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ARTICLE

Validation of the NOSCA – nurses' observation scale of cognitive abilities

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Aims and objectives. To examine the psychometric properties of the Nurses' Observation Scale for Cognitive Abilities.
Background. Nurses' Observation Scale for Cognitive Abilities is a behavioural rating scale comprising eight subscales that represent different cognitive domains. It is based on observations during contact between nurse and patient.
Design. Observational study.
Methods. A total of 50 patients from two geriatric wards in acute care hospitals participated in this study. Reliability was examined via internal consistency and inter-rater reliability. Construct validity of the Nurses' Observation Scale for Cognitive Abilities and its subscales were explored by means of convergent and divergent validity and post hoc analyses for group differences.
Results. Cronbach's αs of the total Nurses' Observation Scale for Cognitive Abilities and its subscales were 0·98 and 0·66–0·93, respectively. The item–total correlations were satisfactory (overall > 0·4). The intra-class coefficients were good (37 of 39 items > 0·4). The convergent validity of the Nurses' Observation Scale for Cognitive Abilities against cognitive ratings (MMSE, NOSGER) and severity of dementia (Clinical Dementia Rating) demonstrated satisfactory correlations (0·59–0·70, $p < 0·01$), except for IQCODE (0·30, $p > 0·05$). The divergent validity of the Nurses' Observation Scale for Cognitive Abilities against depressive symptoms was low (0·12, $p > 0·05$). The construct validity of the Nurses' Observation Scale for Cognitive Abilities subscales against 13 specific neuropsychological tests showed correlations varying from poor to fair (0·18–0·74; 10 of 13 correlations $p < 0·05$).
Conclusions. Validity and reliability of the total Nurses' Observation Scale for Cognitive Abilities are excellent. The correlations between the Nurses' Observation Scale for Cognitive Abilities subscales and standard neuropsychological tests were moderate. More conclusive results may be found if the Nurses' Observation Scale for Cognitive Abilities subscales were to be validated using more ecologically valid tests and in a patient population with less cognitive impairment.
Relevance to clinical practice. Use of the Nurses' Observation Scale for Cognitive Abilities yields standardised, reliable and valid information about patient's cognitive behaviour in daily practice. The Nurses' Observation Scale for Cognitive Abilities aids in tailoring nursing interventions to patients' specific cognitive needs. We advocate the implementation of the Nurses' Observation Scale for Cognitive Abilities both in research and at geriatric units in acute care hospitals.

Key words: assessment, behaviour observation, brain injury, dementia, geriatric, hospital patients

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Introduction

The Nurses' Observation Scale for Cognitive Abilities (NOSCA) is a behavioural rating scale that structures nurses' observations of geriatric patients' cognitive functioning (see Appendix). It was designed specifically for the assessment of patients admitted to geriatric units in acute care hospitals.

The primary aim of the NOSCA is to aid in the development of interventions that are tailored to, and considerate of, patients' specific cognitive needs. Interventions must take patients' cognitive abilities and possible decline into account as cognitive abilities can influence communication, support needs in daily life activities, medical and nursing treatment, discharge placement and postdischarge compliance (Langley 2000, Flaherty *et al.* 2003, Foreman *et al.* 2003, Milisen *et al.* 2006). Further, awareness of cognitive abilities on the part of nurses is imperative to the provision of good quality care. For example, if a patient has attention-related difficulties, nurses should seek to provide that patient with a quiet environment.

The secondary aim of the NOSCA is to support clinical diagnoses. In particular, the NOSCA can help to identify and distinguish specific types of dementia by assessing cognitive problems on several cognitive domains. For example, loss of disease insight as the first sign of cognitive deterioration is considered to potentially reflect frontotemporal dementia.

Nurses on geriatric wards gather information about a patient's cognitive status by means of direct observation. Daily observation of the patient occurs 24 hours a day and may last for several days. Direct observations are based on informal interactions between the patient and nurse, for example, when taking a bath, having breakfast, during transfers or when interacting with other patients. The observation is not threatening, burdensome or stressful for patients. A patient's cooperation is not necessary, and observation can be conducted even when patients are too ill for neuropsychological testing. Other than neuropsychological testing, which assesses cognitive abilities under optimal experimental conditions, direct observation assesses a person's cognitive abilities in natural setting. Furthermore, observation fits very well into nurses' practice, because it is a major part of nursing and information is directly accessible during patient care encounters (Lekan-Rutledge 1997).

