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# Frailty among older adults: exploring the social dimension

Bunt, Steven

*DOI:*
10.33612/diss.131224932

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*Document Version*
Publisher's PDF, also known as Version of record

*Publication date:*
2020

Link to publication in University of Groningen/UMCG research database

*Citation for published version (APA):*
Bunt, S. (2020). *Frailty among older adults: exploring the social dimension*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen. https://doi.org/10.33612/diss.131224932

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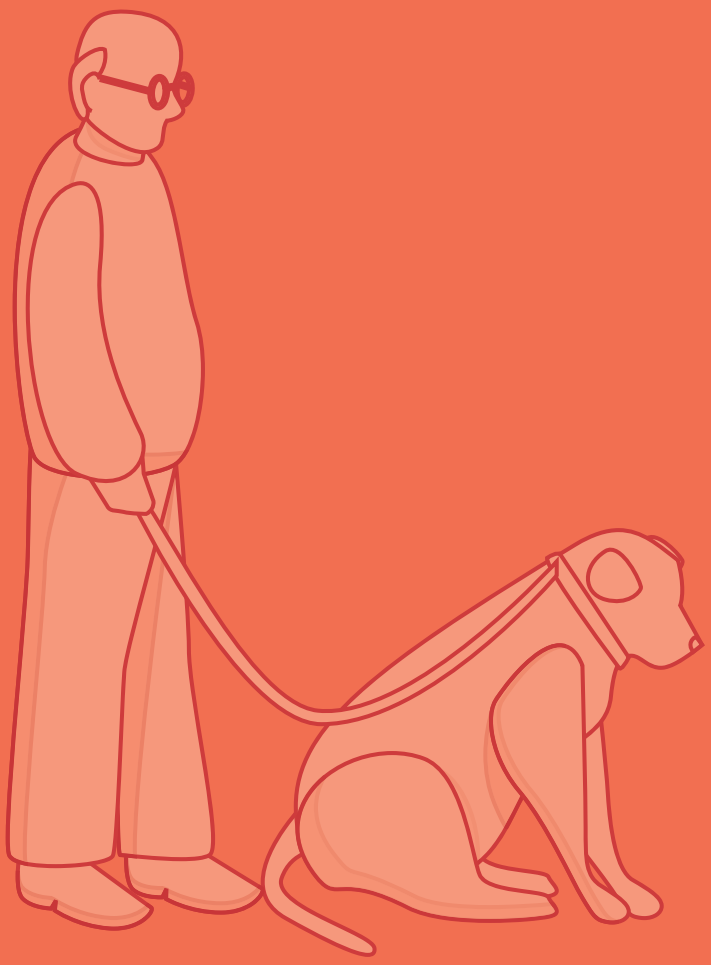

# Validation of the Dutch version of the Quick Mild Cognitive Impairment Screen (Qmci-D)

S. Bunt
R. O'Caoimh
W.P. Krijnen
D.W. Molloy
G.P. Goodijk
C.P. van der Schans
J.S.M. Hobbelen

*Published in: BMC Geriatrics, 2015; 15: 115*

## Abstract

### Background

Differentiating mild cognitive impairment (MCI) from dementia is important, as treatment options differ. There are few short (<5 minutes) but accurate screening tools that discriminate between MCI, normal cognition (NC) and dementia, in the Dutch language. The Quick Mild Cognitive Impairment (Q*mci*) screen is sensitive and specific in differentiating MCI from NC and mild dementia. Given this, we adapted the Q*mci* for use in Dutch-language countries and validated the Dutch version, the Q*mci*-D, against the Dutch translation of the Standardized Mini-Mental State Examination (SMMSE-D).

### Method

The Q*mci* was translated into Dutch with a combined qualitative and quantitative approach. In all, 90 participants were recruited from a hospital geriatric clinic (25 with dementia, 30 with MCI, 35 with NC). The Q*mci*-D and SMMSE-D were administered sequentially but randomly by the same trained rater, blind to the diagnosis.

### Results

The Q*mci*-D was more sensitive than the SMMSE-D in discriminating MCI from dementia, with a significant difference in the area under the curve (AUC), 0.73 compared to 0.60 (p=0.024), respectively, and in discriminating dementia from NC, with an AUC of 0.95 compared to 0.89 (p=0.006). Both screening instruments discriminated MCI from NC with an AUC of 0.86 (Q*mci*-D) and 0.84 (SMMSE-D).

### Conclusion

The Q*mci*-D shows similar, good accuracy as the SMMSE-D in separating NC from MCI, greater, albeit fair, accuracy differentiating MCI from dementia and significantly greater accuracy in separating dementia from NC. Given its brevity and ease of administration, the Q*mci*-D seems a useful cognitive screen in a Dutch population. Further study with a suitably powered sample against more sensitive screens is now required.

## Background

The prevalence of mild cognitive impairment (MCI) (Ward *et al.* 2012) and dementia (Prince *et al.* 2013) is increasing worldwide. Differentiating MCI from dementia is important, because treatment options differ. In particular, pharmaceutical therapy, indicated for treatment of dementia, is inappropriate and potentially even harmful, in those with MCI (Tricco *et al.* 2013). Differentiating MCI from normal cognition (NC) is also important, because people with MCI are at increased risk of developing dementia, compared to aged-matched individuals in the population (Mitchell and Shiri-Feshki 2009), and early identification may allow prompt intervention (Fiatarone Singh *et al.* 2014, O'Caoimh *et al.* 2015). Few short (administration time of approximately five minutes) cognitive screening instruments are useful in discriminating between MCI and NC or dementia. Most are limited by their sensitivity and specificity (Ritchie *et al.* 2001). Likewise, few are available in the Dutch language. One of the most widely used tools is the Mini-Mental State Examination (MMSE) (Folstein *et al.* 1975). The MMSE was standardized to improve reliability producing the Standardised Mini-Mental State Examination (SMMSE) (Molloy *et al.* 1991, Molloy and Standish 1997), which is available in a wide variety of languages, including Dutch (Kok and Verheij 2002). However, there is limited evidence that either the MMSE or SMMSE are sufficiently accurate in identifying MCI (Mitchell 2009), particularly in those with high educational attainment (Crum *et al.* 1993).



To address these challenges, the Quick Mild Cognitive Impairment (Q*mci*, Appendix A) screen was developed. Based upon the ABCS 135 (Molloy *et al.* 2005), it was modified to increase its sensitivity to differentiate NC from MCI, by the addition of logical memory. The Q*mci* is more sensitive in differentiating MCI from NC than the SMMSE and ABCS 135 (O'Caoimh *et al.* 2012). The Q*mci* has six subtests, orientation, registration, clock drawing, delayed recall, verbal fluency and logical memory. It is scored out of 100, can be administered and scored in less than five minutes and has excellent test-retest reliability (O'Caoimh *et al.* 2013). The Q*mci* correlates highly with the Standardised ADAS-cog, Clinical Dementia Rating scale and the Lawton-Brody activities of daily living scale (O'Caoimh *et al.* 2014).

