (n = 109) was found. In comparison, the MMSE had 0.76 sensitivity and 0.81 specificity. Administration time for BASIC-Q was less than 5 minutes compared to approximately 10 minutes for the MMSE.

Conclusions: BASIC-Q is a brief, efficient and valid tool for identification of cognitive impairment in a clinical setting. Further validation in a community setting is needed.

KEYWORDS

BASIC, BASIC-Q, cognitive impairment, cognitive screening, diagnostic accuracy, discriminative validity, predictive validity, questionnaire

1 | INTRODUCTION

Incipient dementia often develops slowly and insidiously before eventually being noticed by the person involved, a close family member or a community elderly care professional. Differentiating mild cognitive impairment (MCI) or even mild dementia from normal age-related cognitive decline in elderly persons can be challenging and several studies indicate that dementia may be underdiagnosed in primary care.[1-5]

Although many brief cognitive tests are available for identification of dementia in a clinical setting, they may not be ideal for community

settings. Focus group interviews conducted in 2018 with community elderly care professionals such as nurses and health visitors led us to the understanding that an instrument aimed at use in community settings should not include cognitive testing, but rather take the form of a questionnaire or structured interview combined with clinical observation. The focus groups welcomed a brief and easy-to-use tool applicable in situations where a senior citizen shows early signs or symptoms of cognitive impairment. As some older community-dwelling citizens with incipient cognitive impairment may have limited awareness of their condition, the questionnaire should not focus only on subjective cognitive impairment but also include an "objective" measure of cognitive status.

In 2017, a Danish action plan for dementia was launched focusing on early identification of possible dementia and higher quality in assessment.[6] The focus of this plan is similar to the National Alzheimer's Project Act of 2011 which recommends identifying early stages of Alzheimer's disease (AD) including MCI as a national priority.[7] However, general cognitive screening of the senior population is not advisable.[8] The Brief Assessment of Impaired Cognition (BASIC) for use in both primary and secondary care was developed and found to be efficient, highly valid and possibly superior to the MMSE for identification of dementia and cognitive impairment in a memory clinic setting.[9] BASIC combines self- and informant report with brief cognitive tests.

The aim of the present study was to develop a questionnaire-version of BASIC (BASIC-Q) for identification of cognitive impairment in community settings and perform a preliminary validation based on further analysis of data from the primary validation of BASIC. The rationale for basing the validation of BASIC-Q on data from a clinical setting was the fact that all participating patients had a comprehensive diagnostic work-up and were assigned an expert clinical diagnosis well suited as reference standard in diagnostic accuracy analyses.

Key points

- The Brief Assessment of Impaired Cognition Questionnaire (BASIC-Q) integrates self-report and informant report with questions on orientation in time and person. Performance on the tool is unaffected by education and age and only slightly affected by gender.
- Previous studies investigating the utility of self- and informant report found that self-report was more reliably correlated with cognition earlier in the process of decline, whereas informant report became superior at later stages with loss of insight. The results of the present study substantiate the effectiveness and validity of integrating self- and informant report with assessment of orientation in an instrument aimed at identification of cognitive impairment.
- Although BASIC-Q has promising diagnostic properties in a clinical setting, further validation of the questionnaire in a community or primary care setting is necessary.

2 | METHODS

Based on focus group interviews with community elderly care professionals, specifications for the new tool were defined: (a) It should be broadly applicable in community and primary care settings, (b) should not contain cognitive testing or items that may be perceived as unnecessarily confrontational, (c) be easily administered by trained community elderly care professionals, (d) have good discriminative validity, and (e) be available for elderly care professionals and non-commercial research without copyright restrictions.

2.1 | The Brief Assessment of Impaired Cognition Questionnaire

BASIC-Q consists of three components: (a) self-report, (b) orientation, and (c) informant report (Table 1). It is inspired by existing, validated instruments[10,11] and includes elements from validated questionnaires.[12,13]