Prior to developing the NOSCA, a literature search for behavioural rating scales that comprehensively assess cognitive functioning (excluding the specific delirium screening instruments) was conducted (Persoon *et al.* 2006). We found that, although some scales measure one or, at most, two cognitive domains (for example the NOSGER) (Spiegel *et al.* 1991), prior to the NOSCA, no observation scale assessed several cognitive domains. Essentially, in daily practice, nurses simply employ their own unique style of observation and registration and determine their own priorities in selecting cognitive domains (Persoon *et al.* 2009). Consequently, agreement regarding patients' cognitive functioning among nurses varies from poor to fair at best (Persoon *et al.* 2007).

Development of the NOSCA

As no specific theoretical conceptual framework for classifying cognitive domains was dominant, we based the observation scale on the International Classification of Functioning, Disability and Health (ICF) (WHO, 2001). The preliminary items were mainly derived from existing related observation scales (Persoon *et al.* 2006). A multidisciplinary panel of experts (geriatric advanced nurses, neuropsychologists and geriatricians) was asked to reach consensus on the cognitive domains and the items to be included and add any missing items. We obtained a written judgment from the experts concerning their opinion on the construct and the items of the scale by means of the Delphi technique. In four rounds, we achieved consensus ($>70\%$ agreement). The result was an observation scale that comprises eight cognitive subscales, representing eight cognitive domains: attention, perception, memory, orientation, higher cognitive functions, thoughts, language and praxis. The scale comprises 39 items (2–7 items per cognitive domain), items are scored on a four-point Likert scale, and higher scores reflect better cognitively mediated activities. The NOSCA total score can range from 0–117; the eight subscales can range from 0–3. The NOSCA should be filled out at the end of the shift, and it takes five to eight minutes to complete. The items of the NOSCA should be read carefully at the beginning of the shift, but no extra training of the geriatric nurses is required. The NOSCA has to be administered two times a day on two consecutive days to capture the variation in the patient's clinical presentation.

The content validity of the NOSCA has been established based on expert opinion. It proved to sufficiently reflect the professional's concept of cognitive functioning, and no cognitive domains or items were considered lacking. The purpose of this study was to evaluate the psychometric properties of the NOSCA and to answer the following questions: (1) Is the NOSCA reliable?; (2) Is the total NOSCA valid in the assessment of cognitive functioning?; and c) Are the NOSCA subscales for the specific cognitive domains valid?

Methods

Setting and population

Patients hospitalised in geriatric units at either an academic centre or general hospitals were included. The average length of stay in the academic centre was 16 days. At the general hospital, the average length of stay was 20 days. At both sites, a multidisciplinary team was available, a geriatric environment was present (walking circuit, living room), and nursing staff consisted of mainly registered nurses, most of whom were qualified clinical geriatric nurses (350-hour programme). All patients admitted were eligible for participation unless they met one of the following exclusion criteria: being bedridden, inability to communicate in Dutch, the presence of delirium symptoms [Delirium Observation Scale (DOS) ≥ 3; Schuurmans *et al.* 2003] or severe dementia (CDR = 3; Hughes *et al.* 1982), inability to hear or read or inability to sufficiently or not cooperate with neuropsychological testing. Of the 100 patients who were admitted and screened, 50 did meet the exclusion criteria and were not included in the study.

Measures

The NOSCA total score can range from 0–117 (39 items, scored 0–3; higher scores reflect more cognitive abilities). Reliability was measured (*research question 1*) via internal consistency and inter-rater reliability.

The validity of the total NOSCA was assessed (*question 2*) with construct validity, given the lack of a gold standard for exploring the criterion validity of a behavioural rating scale that assesses cognitive functioning. The construct validity of the NOSCA was investigated via convergent validity, divergent validity and the known-groups technique. Convergent validity was examined by correlating the results of the total NOSCA with three other instruments that assess global cognitive function, namely the Mini Mental State Examination (MMSE; Folstein *et al.* 1975), three cognitive subscales of the Nurses Observation Scale for Geriatric Inpatients (NOSGER; Spiegel *et al.* 1991) and the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE; Jorm 1994). Convergent correlations with the severity of dementia (Clinical Dementia Rating scale/CDR; Hughes *et al.* 1982) and activities of daily living (Barthel Index/BI; Mahoney & Barthel 1965) were also expected. Divergent validity was studied by correlating the NOSCA with depressive symptoms (Geriatric Depression Scale Short Form/GDS-15; Yesavage *et al.* 1982). A post hoc analysis for group differences was applied by comparing the mean score of the NOSCA across relevant subject groups, namely groups that vary with respect to the severity of their dementia, the severity of their cognitive impairment and the severity of their depressive symptoms. To do this, we created groups using mean scores for the CDR (three groups: possible dementia: CDR = 0·5; mild dementia: CDR = 1; and moderate dementia: CDR = 2), the MMSE (four groups: MMSE is 30, 23–29; 18–22; 17 or lower) and the GDS-15 (no depressive symptoms: GDS-15 ≤ 5; depressive symptoms: GDS15 ≥ 6).