The goal of the present study was to adapt the Q*mci* for use in Dutch-language countries, to validate the Dutch version of the Q*mci* (Q*mci*-D) and to compare its sensitivity and specificity in differentiating MCI from NC and dementia to the most widely used short cognitive screen in the Netherlands, the Dutch version of the SMMSE (SMMSE-D).

## Methods

### Translation

The translation of the Q*mci* was performed with a combined qualitative and quantitative approach (Beaton *et al.* 2000). The original version of the Q*mci* was translated to Dutch by a health professional with a good understanding of English, whose primary language is Dutch. This Dutch version was reviewed by an expert panel of Dutch health professionals and researchers and a completed version of the Q*mci*-D was generated (Appendix B). A professional, native English language-speaking translator, without knowledge of the concepts behind the screening tool, performed the back-translation. The back-translation was then reviewed by the original developers of the Q*mci* screen, who approved the final version. The Q*mci*-D was pre-tested on participants with normal cognition before it was used in this study.

### Participants

Consecutive patients were recruited during a four month-period, between November 2013 and March 2014, from a geriatric outpatient department in a regional hospital, in the North of the Netherlands, where they were referred for the assessment of cognitive problems. Normal controls were recruited by convenience sampling among healthy participants without cognitive problems, who were accompanying the patients. A diagnosis of dementia (Alzheimer's disease, vascular or mixed dementia subtypes) was made using DSM-IV (American Psychiatric Association 1994) and NINCDS-ADRDA (McKhann *et al.* 1984) criteria. A diagnosis of amnestic type MCI was made in patients with objective memory loss, greater than expected with ageing but without loss of social or occupational function, according to the National Institute on Aging- Alzheimer's Association workgroups diagnostic guidelines for Alzheimer's disease (Albert *et al.* 2011). Participants were excluded if they were younger than 55, if they had active depression (Geriatric Depression Scale >5), if they weren't able to communicate in Dutch or if they were diagnosed with other MCI or dementia subtypes, including frontotemporal dementia, Parkinson's disease or Lewy Body dementia. Those with frontotemporal, Parkinson's disease and Lewy body dementia were excluded as they present infrequently (Brunnstrom *et al.* 2009) and typically present with exaggerated functional deficits and different MCI syndromes (de Mendonca *et al.* 2004, Caviness *et al.* 2007, Yoon *et al.* 2014).

The MCI and dementia groups underwent the same comprehensive review at baseline including neuropsychological assessment and Magnetic Resonance Imaging or Computerized Tomogram. The purpose and procedure of the research were explained in advance and all participants signed an informed consent before participation in the study.

The Medical Ethical Committee of the University Medical Center Groningen evaluated the study and judged that it did not need ethical approval under Dutch law.

A power calculation was performed *a priori,* to establish the sample size, using the WINPEPI software programme PAIRSetc (Gahlinger 1995, Abramson 2011).Based upon the original validation results of the Q*mci* compared to the SMMSE (O'Caoimh *et al.* 2012), it was expected that the accuracy, as indicated by the area under the curve (AUC) of receiver operating characteristic (ROC) curves, of the Q*mci* would be 85% compared to approximately 65% for the SMMSE, to differentiate MCI from NC. To detect a 20% (medium to large effect size) difference in sensitivity and specificity, between the two tests, at a significance level of 0.05 and power of 80%, 76-paired observations were required. The sample size needed to distinguish MCI from dementia was not estimated as a significant difference between the Q*mci* and the SMMSE would not be expected (O'Caoimh *et al.* 2012).

**Data collection**

Demographic data (age and gender) were collected during each visit to the geriatric department. Patients were classified by a consultant geriatrician and divided into three groups (NC, MCI or dementia). A trained rater administered both the Q*mci*-D (score range 0-100, impaired to normal) and SMMSE-D (score range 0-30, impaired to normal) on the same day, in a counterbalanced fashion, blind to the final diagnosis.

**Statistical analysis**

Data were analyzed using SPSS version 20.0 and the statistical programming language R. The Shapiro-Wilk test was used to test for normality. Differences in Q*mci*-D and SMMSE-D scores, between groups, were tested by one-way analysis of variance (ANOVA). Analysis of covariance (ANCOVA) was used to test differences between participant groups, controlling for participant characteristics such as age. Post hoc pair-wise comparisons were performed using the Tukey's honest significant difference (HSD) test. A p-value <0.05 was regarded as significant. Bootstrapped ROC curves were generated (Robin *et al.* 2011) to analyze the discriminatory characteristics of the Q*mci*-D and SMMSE-D (Carpenter and Bithell 2000). Differences between AUCs were calculated using the DeLong approach (DeLong *et al.* 1988).

## Results

In total, 90 participants, 41 males (46%) and 49 females (54%), were included in this study. In this sample, 35 (39%) had NC, 30 (33%) had MCI and 25 (28%) were diagnosed with

dementia. The overall mean age of the sample was 72.9, standard deviation (SD) of 9.1 years. The NC group (mean age 68.7) was younger than the MCI (mean age 79.1) and dementia (mean age 79.2) groups (p<0.001). The NC group had a mean Q*mci*-D score of 64 (SD 10.5) and a mean SMMSE-D score of 28 (SD 1.8). The mean Q*mci*-D score for the MCI group was 46 (SD 11.8) compared with 24 (SD 2.9) for the SMMSE-D, while the dementia group scored 34 (SD 15.8) for the Q*mci*-D and 22 (SD 4.4) for the SMMSE-D. These scores and demographic data are summarized in Table 1.

**Table 1.** Characteristics of patients with mild cognitive impairment (MCI), dementia, and participants with normal cognition (NC) including their Quick Mild Cognitive Impairment (Q*mci*-D) screen and Standardised Mini-Mental State Examination (SMMSE-D) scores

| **Group** | **Dementia** | **MCI** | **Normal cognition** |
|---|---|---|---|
| **Number of participants** | 25 | 30 | 35 |
| **Age** | | | |
| Mean (SD) | 79.2 (5.7) | 79.1 (5.9) | 68.7 (9.0) |
| Median (IQR) | 80 (84-76=8) | 80 (83-74=9) | 68 (77-61=16) |
| **Gender** | | | |
| (% female) | 48% | 56% | 57% |
| **Q*mci*-D** (range 0-100) | | | |
| Mean Score (SD) | 34 (15.8) | 46 (11.8) | 64 (10.5) |
| Median Score (IQR) | 35.5 (48-21=17) | 46.8 (54-38=16) | 64.5 (72-55=17) |
| **SMMSE-D** (range 0-30) | | | |
| Mean Score (SD) | 22 (4.4) | 24 (2.9) | 28 (1.8) |
| Median Score (IQR) | 23 (26-18=8) | 23.5 (26-22=4) | 28 (29-27=2) |

(SD=Standard Deviation, IQR= inter-quartile range; IQR=Q1-Q3; Q1=1$^{st}$ Quartile, Q3=3$^{rd}$ quartile)

One-way ANCOVA, used to test for differences in SMMSE-D scores between the three groups (NC, MCI and dementia), showed that the mean scores differed significantly across the three groups (F=20.55, df=3,86, p<0.001). Post hoc pair-wise comparisons using the Tukey's HSD test showed significant mean differences between groups (p<0.05). The mean scores for the Q*mci*-D also differed significantly between the three groups; (F =33.24, df=3,86, p <0.001). The differences between groups are presented as boxplots in Figure 1. ANOVA post-hoc testing for multiple comparisons, showed a significant difference in mean scores between the dementia and NC groups, for both tests (see Table 2).