Prior to construction of BASIC-Q, a preliminary instrument including components from both BASIC-Q and BASIC was tested. BASIC-Q contains the same self- and informant report as BASIC, but two cognitive tests (Supermarket fluency, Category cued memory test) included in BASIC are substituted with questions regarding orientation. Questions regarding orientation in time, place and/or person are easily administered, time-saving and relates to everyday life, and constitute an integral part of numerous case-finding instruments.[14-20] The preliminary version of BASIC included seven orientation items eventually excluded from the final version, as they provided minimal contribution to the discriminative validity of the instrument when cognitive tests were also included. However, when cognitive tests are not included, orientation items prove valuable. Orientation in time has been found to be a strong predictor of subsequent cognitive decline.[21] When designing the BASIC-Q, two of the seven orientation items ("What is the season?", "Where are we?") were excluded as they were considered less suitable in a community setting. Combinations of the remaining five orientation items together with self- and informant report components from BASIC were analyzed in a series of stepwise backwards binary logistic regression analyses utilizing the probability of the Wald statistic with case-control status as the dependent variable. This resulted in the exclusion of one more item ("What date is your birthday?") that provided minimal incremental diagnostic accuracy when other orientation items were included. The BASIC-Q record form and instructions are available as Appendix S1).

2.1.1 | Self-report

The person is asked three questions regarding memory functioning from the Cognitive Function Instrument (CFI)[13] Response options are

TABLE 1 Brief Assessment of Impaired Cognition Questionnaire (BASIC-Q)

Component	Description	Score range
1. Self-report	Compared to previously, do you feel that your memory has declined substantially? Do you need more help from others to remember appointments, family occasions, or holidays? Do you have more trouble recalling names, finding the right words, or completing sentences? Scoring: No = 2 points; To some extent = 1 point; To a great extent = 0 points.	0-6
2. Orientation	What is the year? What is the month? What day of the week is it? How old are you? Scoring: Correct answer = 2 points; Wrong answer = 0 points	0-8
3. Informant report	Compared with a few years ago, how is your spouse / partner / parent / family member / this person at: Remembering things that have happened recently? Recalling conversations a few days later? Remembering what day and month it is? Scoring: Unchanged = 2 points; A bit worse = 1 point; Much worse = 0 points.	0-6
BASIC-Q total score		0-20

Note: Optimal cutoff score for case-finding of cognitive impairment = 16/17.

"No" (2 points), "To some extent" (1 point) and "To a great extent" (0 points).

2.1.2 | Orientation

The person is asked three questions regarding orientation in time (year, month, day of week) and one question regarding orientation in person (age). In order to balance the contribution of the four orientation items relative to the contribution of self- and informant report to the total BASIC-Q score, a simple weighting was used for orientation questions (correct answer = 2 points; wrong answer = 0 points).

2.1.3 | Informant report

An informant (eg, spouse or partner) is asked three questions from the Informant Questionnaire on Cognitive Decline (IQCODE)[12] regarding the cognitive functioning of the person involved. Response options are "Unchanged" (2 points), "A bit worse" (1 point), "Much worse" (0 points). Informant report can either be administered by the examiner or self-administered.

The BASIC-Q score is obtained by summing the scores of the three components into a composite score (range 0-20 points). Informant report generally provides valid and important information, but in situations where reliable informant report cannot be obtained, a prorated BASIC-Q score may be used as a second-best option (Table S1).

2.2 | Participants

The study was carried out in accordance with the Code of Ethics of the World Medical Association for experiments involving humans (reference no. 17026283) and approved by the Danish Data Protection Agency (RH-2018-34). Written informed consent was obtained from all participants. A clinical sample and a control sample were included between February and November 2018. Inclusion criteria for all participants were age ≥65 years and being fluent in Danish. Persons with impaired eyesight or hearing invalidating assessment were excluded. One outpatient memory clinic from each of the five administrative regions of Denmark took part in the data collection. Further inclusion criteria for the clinical sample were: (a) a relevant informant (eg, relative) present at the examination and (b) referred from general practice for diagnostic evaluation. Other referrals (eg, second opinion, genetic counselling) were excluded. Patients were consecutively included at their initial memory clinic admission and administered a preliminary version of BASIC. Patients further underwent an extensive diagnostic work-up as described in a previous publication.[9] A multidisciplinary staff meeting led by senior specialists in neurology, psychiatry or geriatrics blinded to BASIC results subsequently established a consensus diagnosis according to previously described criteria.

The control sample was recruited among participating patients' relatives (mainly spouses) and volunteers from ongoing research projects at the involved memory clinics. Accompanying relatives were informed about the study and asked if they would like to participate as controls. Candidates for inclusion completed a comprehensive questionnaire including medical history and use of medication and alcohol, and candidates with a history of neurological or psychiatric disease or alcohol consumption above recommended national levels were excluded. Remaining candidates were assessed with the MMSE and the 15-item Geriatric Depression Scale (GDS-15).[22] Further exclusion criteria for the control sample were MMSE <24, and/or GDS-15 ≥ 6.