The construct validity of the NOSCA subscales (*question 3*) was explored as well, namely with convergent validity. The cognitive domain subscale results were correlated with scores on neuropsychological tests. One or more neuropsychological test per NOSCA subscale was selected. Tests were selected on the basis of their acceptance in clinical geriatric practice and their fit with the content of the designated NOSCA subscale. Table 3 displays the selected tests. All tests are described in Lezak *et al.* (2004), with the exception of the Visual Association Test and the praxis test, which are reported in Lindeboom *et al.* (2002) and Heilman and Gonzales Rothi (2003), respectively. All tests were at interval level. Additionally, we calculated correlations between each neuropsychological test and all other subscales, expecting to find lower correlation coefficients in these analyses than when the test was correlated with its designated NOSCA subscale.

Background variables measured included age, sex, education level and comorbidity (by means of the Cumulative Illness Rating Scale-Geriatric/CIRS-G; Miller *et al.* 1992).

Data collection/study procedure

Patients were enrolled in the study on the day they were admitted. Nurses observed the patient in their normal daily interactions with the patient. The NOSCA was completed four times, that is, twice on two consecutive days. The four assessments were performed by four different nurses who were on duty on the two consecutive days. Nurses reviewed the NOSCA items at the beginning of their shift so they could focus on observing the corresponding behaviours during patient care. On the third day, the activities of daily living rating (Barthel Index) and a general rating of cognitive symptoms (NOSGER) were completed by a nurse. The neuropsychological tests were administered by a trained psychologist who was blind to the NOSCA observation ratings within three days of the final NOSCA assessment. The CDR and CIRS-G were rated by a geriatrician and confirmed at a multidisciplinary meeting prior to discharge. The IQCODE was completed by the patient caregiver, often a family member. The study was registered and approved by

the medical ethics committee (CMO Arnhem-Nijmegen), and written informed consent was provided by the patient and caregiver.

Data analyses

The total NOSCA score was calculated as the mean of the four assessments. Scores on the NOSCA subscales were calculated as the average of subscale items on the four assessments. Impaired performance on neuropsychological tests was defined as having a score more than 1·5 standard deviations below the age- and education-corrected normative mean. Impaired performance in a cognitive domain was defined as one or more incidents of impaired performance on a neuropsychological test within one domain.

Internal consistency was analysed by calculating Cronbach's α and the item–total correlation. Intra-class coefficients for absolute agreement were viewed as a measure for inter-rater reliability between two groups of four nurses. Pearson's correlation coefficients were calculated to examine the construct validities. ANOVA and *t*-tests were applied for the post hoc analyses for group differences. The α was set at 0·05, and statistically significant coefficients higher than 0·4 were regarded as meaningful (Slick 2006).

Results

Population characteristics

On average, the patients included in this study were older persons with moderate dysfunction in activities of daily living, extensive comorbidity, mild cognitive impairment according to the MMSE and considerable cognitive impairment on several cognitive domains as measured by several neuropsychological tests (on average, impairment on four to five of seven cognitive domains, see Table 1).

Table 1 Patient characteristics

Patient characteristic	*n*	Measure	Outcome
Age	50	Mean ± SD	83 ± 6
Female	50	*n* (%)	33 (66)
Education	45	Primary school or less, *n* (%)	14 (31)
		More than primary school, *n* (%)	31 (69)
Co-morbidity	36	CIRS-G (0–54)*, mean ± SD	13 ± 4
Activities of daily functioning	48	Barthel Index (0–20)†, mean ± SD	14 ± 4
Delirium	44	No delirium during admission (DOS < 3)‡	36
Depressive symptoms	48	GDS-15 (0–15)§, mean ± SD	5 ± 3
Mental state	49	MMSE (0–30)¶, mean ± SD	24 ± 5
No dementia	23	CDR = 0**, *n* (%)	21 (45)
Cognitive symptoms	45	NOSGER (15–75)††, mean ± SD	35 ± 13
	50	NOSCA (0–117)‡‡, mean ± SD	97 ± 17
Cognitive impairment	40	Not impaired in any cognitive domain§§, *n* (%)	0 (0)
	40	Number impaired cognitive domains (0–7), mean ± SD	4·7 (1·8)