**Table 2.** ANOVA Post-Hoc tests: multiple comparisons between NC, MCI and Dementia groups

| Dependent Variable | Group | Group | Mean Difference | Std. Error | P-value | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound |
| **Q*mci*-D** | MCI | Dementia | 12.56 | 3.40 | 0.001 | 4.25 | 20.87 |
| | NC | MCI | 17.19 | 3.13 | <0.001 | 9.55 | 24.82 |
| | NC | Dementia | 29.75 | 3.29 | <0.001 | 21.71 | 37.78 |
| **SMMSE-D** | MCI | Dementia | 1.79 | 0.83 | 0.102 | -0.24 | 3.83 |
| | NC | MCI | 3.70* | 0.77 | <0.001 | 1.84 | 5.58 |
| | NC | Dementia | 5.50* | 0.81 | <0.001 | 3.54 | 7.47 |

SMMSE-D=Dutch version of the Standardised Mini Mental State Examination Q*mci*-D=Dutch version of the Quick Mild Cognitive Impairment Screen; MCI=Mild Cognitive Impairment
NC= Normal Cognition.

Comparisons of the AUC of ROC curves and the point estimates (cut-off scores), providing the optimal sensitivity and specificity, are presented in Figure 2. These show that the Q*mci*-D was more accurate than the SMMSE-D in discriminating between dementia and NC, with an AUC of 0.95 (95% CI 0.90-0.99), compared to 0.89 (95% CI 0.80-0.96) for the SMMSE-D (see Figure 2a,b). The difference was significant (p=0.006). Both the Q*mci*-D and the SMMSE-D discriminated MCI from NC, with ANOVA post-hoc tests showing a significant mean difference between the MCI and NC groups (p<0.001). The AUC of the Q*mci*-D, in discriminating MCI from NC, was marginally greater at 0.86 (95% CI 0.77-0.95), compared to 0.84 (95% CI 0.74-0.94) for the SMMSE-D (see Figure 2c,d). This difference was non-significant (p=0.335). At the point estimate the Qmci-D had a sensitivity of 70% and specificity of 94% compared to a sensitivity of only 60% and a similar specificity of 94% for the SMMSE-D. As for the discrimination of MCI from dementia, ANOVA post-hoc tests, showed a significant mean difference (p<0.001) between these participants with the Q*mci*-D. The difference between scores for the MCI and dementia groups, for the SMMSE-D (p=1.02) was not significant. The score test for homogeneity of variances across groups in ANCOVA indicated that homogeneity for the Q*mci* is rejected. Heteroscedasticity-corrected SEs and Tests after ANCOVA (White 1980) indicated that the difference in Q*mci*-D mean scores after correction for age, between MCI and NC as well as between MCI and dementia, are significantly different from zero. The ability of the Q*mci*-D, to discriminate MCI from dementia, was significantly greater (p=0.024) than the SMMSE-D, AUC of 0.73 (95% CI 0.59-0.85) compared to 0.60 (95% CI 0.45-0.75), respectively (See Figure 2e,f). At the point estimate the Q*mci*-D had a modest sensitivity of 64% to differentiate MCI from dementia, although this compared favorably to the SMMSE-D with a sensitivity of only 28%.

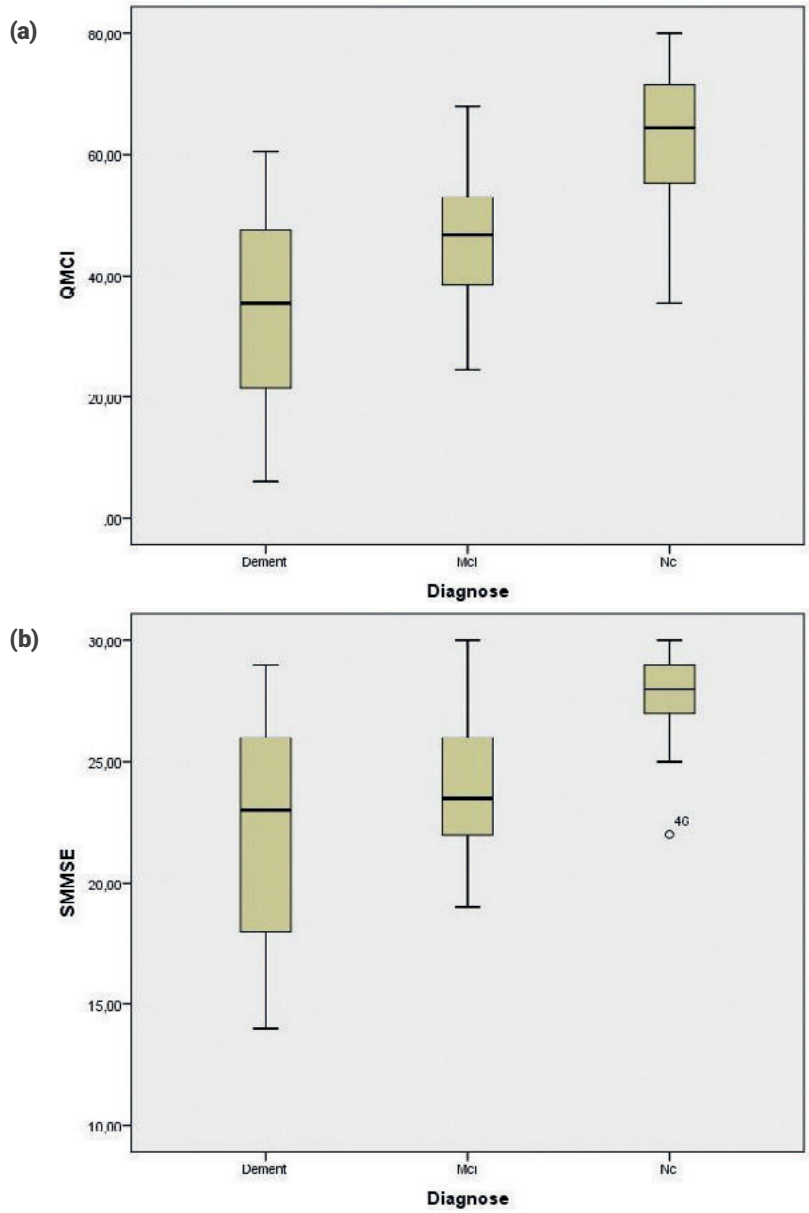


**Figure 1.** Boxplots representing scores on the (a) Q*mci*-D (score range 0-100) and (b) SMMSE-D (score range 0-30) in dementia, MCI and normal cognition groups