2.3 | Procedure

The validation of BASIC-Q is based on further analysis of data from the primary validation of BASIC, which was a prospective study in

which patients were assessed prior to diagnosis. In most cases, diagnosis was established 1 to 3 months later. At each site, the preliminary instrument was administered by trained nurses or physicians. Administration was standardized across memory clinics. Informants concurrently completed a brief informant report questionnaire. Control participants served as their own informants. Age, gender and post-secondary education (type and approximate length of education exceeding compulsory education) were registered for all participants. Moreover, total years of education (sum of years of compulsory plus secondary education) were registered for control participants.

2.4 | Data analysis

The significance of group differences on continuous variables was determined using independent samples *t* tests. The significance of group differences in gender distribution was determined using the Pearson χ^2 test. Effect sizes were calculated as Hedges' *g*.[23] Effect sizes of 0.2 to 0.5 were considered small, >0.5 to 0.8 were considered medium and effect sizes >0.8 were considered large. Discriminative validity was assessed by calculating sensitivity, specificity and likelihood ratios using a clinical diagnosis of cognitive impairment—defined as either dementia or MCI—as reference standard. The optimal balance between sensitivity and specificity for separation between groups was determined by Youden's J.[24] Receiver operating characteristic (ROC) curves for BASIC-Q and MMSE were constructed and the areas under the curve (AUC) were compared using the nonparametric approach by DeLong et al.[25] for correlated ROC curves. Predictive validity was calculated according to Bayes' theorem.[26] Positive predictive validity (PPV) can be interpreted as an estimate of the probability of cognitive impairment for individuals with a positive result according to a given cutoff, whereas negative predictive validity (NPV) can be conceived as an estimate of the probability of being without cognitive impairment for individuals with a negative result according to the cutoff. Effects of age, education and gender on BASIC-Q performance in the control sample were estimated by linear regression analysis with plots of residuals as model control. Associations between continuous variables were assessed using the Pearson product-moment correlation coefficient. Internal consistency of BASIC-Q was determined by coefficient alpha as an approximation of scale reliability. Pro-rated BASIC-Q score estimates were obtained by linear regression rounding the result to the closest integer. An online clinical research calculator was used to calculate confidence intervals (CI) for sensitivity, specificity, PPV and NPV (www.vassarstats.net). MedCalc statistical software was used to compare ROC curves (www.medcalc.org). All other analyses were performed with SPSS statistical software (version 25). $P < .05$ (two-tailed) was considered significant.

3 | RESULTS

Of 442 participants assessed, four dropped out prior to diagnosis and 10 were excluded due to: (a) age <65 years (nine participants); and (b) GDS-15 ≥ 6 (one control participant). Thus, 428 participants (293 cases and 135 controls) were eligible for inclusion. To minimize the possible impact of socio-demographic variables on the discriminative validity analyses we selected two socio-demographically matched subsamples through stepwise exclusion of participants until statistically significant differences in age, education and gender between the subsamples were suspended. The final sample used for discriminative validity analyses consisted of (a) a cognitively impaired subsample including persons with dementia or MCI (n = 159), and (b) a matched control subsample (n = 109) (Table 2).

TABLE 2 Socio-demographic and cognitive characteristics

	Cognitively impaired (dementia or MCI)	Controls
Number	159	109
Age (years)	75.7 (4.89)	75.1 (4.87)
Post-secondary education (years)	2.3 (1.51)	2.6 (1.50)
Gender (female/male)	83/76	65/44
MMSE***	23.8 (4.43)	28.7 (1.55)
BASIC-Q***	11.7 (3.74)	19.0 (1.11)
Self-report***	3.8 (1.46)	5.3 (.90)
Orientation***	4.5 (2.04)	5.9 (.33)
Informant report***	2.2 (1.69)	5.8 (.46)

Note: Age, education and scores are reported as mean and SD.
Abbreviation: MMSE = Mini-Mental State Examination.
***$P < .001$.

The two socio-demographically matched subsamples in the present study are identical to the subsamples presented in the primary BASIC validation study except for the exclusion of three participants from the clinical subsample due to missing data on orientation. The distribution of diagnoses in the cognitively impaired subsample was: 42% AD, 23% MCI, 12% vascular dementia, 5% Lewy body dementia, 5% frontotemporal dementia, 4% mixed dementia, 3% dementia not otherwise specified, 3% Parkinson's disease dementia, 2% alcohol-related dementia and 2% other causes of dementia.