*CIRS-G, Cumulative Illness Rating Scale-Geriatric; higher scores indicate more comorbidity.
†Barthel Index, higher scores indicate less daily activities.
‡DOS, Delirium Observation Scale: higher scores indicate more delirium symptoms.
§GDS-15, Geriatric Depression Scale: higher scores indicate more depressive symptoms.
¶MMSE, Mini Mental State Examination: higher scores indicate less cognitive impairment.
**CDR, Clinical Dementia Rating: higher scores indicate a more severe stage of dementia.
††NOSGER, Nurses' Observation Scale for Geriatric Inpatients: higher scores indicate more impairment.
‡‡NOSCA, Nurses' Observation Scale for Cognitive Abilities: higher scores indicate more cognitive abilities.
§§Based on seven cognitive domains and assessed by performance(s) on neuropsychological tests: attention (TMT-A), perception (Silhouettes VSOP), memory (digit span WAIS-III and VAT), thoughts (similarities WAIS-III and digit symbol test WAIS-III), higher cognitive thinking (key search BADS and TMT-B), language (verbal fluency profession naming and animal naming) and praxis (apraxia test; Heilman & Valenstein). See Table 3 for abbreviations of neuropsychological tests.

Reliability of the NOSCA

Cronbach's α for the total NOSCA was 0·98. Cronbach's αs for most of the eight subscales were above 0·8. Two exceptions were the subscales 'thinking' and 'visual perception' for which the αs were 0·78 and 0·66, respectively (see Table 3). All 39 item–total correlations were higher than 0·4. Removing any single item did not improve the overall Cronbach's α. The item–total correlations within the NOSCA subscales were all higher than 0·4, except for one (item 30, see Appendix). In general, removing items from subscales did not improve the Cronbach's αs. Exceptions were four items (10, 20, 30 and 35) in four different subscales. The intra-class coefficients for absolute agreement were excellent (above 0·7) for 24 items, fair to good (between 0·4–0·7) for 13 items and poor (below 0·4) for two items (6 and 28).

Construct validity of the NOSCA

Convergent validity

The correlations between the NOSCA and the cognitive ratings from the MMSE and NOSGER were as expected ($r = 0{\cdot}69$ and $0{\cdot}59$, respectively, $p < 0{\cdot}01$). No significant correlation was found between the NOSCA and the IQCODE (see Table 2). The correlation between the NOSCA and the severity of dementia scale was $0{\cdot}70$ ($p < 0{\cdot}01$), and the correlation between the NOSCA and the BI was $0{\cdot}51$ ($p < 0{\cdot}01$).

Divergent validity

No significant correlation was found between the NOSCA and depressive symptoms (GDS-15).

Post hoc analyses for group differences

The difference in total NOSCA scores between the groups that were created on the basis of cognitive impairment and severity of dementia differed significantly (see Table 2). The differences in scores for the groups with and without depressive symptoms did not differ significantly.

Construct validity of the NOSCA subscales

Convergent validity

Pearson's correlations between the NOSCA subscales and the neuropsychological tests ranged between 0·18–0·74. Most correlations were around 0·4. Four were below 0·4 (see Table 3). In all, 10 of the 13 correlations were statistically significant ($p < 0{\cdot}05$). Each NOSCA subscale correlated significantly with at least one neuropsychological test.

The correlation coefficients between each neuropsychological test and all subscales other than the designated subscale were between 0·24–0·71 (see Table 3). These correlation coefficients were, surprisingly, slightly higher than the correlation coefficients found between the tests and their designated subscale (compare the results of the last two columns in Table 3). Among these correlations, 11 of 13 were statistically significant ($p < 0{\cdot}05$).