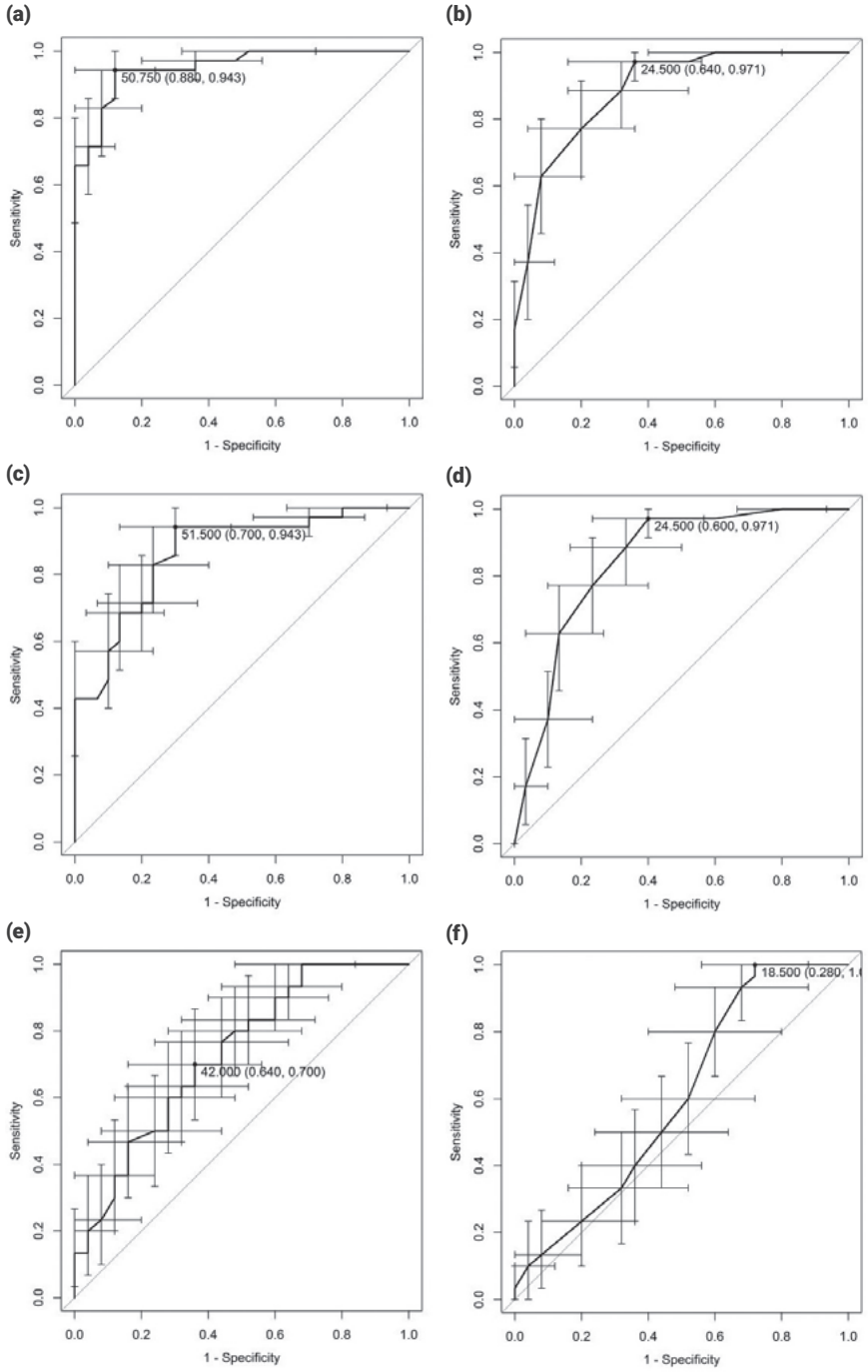


**Figure 2.** Bootstrapped ROC curves with 95% confidence intervals demonstrating sensitivities and specificities of (a) Q*mci*-D and (b) SMMSE-D in differentiating dementia from normal cognition, the (c) Q*mci*-D and (d) SMMSE-D in differentiating MCI from normal cognition, and the (e) Q*mci*-D and (f) SMMSE-D in differentiating MCI from dementia**.**

When moderate and severe dementia cases were removed from analysis, the AUC of the Q*mci*-D and SMMSE-D for differentiating MCI from mild dementia cases alone was unchanged at 0.62 and 0.54, p=0.03, respectively.

## Discussion

The goals of this study were to adapt the Q*mci* for use in Dutch-language countries and to explore its concurrent validity against the most commonly used short cognitive screen in Dutch, the SMMSE-D. The results show that the Q*mci*-D is more accurate than the SMMSE-D in differentiating dementia from NC. It had only fair accuracy (AUC 0.73) at differentiating MCI from dementia, although it was significantly more accurate than the SMMSE (AUC 0.60). In this study however, the SMMSE-D wasn't able to discriminate MCI from dementia with a very poor sensitivity of 24%, particularly when moderate to severe cases were excluded. Based upon this data it would appear that both instruments have limited ability to separate MCI from dementia. This is markedly different from the initial validation of the English language version of the Qmci against the SMMSE (O'Caoimh *et al.* 2012), which in a much larger sample of almost 1000 Canadians, suggested that both had excellent accuracy (AUC >0.90), although it showed no significant difference between the two instruments in their ability to distinguish MCI from dementia. There was also no significant difference between the tests' ability to discriminate between MCI and NC in this sample, although the accuracy of both tests was good, suggesting that both were able to separate MCI from NC. This differs from the initial validation, where the Q*mci* showed significantly greater accuracy over the SMMSE. This discrepancy may relate to the small sample size suggesting that this study was underpowered to show superiority of one instrument over the other. This said, the goal of this study was not to show superiority of a Dutch language version of the Q*mci*, the Q*mci*-D, rather it was to show the concurrent validity of the translation against a widely used screening instrument.

The strength of this study is the robust analysis with bootstrapped ROC curves and 95% confidence intervals, to identify the discriminatory characteristics of both screening tools. This method provides more accurate results than non-bootstrapped methods, especially when analyzing smaller sample sizes. The 95% confidence intervals obtained from the bootstrap and the asymptotic approach (DeLong *et al.* 1988), were in all cases virtually equal. This indicates that the intervals are valid.