Significant differences with large effect sizes were present between the two subsamples on BASIC-Q (t [266] = 19.68, $P < .001$, $g = 2.45$), and its components: self-report (t [266] = 9.62, $P < .001$, $g = 1.25$), orientation (t [266] = 7.58, $P < .001$, $g = 1.02$) and informant report (t [266] = 22.04, $P < .001$, $g = 2.74$) (Table 2).

3.1 | Reliability

Coefficient alpha for the BASIC-Q scale (10 items) was 0.84.

3.2 | Discriminative validity

Using the AUC as an index of diagnostic accuracy, BASIC-Q was highly accurate in differentiating participants with cognitive

impairment from control participants (AUC = 0.98; 95% CI 0.96-0.99) (Figure 1).

In comparison, the MMSE had an AUC of 0.86 (95% CI 0.81-0.90). Pairwise comparison of ROC curves revealed that BASIC-Q had significantly higher classification accuracy than the MMSE (z = 5.37, P < .0001). Discriminative validity statistics for BASIC-Q for identification of cognitive impairment at six different cutoff scores are presented in Table 3.

A cutoff score of 16/17 on BASIC-Q provided optimal discrimination between cognitively impaired participants and control participants with high sensitivity (0.92) and specificity (0.97). By comparison, MMSE had moderate sensitivity (0.76) and specificity (0.81) at an optimal cutoff score of 27/28 in this sample, and maximum specificity (1.00) but very poor sensitivity (0.43) at the commonly applied cutoff of 23/24. Predictive validity estimates for a range of scores below and above the optimal cutoff at selected base rates of cognitive impairment are presented in Table 4.

The diagnostic accuracy of BASIC-Q without informant report for cognitive impairment was high (AUC = 0.92; 95% CI 0.89-0.95). This is identical to the diagnostic accuracy of pro-rated BASIC-Q scores, but the full BASIC-Q performed significantly better (z = 4.59, P < .0001).

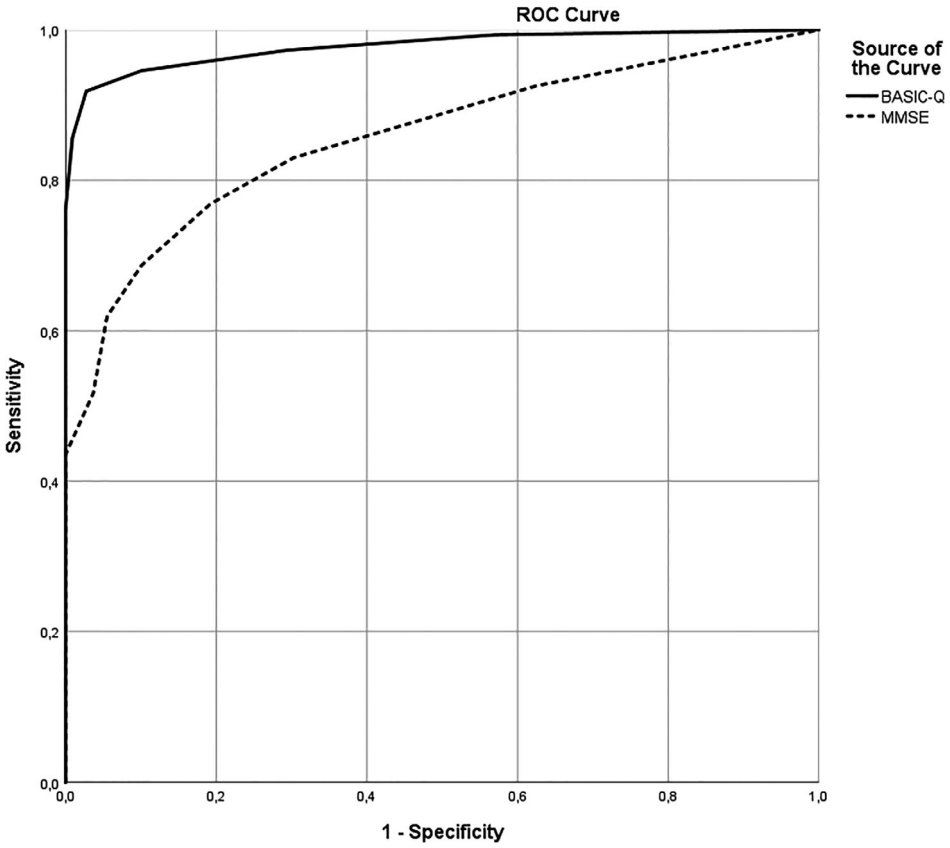

FIGURE 1 Receiver operating characteristic curves for BASIC-Q and MMSE for cognitive impairment. Areas under the ROC curve (AUC): BASIC-Q = 0.98; MMSE = 0.86. MMSE, Mini-Mental State Examination