Discussion

This is the first validation study addressing the reliability and construct validity of the NOSCA and its subscales. The NOSCA is a behavioural rating scale that can be employed by

Table 2 Construct validity of the Nurses' Observation Scale for Cognitive Abilities (NOSCA) ($n = 50$)

Construct validity	Construct	Instrument*	*n*	NOSCA correlation (Pearson's *r*)	
Convergent validity	Cognitive ratings	MMSE	48	0·687**	
		IQCODE	35	−0·297	
		NOSGER	45	−0·594**	
	Severity of dementia	CDR (CDR > 0)	26	−0·703**	
	Activities of daily living	BI	48	0·511**	
Divergent validity	Depressive symptoms	GDS-15	48	0·120	
Post hoc analyses for group differences	Grouping characteristic	Grouping criteria	*n*	Group test for differences	NOSCA† mean ± SD
	Cognitive impairment	No: MMSE = 30	6	$F(3, 45) = 19{,}644$, $p < 0{\cdot}001$	116
		Mild: MMSE 23–29	10		102 ± 10·0
		Moderate: MMSE 18–22	32		101 ± 12·8
		Severe: MMSE < 18	1		65 ± 13·9
	Dementia	Possible: CDR = 0.5	13	$F(2, 23) = 11{\cdot}258$, $p < 0{\cdot}001$	103 ± 8·0
		Mild: CDR = 1	8		94 ± 5·0
		Moderate CDR = 2	5		77 ± 4·5
	Depressive symptoms	No: GDS-15 ≤ 5	30	$t = 0{\cdot}405$, $p = 0{\cdot}53$, df = 1	99 ± 18
		Yes: GDS-15 > 5	18		95 ± 17

*Instrument: MMSE, Mini Mental State Examination; IQCODE, Informant Questionnaire on Cognitive Decline in the Elderly; NOSGER, Nurses' Observation Scale for Geriatric Patients; CDR, Clinical Dementia Rating; BI, Barthel Index; GDS, Geriatric Depression Scale.
†NOSCA, lower scores indicate less cognitive abilities.
**Statistically significant $p < 0{\cdot}01$.

Table 3 Internal consistency and construct validity of the Nurses' Observation Scale for Cognitive Abilities (NOSCA) subscales (n = 50)

Subscales NOSCA/ ICF code[†]	NOSCA items	Cronbach's α	NOSCA subscore[‡] mean ± SD	Neuropsychological test[§]	n	Correlations NP test[¶] and designated NOSCA subscale	Correlations NP test[¶] and all other subscales
Attention *ICF b140*	1–4	0·889	2·3 ± 0·5	TMT-A	50	−0·40*	−0·59**
Visual perception *ICF b156*	5–6	0·661	2·9 ± 0·2	Silhouettes VOSP	49	0·33*	0·54**
Orientation *ICF b114*	7–12	0·919	2·6 ± 0·5	Orientation items MMSE	49	0·66**	0·65**
Memory *ICF b144*	13–18	0·955	2·3 ± 0·6	Digit Span WAIS-III (forward and backward)	50	0·42**	0·45**
				VAT	47	0·74**	0·71**
Thoughts functioning *ICF b160*	19–23	0·784	2·7 ± 0·4	Similarities WAIS-III	47	0·18	0·39**
				Digit symbol test WAIS-III	42	0·44**	0·58**
Higher cognitive thinking *ICF b164*	24–30	0·825	2·2 ± 0·5	Key search BADS	48	0·44**	0·36*
				TMT-B	44	−0·28	−0·24
Language *ICF b167*	31–36	0·888	2·6 ± 0·4	Fluency (profession naming)	48	0·18	0·35*
				Fluency (animal naming)	48	0·36*	0·51**
				Token test (short form)	23	0·48*	0·50*
Praxis *ICF b176*	37–39	0·933	2·6 ± 0·6	Apraxia test Heilman & Gonzales Rothi	48	0·57**	0·61**

[†]ICF: International classification of functioning.
[‡]NOSCA subscale score: range 0–3, higher scores indicate more cognitive abilities.
[§]Neuropsychological tests: TMT, Trail Making Test; VOSP, Visual Object and Space Perception Battery; MMSE, Mini Mental State Examination; WAIS, Wechsler Adult Intelligence Scale; VAT, Visual Association Test; BADS, Behavioral Assessment of Dysexecutive Syndrome; CAMCOG-R, Revised Cambridge Cognitive Examination.
[¶]NP test: neuropsychological test.
*Statistically significant $p < 0{\cdot}05$.
**Statistically significant $p < 0{\cdot}01$.

nurses to assess the cognitive functioning of patients admitted to geriatric wards. We found the reliability and construct validity of the NOSCA as a whole to be satisfactory. The correlations between the NOSCA subscales and a number of neuropsychological tests were poor to fair.