The study has limitations. First, the diagnosis of MCI was based on clinical criteria, which may have increased the heterogeneity of this group and led to some bias. However, no

single gold standard criterion for MCI exists and there is still a lack of uniformity in the clinical diagnosis of MCI between studies (Christa Maree Stephan *et al.* 2013). This said, in this study a history of objective history of cognitive decline over time was obtained from each patient's collateral (family member or caregiver) and by neuropsychological testing independent of the short cognitive screens assessed, in keeping with the National Institute on Aging Alzheimer's Association diagnostic guidelines (Albert *et al*. 2011). Second, the NC group consisted of participants recruited by convenience sampling from healthy relatives or caregivers attending with patients. These participants were significantly younger than patients with MCI or dementia. This could have increased heterogeneity and created bias, explaining why there was no significant difference in the ability of both instruments to distinguish MCI from NC, unlike that seen in the initial validation of the Q*mci* (O'Caoimh *et al.* 2012). Patients with MCI and dementia were, however, well matched for age and gender. ANCOVA testing and post-hoc analysis confirmed that differences in mean test score were not attributable to age. Furthermore, the educational status of patients was not recorded routinely, which may also have created some bias. Third, the sample size was small and did not exceed the desired 76-paired observations, calculated as the sample size to detect differences in accuracy between participants with MCI and NC for the screening tools. Fourth, the study excluded those with active depression and less prevalent dementia subtypes as described above. Active depression was excluded as these patients may have slower reaction times and processing speeds (Iverson 2006). Frontotemporal, Parkinson's disease and Lewy body dementia often present with exaggerated functional deficits potentially clouding the diagnosis of MCI, the focus of this study. This may have caused the sample to be less representative and created some spectrum bias, limiting the generalizability of the results. Finally, the study compared the Q*mci*-D only with the SMMSE-D. This was because the SMMSE is the most widely used short cognitive screen (Ismail *et al.* 2010) and in the initial validation of the English language version of the Q*mci* the comparator was the SMMSE allowing direct comparison with the results of that study (O'Caoimh *et al.* 2012). The authors acknowledge the importance of future validation against other short, albeit longer screens including the Dutch version of the Montreal cognitive assessment (MoCA) (Nasreddine *et al.* 2005, Thissen *et al.* 2010), the Addenbrooke's Cognitive Examination-Revised (Larner and Mitchell 2014) and shorter instruments like the Mini-Addenbrooke's Cognitive Examination (M-ACE) (Hsieh *et al.* 2015). The authors also caution that screening for cognitive impairment continues to have challenges and in clinical practice (Lin *et al.* 2013) it remains only one part of a comprehensive assessment of cognition, and should not be relied upon exclusively.

## Conclusion

In conclusion, this study shows the concurrent validity of the Q*mci*-D against the SMMSE-D. The data suggests that the Q*mci*-D, although statistically significantly more accurate than the SMMSE-D, is limited in its ability to differentiate MCI from dementia. The results also suggest that the accuracy of both instruments at distinguishing MCI from NC was good although the Q*mci* was more accurate than the SMMSE in separating dementia from NC in a Dutch speaking population. Given this, albeit limited analysis in a small sample, as well as its brevity and ease of administration (O'Caoimh *et al.* 2012, O'Caoimh *et al.* 2013, O'Caoimh *et al.* 2013, O'Caoimh *et al.* 2014), the Dutch version of the Q*mci*, the Q*mci*-D, appears useful as a short cognitive screen. Further research is now required to confirm these findings with a larger sample including other dementia subtypes and to compare the test to other cognitive screens including the MoCA and M-ACE.

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## Appendix A

**Quick Mild Cognitive Impairment screen (Qmci)**
Administration and Scoring Guidelines

## 1. Orientation

**Scoring**
2 points for the correct answer, 1 point for wrong answers, and 0 points for no answer or a conceptually unrelated answer (see details below).

**Timing**
Maximum of 10 seconds for each answer.

**Instructions and Scoring Guide**

| | |
|---|---|
| **Year** | If the person gives the correct year score 2 points, the incorrect year score 1 point, and 0 points if no year is given. |
| **Country** | Score 2 points for correct country, 1 point for incorrect country, and 0 if no country is named. |
| **Month** | Score 2 points for the correct month or for the previous or following month if within two days of the change of the month (for example, if the date is September 30th, score the full 2 points if person answers October. Similarly, if the date is October 2nd, score 2 points if person says September). Score 1 point if the month is incorrect and 0 if no month is named. |
| **Date** | Score 2 points for exact date or ± one day, 1 point for any other date, 0 if no date is named. |
| **Day of week** | 2 points for correct day, 1 point for incorrect day, 0 if no day named. |

To begin say... **"I'd like to ask you some questions and give you some problems to solve. Would that be OK?"**

**What country is this?** _____
**What year is this?** _____
**What month is this?** _____
**What is today's date?** _____
**What day of the week is this?** _____

**Score _____ / 10**

## 2. Word Registration

**Instructions and Scoring Guide**

**Scoring**
Score 1 point for each word recalled after the first reading. If subject recalls all five, repeat the five items once and then go on to clock drawing. If subject does not repeat all 5, repeat the 5 items and ask the subject to repeat them. Do this until the subject correctly recalls all 5 items or for a maximum of 3 trials. Do not score for trials 2 and 3. These trials are to help the person learn in preparation for the delayed recall task.

**Timing**
Say the words very deliberately, one per second. Allow 10 seconds for the recall.

To begin say…
**"I am going to say 5 words. After I have said these 5 words, repeat them back to me. Are you ready?"**



| | | | | |
|---|---|---|---|---|
| **Dog** | **rain** | **butter** | **love** | **door** |

**Score _____ / 5**

When finished, say… **"Remember these words because I'll ask you to recall them later."**
Alternate word groups include…

| | | | | |
|---|---|---|---|---|
| **cat** | **dark** | **pepper** | **fear** | **bed** |
| **rat** | **heat** | **bread** | **round** | **chair** |

## 3. Clock Drawing

**Instructions and Scoring Guide**

**Scoring**
Place the circle of the transparent scoring template over the circle of the patient's completed clock. Rotate the template circle so that the "12" s align. Score 1 point each if the 1, 2, 4, 5, 7, 8, 10, and 11 are in the correct quadrants. Score 1 point each if the 12, 3, 6, and 9 touch their quadrant lines. Subtract one point for each number

repeated or for numbers above 12. (Should the patient not have drawn a "12" align the template with the 3, 6, or 9.)

Score the placement of hands according to the tips and pivot. Give 1 point for each hand between the dashed lines. Score 1 point for hands connecting at the pivot.