TABLE 3 Classification accuracy of BASIC-Q and MMSE for cognitive impairment at different cutoff scores

	Cutoff	Sensitivity (95% CI)	Specificity (95% CI)	LR+	LR−
BASIC-Q	14/15	0.77 (0.69-0.83)	1.00 (0.96-1.00)	N/A	0.23
	15/16	0.86 (0.79-0.90)	0.99 (0.94-1.00)	93.23	0.15
	16/17[a]	0.92 (0.86-0.95)	0.97 (0.92-0.99)	33.36	0.08
	17/18	0.95 (0.90-0.98)	0.90 (0.82-0.95)	9.41	0.06
	18/19	0.97 (0.93-0.99)	0.71 (0.61-0.79)	3.32	0.04
	19/20	0.99 (0.96-1.00)	0.43 (0.34-0.53)	1.75	0.01
MMSE	23/24[b]	0.43 (0.35-0.51)	1.00 (0.97-1.00)	N/A	0.57
	27/28[a]	0.76 (0.68-0.82)	0.81 (0.72-0.88)	3.98	0.30

Abbreviations: CI, confidence interval; LR−, negative likelihood ratio; LR+, positive likelihood ratio; MMSE, Mini-Mental State Examination.

[a]Optimal cutoff score for discrimination between cognitively impaired group and control group.

[b]Commonly applied cutoff score for MMSE.

TABLE 4 Predictive validity estimates at different cutoff scores and base rates of cognitive impairment

		Base rate 5%		Base rate 10%		Base rate 25%		Base rate 50%	
	Cutoff	PPV (95% CI)	NPV (95% CI)	PPV (95% CI)	NPV (95% CI)	PPV (95% CI)	NPV (95% CI)	PPV (95% CI)	NPV (95% CI)
BASIC-Q	14/15	1.00 (0.96–1.00)	0.99 (0.98-0.99)	1.00 (0.96-1.00)	0.97 (0.96-0.98)	1.00 (0.96-1.00)	0.93 (0.90-0.95)	1.00 (0.96-1.00)	0.81 (0.75-0.86)
	15/16	0.83 (0.76-0.88)	1.00 (0.99-1.00)	0.91 (0.85-0.95)	0.98 (0.98-0.99)	0.97 (0.92-0.99)	0.95 (0.93-0.97)	0.99 (0.95-1.00)	0.87 (0.81-0.92)
	16/17[a]	0.64 (0.57-0.70)	1.00 (0.99-1.00)	0.79 (0.72-0.84)	0.99 (0.98-0.99)	0.92 (0.86-0.95)	0.97 (0.95-0.98)	0.97 (0.93-0.99)	0.92 (0.87-0.96)
	17/18	0.33 (0.29-0.38)	1.00 (0.99-1.00)	0.51 (0.45-0.57)	0.99 (0.99-1.00)	0.76 (0.69-0.82)	0.98 (0.96-0.99)	0.90 (0.85-0.94)	0.95 (0.89-0.98)
	18/19	0.15 (0.13-0.17)	1.00 (0.99-1.00)	0.27 (0.23-0.31)	1.00 (0.99-1.00)	0.53 (0.47-0.58)	0.99 (0.97-1.00)	0.77 (0.70-0.82)	0.97 (0.91-0.99)
	19/20	0.08 (0.07-0.10)	1.00 (1.00-1.00)	0.16 (0.14-0.19)	1.00 (0.99-1.00)	0.37 (0.32-0.42)	1.00 (0.97-1.00)	0.64 (0.57-0.70)	0.99 (0.91-1.00)
MMSE	23/24[b]	1.00 (0.93-1.00)	0.97 (0.96–0.98)	1.00 (0.93-1.00)	0.94 (0.93-0.95)	1.00 (0.93-1.00)	0.84 (0.80-0.87)	1.00 (0.93-1.00)	0.63 (0.57-0.70)
	26/27[a]	0.17 (0.15-0.21)	0.98 (0.98-0.99)	0.31 (0.26-0.36)	0.97 (0.96-0.98)	0.57 (0.50-0.64)	0.91 (0.88-0.94)	0.80 (0.72-0.86)	0.77 (0.70-0.83)