The Cronbach's αs for the NOSCA were good, even in subscales comprising only a few items. The item–total correlations were acceptable as well, except for item 30 in the subscale 'higher cognitive thinking'. This item focused on repetitiveness, and although this behaviour is characteristic to this cognitive domain, it is likely that repetitiveness was not highly prevalent in our study sample. Removing four different items from four different subscales increased the Cronbach's α for those subscales slightly. However, as the alphas for the subscales were already (very) high (0·78–0·93), we do not recommend removing these items from the scale. The intraclass coefficients for the items were excellent, thus suggesting that if another set of four nurses were to observe a patient, similar scores for the patient's cognitive functions would be assigned by all four nurses. Only items 6 and 28 scored relatively low. This is likely attributable to a lack of variation in the sample included in this study.

The construct validity of the NOSCA as a tool for assessing overall cognitive functioning was satisfactory, even when compared to a neuropsychological assessment that is generally administered very differently than daily observation. The NOSCA correlated well with cognitive impairment as measured by the MMSE and also with the severity of dementia as measured by the CDR. Further, the NOSCA and the NOSGER, which is an observational scale, correlated adequately. The only correlation that was lower than expected was the correlation between the NOSCA and the IQCODE. In the IQCODE, family members are required to score the relative deterioration of the patient over a period of 10 years. A period of that length is not covered by the NOSCA, and this may possibly account for the lower correlation. The correlation between the NOSCA and activities of daily living was reasonable as expected. The fact that no statistically significant correlation was found between the NOSCA and depressive symptoms is promising. In clinical practice, the

differentiation between cognitive impairment and depression is a complicated endeavour. The fact that no significant correlation was found between the NOSCA and depression may thus have important diagnostic implications.

The validation results for the NOSCA subscales are less conclusive than the results for the total scale. Although most correlations between the NOSCA subscales and neuropsychological tests were statistically significant, the correlations were poor to fair. However, poor correlations between a given test and a NOSCA subscale were always accompanied by a fair correlation between the same NOSCA subscale and another neuropsychological test. Given that the correlations between the neuropsychological tests and their designated NOSCA subscale were, surprisingly, in a number of cases, lower than the correlations between the tests and other NOSCA subscales, we must conclude that it is not clear whether the NOSCA is able to discriminate between cognitive domains.

The selection of the neuropsychological tests was complicated as numerous tests are available. In a previous validation study, we examined the correlation between a rating scale that observed the patient memory function in daily practice and four neuropsychological memory tests (unpublished). The correlations varied between 0·45–0·70. There are two possible explanations for this. The first pertains to the focus of the neuropsychological tests. The selected tests in this study were considered good matches because their focus corresponded with the focus of the NOSCA subscales. For example, the six-item NOSCA subscale 'higher cognitive thinking' includes the ICF sub-domains 'organisation and planning', 'insight' and 'self-regulation'. We selected the TMT-B and the key search task from the BADS as the best match, despite having to ignore three of the six observation items concerning insight and self-regulation. Given that the selection of neuropsychological tests was more complicated than expected, it is possible that we have not yet succeeded in selecting tests with a sufficiently similar focus to the focus of the NOSCA subscales.

The second explanation pertains to the ecological validity of the tests. It is possible that neuropsychological tests conducted in controlled experimental conditions yield different results than tests conducted in everyday life situations (Tupper & Cicerone 1990). It could be argued that most neuropsychological tests measure cognitive functioning at the level of impairment, whereas the NOSCA assesses cognitive functioning at the activity level. The ecological validity of neuropsychological tests has not been studied extensively, but in the studies conducted, moderate associations between the test and everyday function were found (Chaytor & Schmitter-Edgecome 2003, Marson & Hebert 2006, Bouwens *et al.* 2008). This may very well have inhibited the effective validation of the NOSCA subscales. We thus suggest additional attempts to validate the subscales. Furthermore, we recommend that the NOSCA be validated explicitly against instruments with good ecological validity. The Arnadottir OT-ADL Neurobehavioral Evaluation (A-ONE) might be interesting in this respect (Arnadottir 1990).

Furthermore, it is likely that certain characteristics of the study sample impacted the correlation coefficients between the tests and the subscales. The sample employed in this study had considerable cognitive impairment. In fact, an average participant experienced cognitive impairment in four to five cognitive domains (see Table 1). Clearly, this may have made it difficult to discriminate between the domains. This contention is supported by additional analyses in which correlation coefficients between all neuropsychological tests were calculated. The results showed a lack of distinction between the cognitive domains tested. The broad range of cognitive impairment manifestations found on the neuropsychological tests was unexpected. Although we included all possible patients even those with no apparent cognitive dysfunction, is it possible that selection bias occurred. We, therefore, recommend replicating this study with a larger sample that explicitly includes patients without cognitive deficits.