**Timing**
One minute.

To begin…
Give the sheet of paper with the pre-drawn circle and a pencil to the patient. Say **"Now put in the numbers like the face of a clock."** Then say **"Set the hands to show ten past eleven." Place the numbers and hands as carefully as you can."**

You may prompt at each stage…"**put in the numbers…. put the time as ten past eleven**".

| **Score:** | Numbers | Correct | + _____/ 12 |
|---|---|---|---|
| | | Errors | - _____ |
| | Hands | | + _____/ 2 |
| | Pivot | | + _____/ 1 |
| | **Total** | | **+ _____/ 15** |

## 4. Delayed Recall

**Instructions and Scoring Guide**

**Scoring**
Score 4 points for each word recalled. Subjects may recall words in any order.

**Timing**
10 seconds.

To begin say…
**A few minutes ago I named five words. Name as many of those words as you can remember.**

**dog** **rain** **butter** **love** **door**

**Score _____ / 20**

Alternate word groups include…

| | | | | |
|---|---|---|---|---|
| **cat** | **dark** | **pepper** | **fear** | **bed** |
| **rat** | **heat** | **bread** | **round** | **chair** |

## 5. Verbal Fluency

**Instructions and Scoring Guide**

**Scoring.**
Give ½ point for each correct word recalled to a maximum of 40 words. Round up the final score. Do not count words with different suffixes twice (e.g. fish / fishes, mouse / mice, etc.). Accept alternate species (e.g. blue jay, robin, sparrow, duck, etc.). Alternate forms include fruits and vegetables, cities and towns.

**Timing.**
60 seconds. Write down each word the patient says. (You may need to develop some kind of "shorthand" for the speedier patients, such as writing the first 3 letters of each word and then completing them later.)

To begin say…
**"Name as many *animals* as you can in one minute. Ready? Go."**

**Score _____ / 20**

## 6. Logical Memory

**Instructions and Scoring Guide**

**Scoring.**
Give 2 points for each correct word item recalled verbatim. All bolded words within each section must be recalled for score 2 points. Otherwise score 0. Recall may be in any order.

**Timing.**
30 seconds. Check off each word unit recalled.

To begin say…

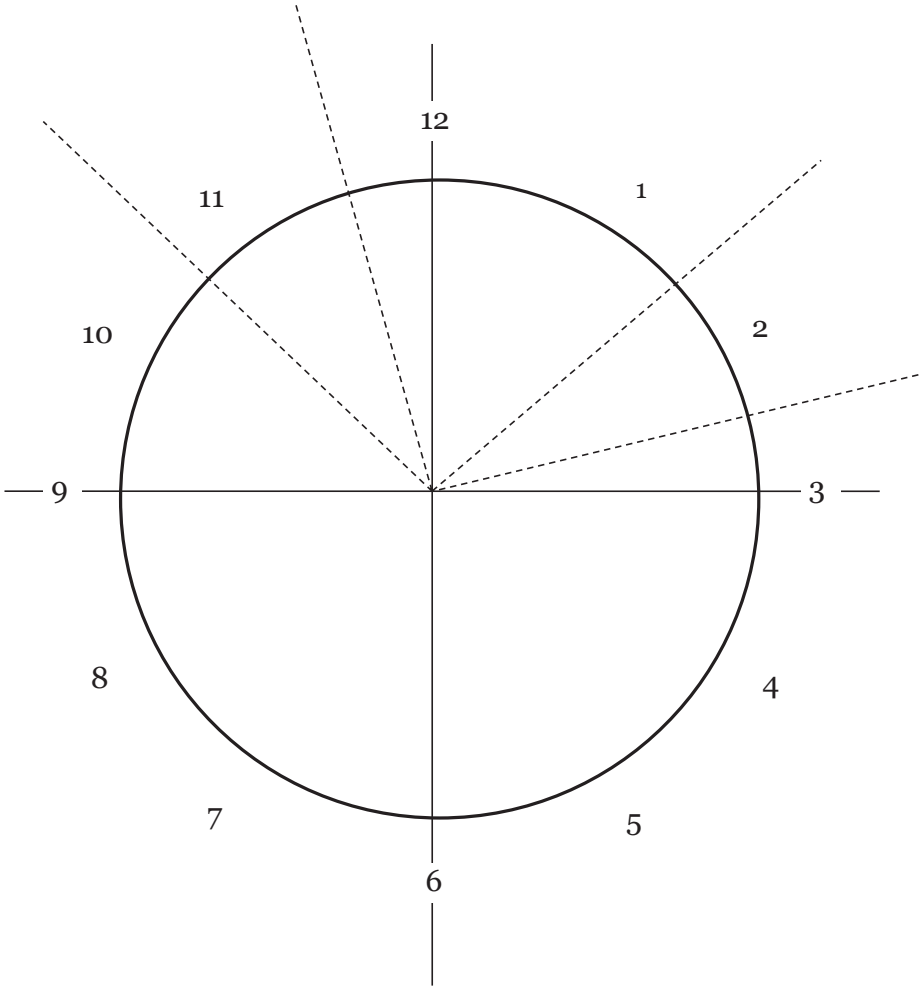
**"I am going to read you a short story. After I have finished reading I want you to tell me as much of the story as you can. OK?"** [patient signifies agreement, then begin reading the paragraph at about 1 second for each word unit] **"The red… fox… ran across…….. the bushes."**

| **6. Logical Memory** | | | |
|---|---|---|---|
| The **red** | The **brown** | The **white** | 2 / 0 |
| **fox** | **dog** | **hen** | 2 / 0 |
| **ran across** | **ran across** | **walked across** | 2 / 0 |
| the **ploughed** | the **metal** | the **concrete** | 2 / 0 |
| **field**. | **bridge**. | **road**. | 2 / 0 |
| It was **chased** by | It was **hunting** | It was **followed** by | 2 / 0 |
| a **brown** | a **white** | a **black** | 2 / 0 |
| **dog**. | **rabbit**. | **cat**. | 2 / 0 |
| It was a **hot** | It was a **cold** | It was a **warm** | 2 / 0 |
| **May** | **October** | **September** | 2 / 0 |
| **morning**. | **day**. | **afternoon**. | 2 / 0 |
| **Fragrant** | **Ripe** | **Dry** | 2 / 0 |
| **blossoms** | **apples** | **leaves** | 2 / 0 |
| were **forming** on | were **hanging** on | were **blowing** in | 2 / 0 |
| the **bushes**. | the **trees**. | the **wind**. | 2 / 0 |

**Score _____ / 30**

***Qmci*** Total Score _____ / 100

**The Clock Transparency Scoring Template**




**Scoring**

Place this scoring template over the completed clock with the template's "12 o'clock" line placed over the subject's 12. Adjust the template to maximize the score for the numbers and hands. The total score is 15. Record scores on the score sheet as follows:

**Numbers**

- For the numbers 12, 3, 6, and 9 score one (1) point if they touch their respective lines, zero (0) point if missed, and zero (0) if the number is omitted.