Note: Receiver operating characteristic curves for BASIC-Q and MMSE for cognitive impairment. Areas under the ROC curve (AUC): BASIC-Q = 0.98 (95% CI 0.96-0.99); MMSE = 0.86 (95% CI 0.81-0.90).
Abbreviations: CI, confidence interval; MMSE, Mini-Mental State Examination; NPV, negative predictive validity; PPV, positive predictive validity.
[a]Optimal cutoff score for discrimination between cognitively impaired group and control group.
[b]Commonly applied cutoff score for MMSE.

3.3 | Construct validity

Moderate correlations were found between the BASIC-Q and the MMSE (r = 0.73, P < .01) (Table S2). Also, significant correlations were found between BASIC-Q and its three components, and between the components relative to each other. The weakest, but still significant, correlations were seen between self-report and other measures.

3.3.1 | Face validity

The face validity of BASIC-Q has not been formally examined, but a review of the items indicates that they are generally non-confrontational and relate to the everyday life of the person being interviewed and his/her family member. If the questionnaire format is perceived as too formal, it is possible to integrate the BASIC-Q items in a semi-structured interview.

3.4 | Impact of socio-demographic variables

Gender had a statistically significant but numerically small impact on BASIC-Q score in the control sample, whereas neither age nor years of education had significant or numerically relevant effects in the examined age range (65-87 years) (Table S3). Women slightly outperformed men by 0.7 points on BASIC-Q. Gender also had statistically significant but numerically small impact on orientation (unstandardized beta = 0.53, P = .007) and informant report (unstandardized beta = 0.41, P = .016) but not on self-report. Neither age, nor education had statistically significant impact on any BASIC-Q component. Predicted BASIC-Q scores for control participants were estimated by combining unstandardized beta coefficients from the regression model with age, education and gender using the following formula: 19.795 − age × 0.033 + years of education × 0.034 + gender × 0.675 (gender coded as female = 2, male = 1). Mean predicted score for the control sample was 18.8. The effect of age was −0.03 point per year accounting for approximately half a point difference between the predicted scores of, for example, a 65-year old and an 85-year old.

4 | DISCUSSION

BASIC-Q was developed as a questionnaire for identification of cognitive impairment for use in community settings. The original BASIC instrument combines self- and informant report with cognitive testing but based on results from focus group interviews with community elderly care professionals cognitive testing was substituted with questions regarding orientation in BASIC-Q. A preliminarily validation of BASIC-Q was performed by further analysis of data from the primary BASIC validation study. A high discriminative validity with a sensitivity of 0.92 and specificity of 0.97 for cognitive impairment vs

socio-demographically matched control participants was found. In comparison, the MMSE optimally had a sensitivity of 0.76 and specificity of 0.81. Comparison of ROC curves indicated that BASIC-Q had significantly higher classification accuracy than MMSE. BASIC-Q appears to be unaffected by education and age (in the examined age range) and the impact of gender is too small to necessitate socio-demographical adjustment of observed scores. BASIC-Q is easy to use and can be administered in less than 5 minutes compared to the approximately 10 minutes necessary for administering the MMSE. It is strongly recommended that the complete BASIC-Q is used as default option, but if reliable informant report cannot be obtained, pro-rated scoring may be used. Pro-rated scoring based on BASIC-Q without informant report has less diagnostic accuracy than the complete BASIC-Q but higher accuracy than the MMSE.