Conclusion

In a group of older patients hospitalised in a geriatric unit, the reliability of the NOSCA was found to be excellent and the construct validity of the total NOSCA satisfactory. Whether the NOSCA is a valid instrument for discrimination between cognitive domains is not yet clear. We recommend the NOSCA subscales to be compared to more ecologically valid tests and in a less impaired patient population whereby only a few cognitive domains are affected.

Relevance to clinical practice

The NOSCA can contribute to clinical diagnoses by providing standardised, reliable and valid information about the patient's overall cognitive functioning in daily practice. We advocate the implementation of the NOSCA at geriatric units in acute care hospitals. The NOSCA aids in the development of interventions that tailor patients' specific cognitive needs. Nursing interventions must take patients' cognitive abilities and possible decline into account as it influences communication, support needs in daily life activities, medical and nursing treatment, discharge placement and postdischarge compliance.

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Appendix 1 Nurses' observation scale for cognitive abilities (NOSCA)

Version 1, August 2009.

Please read the following information about the NOSCA

Aim

- With this observation list, nurses can gain an impression of whether a patient has cognitive problems and if so, in which domains.
- These observations will be used to (1) contribute to the diagnostics at the multidisciplinary meeting and (2) to help determine the nursing interventions (approach form, information, family education).

Instructions

- Before starting your shift, read the NOSCA items so that you can make targeted observations and if necessary, induce behaviour (e.g. start a conversation, read a text, get dressed, etc.).
- Create the most optimal conditions for the patient (glasses on, hearing aid working).
- Make observations over a period of two consecutive days, in the day shifts and evening shifts. This will lead to four completed forms per patients. Research has shown that more than four observation periods do not lead to better information.
- Record the observations per shift, so that the report is as reliable as possible.

Filling in the form

- Put a circle around the correct answer in accordance with your observations during one shift. 'never' means that the behaviour did not occur during your whole shift. 'Repeatedly' means that the behaviour occurred repeatedly during your shift.
- Put a circle around the question mark '?' if the behaviour could not be observed because the situation did not arise (e.g. because the patient did not read anything). Also put a circle around the question mark '?' if the patient could not display certain behaviour (e.g. the patient could not put on his/her clothes in the correct order, because he/she cannot dress independently due to a physical disability.

Drawing a conclusion

- The observations over four shifts lead to one conclusion. Calculate the average score per subscale, representing a cognitive domain, and note it on the summary sheet (range 0–3 points). The NOSCA overall score is calculated by the sum of the eight domains (range 0–24 points).
- Norm values of the subscales: lower scores indicate less cognitive abilities:
  3 means that no problems were observed;
  2 means that problems sometimes arose;
  1 means that problems usually arose;
  0 means that problems arose repeatedly.

Consciousness[ICF-code b110]

The patient ..		1	0
A	.. responds to being spoken to during the day	Yes	No
B	.. has to be shaken awake during the day or evening if you want to communicate with him/her	No	Yes
C	.. falls asleep when no activities are going on	No	Yes
D	.. dozes off during a conversation or activity	No	Yes

Total consciousness: …. points/number of answers = …….. points

Note: if any of the above items are scored in the right-hand column, then the results of the observations below must be interpreted with cautin, because the outcomes might change when consciousness is restored.

Attention[ICF-code b140]

The patient ..		3	2	1	0	–
1	.. loses the thread of the conversation (e.g. when giving long answers)	Never	Sometimes	Usually	Repeatedly	?
2	.. stops with the current activity if someone walks by or if he/she hears another voice	Never	Sometimes	Usually	Repeatedly	?
3	.. can easily switch to a different topic of conversation	Repeatedly	Usually	Sometimes	Never	?
4	.. can easily switch to a different activity	Repeatedly	Usually	Sometimes	Never	?

Total attention: …. points/number of answers = …….. points

Visual perception[ICF-code b156]

The patient ..		3	2	1	0	-
5	.. recognizes an object and knows what it is (e.g. a comb to comb his/her hair, a toilet to relieve him/herself)	Repeatedly	Usually	Sometimes	Never	?
6	.. mistakes an object for something else (e.g. pattern in the curtains for an animal)	Never	Sometimes	Usually	Repeatedly	?