- For the numbers 1, 2, 4, 5, 7, 8, 10, and 11 score one (1) point for each number in the correct quadrant, zero (0) point if the number is outside the quadrant, and zero (0) if the number is omitted.
- **Subtract one point for each number repeated or more than 12.**

**Hands**

Score the placement of the entire hand. If the hands are drawn within range, score one (1) point for each hand; if the hands are drawn outside the hatched line or are omitted score zero (0); Give one (1) point if the hands join at the pivot.

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## Appendix B

**Quick *Mild Cognitive Impairment* screen (Dutch version, Q*mci-D)***
Uitvoering en richtlijn voor het scoren

## 1. Oriëntatie

**Scores**
2 punten voor goede antwoorden, 1 punt voor foute antwoorden, en 0 punten bij geen antwoord of een conceptueel ongerelateerd antwoord (zie details onder).

**Tijd**
Maximaal 10 seconden voor elk antwoord.

**Instructies en richtlijn voor het scoren**

| | |
|---|---|
| **Jaar** | Als de persoon het juiste jaar noemt tel 2 punten, het onjuiste jaar tel 1 punt, en 0 punten als geen jaar wordt genoemd. |
| **Land** | Tel 2 punten voor het juiste jaar, 1 punt voor het onjuiste jaar, en 0 als geen land wordt genoemd. |
| **Maand** | Tel 2 punten voor de juiste maand of de volgende of vorige maand wanneer binnen twee dagen van de maandwisseling (bijvoorbeeld, als de datum 30 september is, tel de volle twee punten als de persoon oktober noemt. Vergelijkbaar, als de datum 2 oktober is, tel 2 punten als de persoon september noemt). Tel 1 punt als de maand onjuist is en 0 als geen maand wordt genoemd. |
| **Datum** | Tel 2 punten voor de exacte datum of ± één dag, 1 punt voor elke andere datum, 0 als geen datum wordt genoemd. |
| **Dag van de week** | 2 punten voor de juiste dag, 1 punt voor de onjuiste dag, 0 als geen dag wordt genoemd. |

Geef de volgende instructie…
**“Ik wil u graag enkele vragen stellen en geef u wat problemen om op te lossen. Vindt u dat goed?”**

**In welk land zijn we?** _____
**Welk jaar is het?** _____
**Welke maand is het?** _____

**Welke datum is het vandaag?** _____

**Welke dag van de week is het?** _____

**Score _____ / 10**

## 2. Onthouden van woorden

**Instructies en richtlijn voor het scoren**

**Scores**

Tel 1 punt voor elk woord dat genoemd wordt na de eerste keer oplezen. Als de persoon zich alle vijf woorden herinnert, herhaal dan de vijf items één keer en ga vervolgens door met klok tekenen. Als de persoon zich niet alle vijf items herinnert, herhaal dan de 5 items en vraag de persoon ze opnieuw op te noemen. Herhaal dit tot dat de persoon zich alle vijf items juist herinnert, met een maximum van 3 keer. Geef bij de 2e en 3e keer geen scores. Deze herhalingen zijn bedoeld om de persoon te helpen de woorden te leren in voorbereiding op de opdracht bij uitgestelde herinnering.

**Tijd**

Lees de woorden heel bewust op, één per seconde. Sta 10 seconden toe voor het herinneren.

Geef de volgende instructie…

**"Ik ga 5 woorden opnoemen. Nadat ik deze 5 woorden heb opgenoemd, herhaalt u ze voor me. Bent u er klaar voor?"**

| | | | | |
|---|---|---|---|---|
| **Hond** | **regen** | **boter** | **liefde** | **deur** |

**Score _____ / 5**

Daarna geef de volgende instructie **"Onthoud deze woorden want ik zal u later nog een keer vragen of u ze zich herinnert."**

Woordgroepen ter afwisseling zijn…

| | | | | |
|---|---|---|---|---|
| **kat** | **donker** | **peper** | **angst** | **bed** |
| **rat** | **hitte** | **brood** | **rond** | **stoel** |

## 3. Klok Tekenen

**Instructies en richtlijn voor het scoren**

**Scores**

Plaats de cirkel van het transparante scoringssjabloon over de cirkel van de door de patiënt getekende klok. Roteer de sjabloncirkel zodanig dat de "12"-en op elkaar liggen. Tel 1 punt per correct cijfer als de 1, 2, 4, 5, 7, 8, 10, en 11 in de juiste kwadranten vallen. Tel 1 punt per correct cijfer als de 12, 3, 6, en 9 de kwadrantlijnen raken. Trek 1 punt af voor elk cijfer dat herhaald wordt or voor cijfers boven de 12. (Heeft de patiënt geen "12" getekend, zet het sjabloon dan gelijk aan de 3, 6, of 9.)

Geef de score voor het plaatsen van de wijzers aan de hand van de wijzers en het middelpunt. Geef 1 punt voor elke wijzer tussen de gestippelde lijnen. Tel 1 punt als de wijzers het middelpunt raken.

**Tijd**

Een minuut

Start met het volgende…
Geef het vel papier met de voorgetekende cirkel erop en geef een pen aan de patient. Zeg **"Zet de nummers erin als in een klok."** Zeg vervolgens **"Zet de wijzers op tien over elf. Plaats de nummers en wijzers er zo precies mogelijk in."**

U mag in elke fase onderbreken…"**zet de cijfers erin…. zet de tijd op tien over elf**".

| | | | |
|---|---|---|---|
| **Score:** | Cijfers | Correct | + _____/ 12 |
| | | Fouten | - _____ |
| | Wijzers | | + _____/ 2 |
| | Middelpunt | | + _____/ 1 |
| | **Total** | | **+ _____/ 15** |

## 4. Uitgestelde herinnering

**Instructies en richtlijn voor het scoren**

**Scores**

Tel 4 punten voor elk woord dat wordt herinnerd. De woorden mogen in willekeurige volgorde genoemd worden.

**Tijd**
10 seconden.

Geef de volgende instructie…
**"Enkele minuten geleden noemde ik 5 woorden op. Kunt u deze woorden nog eens opnoemen?"**

| | | | | |
|---|---|---|---|---|
| **hond** | **regen** | **boter** | **liefde** | **deur** |

**Score _____ / 20**

Woordgroepen ter afwisseling zijn…

| | | | | |
|---|---|---|---|---|
| **kat** | **donker** | **peper** | **angst** | **bed** |
| **rat** | **hitte** | **brood** | **rond** | **stoel** |

## 5. Woordvlotheid

**Instructies en richtlijn voor het scoren**

**Scores**
Geef een ½ punt voor elk correct woord dat genoemd wordt met een maximum van 40 woorden. Rond de totale score af. Tel dezelfde woorden met verschillende achtervoegsels niet twee keer (bv. vis / vissen, muis / muizen, etc.). Accepteer verschillende soorten (bv. gaai, roodborstje, mus, eend, etc.). Verschillende soorten gelden ook voor fruit en groenten, steden en dorpen.