BASIC-Q is not the first instrument to combine informant report with either self-report or orientation. The General Practitioner Assessment of Cognition (GPCOG)[11] integrates informant report with time orientation and cognitive testing, BrainCheck[10] integrates informant and self-report with cognitive testing, and CFI[13] combines similarly phrased self- and informant report versions of the same questionnaire. According to a longitudinal study, both CFI versions were associated with cognitive decline during four-year follow-up but self-report may be more accurate while the person is still cognitively intact, whereas the accuracy of informant report improves with progression of cognitive impairment.[13,27] In MCI, only informant report predicted cognitive decline.[27] Accordingly, in a Norwegian validation study the CFI discriminated well between people with dementia and those with either MCI, subjective cognitive impairment (SCI), or a reference group.[28] But informant report performed significantly better than self-report in the dementia stage. The BrainCheck validation study showed that patient-directed items (self-report regarding memory functioning plus clock drawing test) and informant report each had moderate discriminative validity on a separate basis, but combining the two sources of information in an integrated tool significantly improved classification accuracy.[10] Taken together, the results indicate that integrating informant and self-report with an objective measure of cognitive functioning (cognitive testing or orientation) may increase discriminative validity.

The optimal BASIC-Q cutoff score for separation of persons with cognitive impairment from control participants in the present sample is 16/17. However, when evaluating the performance of an individual person, optimal group separation is not the focus of interest. Instead, the probability of cognitive impairment and the probability of being cognitively intact associated with a given cutoff score is more relevant. We therefore also present predictive validity estimates for different base rates of cognitive impairment (Table 4). In a low base rate setting, such as among home-dwelling senior citizens, PPV is relatively attenuated due to a higher proportion of false positive cases. For instance, in a 5% to 10% base rate setting, a BASIC-Q cutoff score of 15/16 instead of 16/17 may be considered, in order to ensure high PPV. In a high base rate setting, such as a memory clinic (base rate 50% or higher), neither PPV nor NPV for BASIC-Q seem to be a challenge. The fact that the case mix in community and primary care settings differs from memory clinics is likely to affect the performance of BASIC-Q in these settings.

The patients in this study were referred from general practice and undiagnosed at the time of assessment. As BASIC-Q had no influence on subsequent clinical diagnosis, the risk of circular evidence was low. The fact that the condition of interest—cognitive impairment—is a clinically defined condition seems to justify the use of expert clinical diagnosis as reference standard rather than, for example, a biomarker-based approach. Another possible strength of the study is the geographical distribution of the sample involving all administrative regions in Denmark.

The major limitation of this study is the fact that data were collected in a memory clinic setting. Our clinical sample is representative for persons referred from general practice at their first memory clinic admission, but not necessarily for a community or primary care setting. Future studies are needed to cross-validate BASIC-Q in these settings and also to examine the ability of BASIC-Q to monitor cognitive decline during disease progression. Reliability has not been properly assessed using a test-retest design. Coefficient alpha is presented as an approximation of scale reliability, but there is not necessarily a strong association between internal consistency and the temporal stability of an instrument. Further, because BASIC-Q is a short scale (10 items) alpha may not be an optimal reliability measure. Reliability measures have been reported for both IQCODE[28,29] and CFI,[13,30] but these are not directly applicable to BASIC-Q, which includes only three items from each of the two instruments. The BASIC-Q composite score was based on combining unweighted self-report and informant report scores with weighted orientation scores. Although more refined methods may have been used, the high intercorrelation between most BASIC-Q components indicates that this is a valid and straightforward approach that can be easily applied in community settings.[31]

5 | CONCLUSION

The present study suggests that BASIC-Q meets criteria for an accurate, time-saving and easy-to-use tool for identification of cognitive impairment in a clinical setting. BASIC-Q appears to be sensitive and highly specific for identification of cognitive impairment among persons referred from general practice for expert diagnostic evaluation. By making the instrument available for elderly care professionals and non-commercial research without copyright restrictions we hope to enable quick and accurate identification of cognitive impairment in community settings, eventually facilitating that a higher proportion of senior citizens with possible cognitive impairment will be motivated to contact their general practitioner for further assessment. It must be emphasized, though, that BASIC-Q can never substitute expert clinical evaluation. A diagnosis of cognitive impairment cannot be based solely on a brief questionnaire.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHORS' CONTRIBUTIONS

G.W., F.B.W., K.J., and A.N. designed the study. A.N. and K.J. coordinated the data collection. K.J. and T.R.N. developed the BASIC-Q, analyzed the data and drafted the initial version of the manuscript. All authors contributed to revision and editing of the article.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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SUPPORTING INFORMATION

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

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APPENDIX A.

- Brief Assessment of Impaired Cognition Questionnaire (BASIC-Q) - Record Form
- Brief Assessment of Impaired Cognition Questionnaire (BASIC-Q) - Informant Report
- Brief Assessment of Impaired Cognition Questionnaire (BASIC-Q) - Administration and Scoring