Total visual perception: …. points/number of answers = …….. points

Orientation[ICF-code b114]

The patient ..		3	2	1	0	-
7	.. is able to locate his/her own bed	Repeatedly	Usually	Sometimes	Never	?
8	.. thinks that he/she is at home or somewhere else	Never	Sometimes	Usually	Repeatedly	?
9	..recognizes other patients and/or staff..	Repeatedly	Usually	Sometimes	Never	?
10	..recognizes family and/or friends..	Repeatedly	Usually	Sometimes	Never	?
11	.. knows whether it is morning, evening or night	Repeatedly	Usually	Sometimes	Never	?
12	.. knows what time it is	Repeatedly	Usually	Sometimes	Never	?

Total orientation: …. points/number of answers = …….. points

Memory[ICF-code b144]

The patient ..		3	2	1	0	-
13	.. cannot remember what has just been said	Never	Sometimes	Usually	Repeatedly	?
14	.. cannot remember where he/she has just left something	Never	Sometimes	Usually	Repeatedly	?
15	.. can remember the task or instruction during the ADL activities	Repeatedly	Usually	Sometimes	Never	?
16	.. can remember appointments made today or yesterday	Repeatedly	Usually	Sometimes	Never	?
17	.. is able to find an object or piece of clothing that he/she has tidied up	Repeatedly	Usually	Sometimes	Never	?
18	.. knows whether or not objects belong to him/her	Repeatedly	Usually	Sometimes	Never	?

Total memory: …. points/number of answers = …….. points

Thoughts[ICF-code b160]

The patient ..		3	2	1	0	–
19	.. responds very slowly to a question and/or instruction	Never	Sometimes	Usually	Repeatedly	?
20	.. gives answers that are relevant to the question	Repeatedly	Usually	Sometimes	Never	?
21	.. switches from one subject to another	Never	Sometimes	Usually	Repeatedly	?
22	.. has unrealistic thoughts (e.g. says that he/she does not have any money or clothes, but does really)	Never	Sometimes	Usually	Repeatedly	?
23	.. is distrustful of others (e.g. does not dare to take his/her medicine; says that people are 'listening', etc.)	Never	Sometimes	Usually	Repeatedly	?

Total thoughts: …. points/number of answers = …….. points

Higher cognitive functions[ICF-code b164]

The patient…		3	2	1	0	–
24	.. can oversee where to start an activity (e.g. collects all the necessary articles together before going to wash)	Repeatedly	Usually	Sometimes	Never	?
25	.. works efficiently and systematically	Repeatedly	Usually	Sometimes	Never	?
26	.. asks questions about his/her illness	Never	Sometimes	Usually	Repeatedly	?
27	.. says that he/she is able to do something although it is clear that they cannot (e.g. walk without the rollator)	Never	Sometimes	Usually	Repeatedly	?
28	.. says that there is nothing wrong with him/her although there clearly is	Repeatedly	Usually	Sometimes	Never	?
29	.. undertakes activities on his/her own initiative (e.g. starting a conversation, going for a walk)	Repeatedly	Usually	Sometimes	Never	?
30	..keeps on repeating an action that is not necessary (e.g. keeps on spreading a slice of bread, keeps on drying his/her arm)	Never	Sometimes	Usually	Repeatedly	?

Total thoughts: …. points/number of answers = …….. points

Language[ICF-code b167]

The patient…		3	2	1	0	–
31	.. understands directions and/or instructions	Repeatedly	Usually	Sometimes	Never	?
32	.. reads something and can show that he/she has understood what is says (e.g. a wrapper, a folder)	Repeatedly	Usually	Sometimes	Never	?
33	.. has to search for words	Never	Sometimes	Usually	Repeatedly	?
34	.. uses vague terms in conversation (e.g. 'You know', or 'thingy')	Never	Sometimes	Usually	Repeatedly	?
35	.. calls something by the wrong name (e.g. says vase instead of bread, lamp instead of table)	Never	Sometimes	Usually	Repeatedly	?
36	.. is able to make clear what he/she wants	Repeatedly	Usually	Sometimes	Never	?
Total language: …. points/number of answers = …….. points						

Praxis[ICF-code b176]

The patient ..		3	2	1	0	–
37	.. does the ADL activities in the correct order (e.g. first takes off pay pyjamas, then gets dressed; first wets the flannel, than washes face)	Repeatedly	Usually	Sometimes	Never	?
38	.. puts on clothes in the correct manner (e.g. not back-to-front, or inside-out)	Repeatedly	Usually	Sometimes	Never	?
39	.. uses the items in the correct manner (e.g. is able to comb his/her hair with a comb, is able to eat with a fork)	Repeatedly	Usually	Sometimes	Never	?
Total praxis: …. points/number of answers = …….. points						