**Tijd**
60 seconden. Schrijf elk woord dat de patiënt zegt, op. (U zult misschien een soort "snelschrift" moeten gebruiken voor de snellere patiënten door bijvoorbeeld de eerste 3 letters van elk woord op te schrijven en ze dan later af te maken.)

Geef de volgende instructie…
**"Noem zoveel mogelijk *dieren* als u kunt. U krijgt hiervoor één minuut. Klaar? Start."**

**Score _____ / 20**

## 6. Logisch Geheugen

**Instructies en richtlijn voor het scoren**

**Scores**

Geef 2 punten voor elk correct genoemd woord, letterlijk, dat de patiënt zich herinnert. Alle vet gedrukte woorden in elk hokje moeten genoemd worden om 2 punten te tellen. Zo niet, tel dan 0 punten. De woorden mogen in elke volgorde worden genoemd.

**Tijd**

30 seconden. Vink elk woord dat genoemd wordt af.

Geef de volgende instructie…

**"Ik ga u een kort verhaaltje voorlezen. Nadat ik klaar ben met voorlezen probeert u zoveel mogelijk van het verhaaltje na te vertellen. OK?"** [nadat de patiënt akkoord geeft, begin met het voorlezen van de paragraaf met een snelheid van ongeveer 1 seconde voor elke woordeenheid] **"De rode… vos… rende door…….. het struikgewas."**

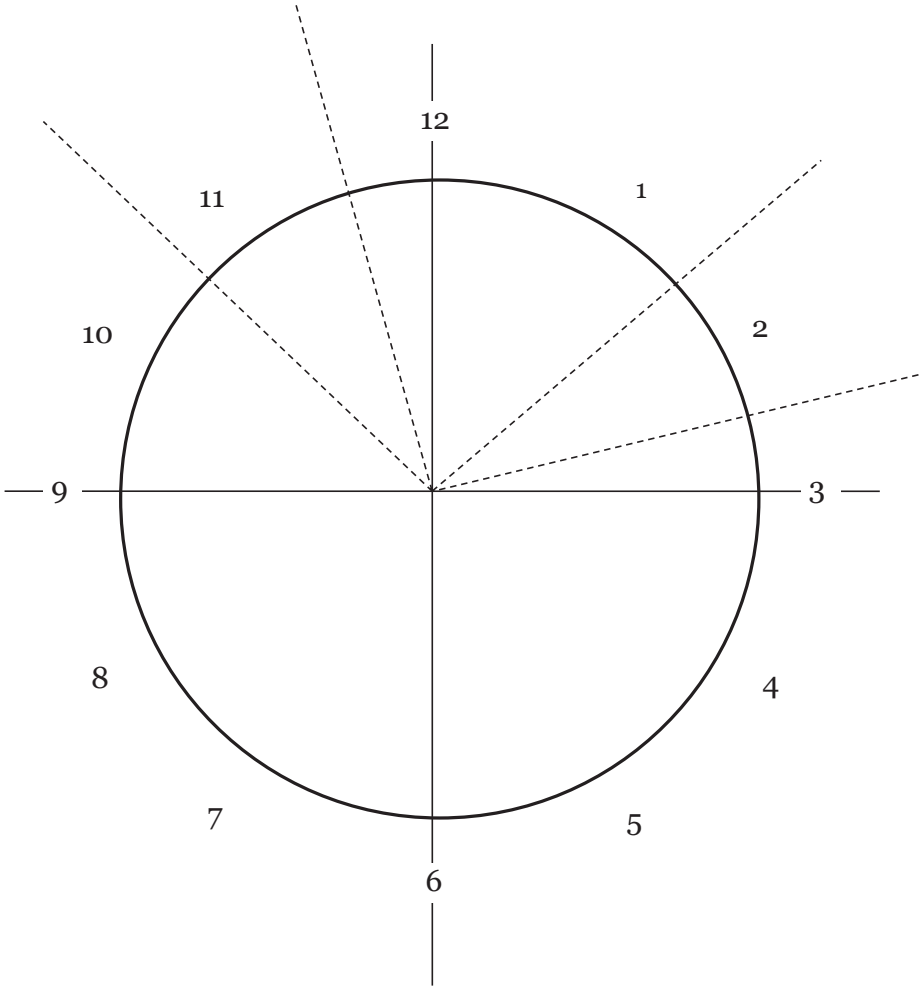


| **6. Logisch Geheugen** | | | |
|---|---|---|---|
| De **rode** | De **bruine** | De **witte** | 2 / 0 |
| **Vos** | **hond** | **kip** | 2 / 0 |
| **rende over** | **rende over** | **liep over** | 2 / 0 |
| het **omgeploegde** | de **metalen** | de **geasfalteerde** | 2 / 0 |
| **veld**. | **brug**. | **weg**. | 2 / 0 |
| Hij werd **nagejaagd** door | Hij **jaagde** op | Hij werd **gevolgd** door | 2 / 0 |
| een **bruine** | een **wit** | een **zwarte** | 2 / 0 |
| **hond**. | **konijn**. | **kat**. | 2 / 0 |
| Het was een **hete** | Het was een **koude** | Het was een **warme** | 2 / 0 |
| **Morgen** | **dag** | **middag** | 2 / 0 |
| in **mei**. | in **oktober**. | in **september**. | 2 / 0 |
| **Geurige** | **Rijpe** | **Droge** | 2 / 0 |
| **Bloesems** | **appels** | **bladeren** | 2 / 0 |
| **Bloeiden** | **hingen** | **bewogen** | 2 / 0 |
| in het **struikgewas**. | in de **bomen**. | in de **wind**. | 2 / 0 |

**Score _____ / 30**

Totale Score _____ / 100

**De Klok Transparante Scoresjabloon**




**Scores**

Plaats dit scoresjabloon over de getekende klok met de "12 uur"- lijn van het sjabloon geplaatst op de 12 van de patiënt. Verschuif het sjabloon om de score voor cijfers en wijzers te maximaliseren. De totale score is 15. Noteer de scores op het scorevel als volgt:

**Cijfers**

· Voor de cijfers 12, 3, 6, en 9 tel één (1) punt Als zij hun respectievelijke lijnen raken, nul (0) punten als dat niet zo is, en nul (0) als een cijfer ontbreekt. Voor de cijfers 1, 2,

4, 5, 7, 8, 10, en 11 tel één (1) punt voor elk cijfer in het juiste kwadrant, nul (0) punten als het cijfer buiten het kwadrant valt, en nul (0) als het cijfer ontbreekt.

- **Trek een punt af voor elk herhaald cijfer of cijfers hoger dan 12.**

**Wijzers**

- Geef een score voor de plaatsing van beide wijzers samen. Als de cijfers binnen de toegestane zone vallen, tel één (1) punt voor elke wijzer; als de wijzers buiten de gestippelde lijn zijn getekend of ontbreken tel dan nul (0) punten; Geef één (1) punt als de wijzers het middelpunt raken.

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