The effect of routine based screening for cognitive disorders on the *healthcare* for elderly: The Montreal Cognitive Assessment.

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EFFECT COGNITIVE SCREENING ON ELDERLY HEALTHCARE

Abstract

Background. Routine based conducting the Montreal Cognitive Assessment (MoCa) can lead to a more efficient use of the healthcare money through more noticed cognitive disorders, shorter treatment duration and less Neuro Psychological Assessment (NPA) at the elderly psychiatric department. **Method.** The test region conducted a MoCa at intake while in the control region the therapist continued their working method. First, the amount of cognitive disorders is compared between both regions along with the MoCa as predictor for cognitive disorders. Second the difference in NPA's and the MoCa as predictor for an NPA was tested. Third, the treatment duration was compared using independent sample t-tests. Finally, the progression of the MoCa scores (ΔMoCa) as a predictor for an NPA and the treatment duration was tested. **Results**. No differences were found between the control and test region on treatment duration, cognitive disorders and NPA. However, the MoCa appeared a significant predictor for cognitive disorders. Conducting (multiple) MoCa('s) appeared additionally a positive predictor for NPA and a negative predictor the treatment duration. **Conclusion** Although further research is needed to gain a better understanding of the impact of the MoCa routine wise, conducting the MoCa is effective in predicting cognitive disorders and thereby permits patients and their family to receive shorter specialised care which could be a more effective use of the healthcare money. Furthermore, a MoCa appears a predictor for an NPA for patients with a lower MoCa mean. A higher MoCa mean was however, a negative predictor for conducting an NPA.

Keywords: Montreal Cognitive Assessment (MoCa), cognitive disorders, Routine Outcome Monitoring, elderly healthcare.

EFFECT COGNITIVE SCREENING ON ELDERLY HEALTHCARE

The effect of cognitive screening on the elderly *healthcare*: The Montreal Cognitive Assessment. The ageing population had been accompanied with an increase in cognitive disorders worldwide. Nowadays 10% of the population ages 65 and above suffers from dementia. For mild cognitive impairment (MCI) this is even 20% rising to 40% above the age of 85 (Gauthier et al., 2006). As a consequence of ageing in the population the costs of healthcare will increase rapidly. These costs are predicted to rise from 57 billion euro in 2003 to 70 billion in 2025. In the Netherlands, the costs of dementia were already 16% of the total healthcare budget in 2003 (Hollander, Hoeymans, Melse, Oers & Polder, 2006).

These healthcare costs are partly spent on people with MCI. This is a syndrome in which there is a cognitive decline bigger than expected for an individual's age but what does not interfere with daily functioning. Although some people remain stable over time, more than half of the people with MCI develop dementia within five years (Dawe, Procter, & Philpot, 1992; Gauthier et al., 2006; Winblad et al., 2004). Dementia is a disorder that often includes a decline in memory and at least one other cognitive domain such as visuospatial, language or executive functioning that interferes with daily life functioning. Dementia causes suffering for patients and their families. People with dementia gradually lose the ability to execute normal activities which could cause feelings of autonomy and identity loss. These feelings can result in negative emotions as for instance sadness and anxiety. According to the Dutch Health Council, many elderly report living with dementia as a state of severe suffering (Boer et al., 2007). For their families, it can lead to anxiety, depression and increased time of care for their relatives (Bousatani, Peterson, Hanson, Harris & Lohr, 2003). While MCI does not interfere with daily functioning, it can cause a higher risk of mortality (Winblad et al., 2004). Because of the increased risk of developing dementia and its negative consequences, it is relevant to detect MCI at an early stage.

Despite their influence on daily functioning cognitive disorders are often not recognized. In the USA, more than 50% of the people with dementia have never received a diagnosis for this disorder from a physician. Another study found that 79% of the people with mild dementia, 72% with moderate dementia and 20% with severe dementia have no documentation of dementia in their medical record. Part of this deficiency is caused by reduced disease awareness within patients. There are multiple causes for this reduced disease awareness for instance not noticing, façade behavior, denial or thinking these complaints are part of ageing (Bousatani at al., 2003).

The reported complaints of patients appear to be unreliable and not the same as the objective complaints (Bousatani et al., 2003). Physicians in several studies reported that the brief amount of time available for a typical visit, limits their ability to set a good diagnosis (Bradford, Kunik, Schulz, Williams & Singh, 2009). Occasionally these complaints/disorders will not be recognized from psychiatric investigation as well (Burleigh, Reeves, McAlpine & Davie, 2002). Without a suspicion of a cognitive disorder, it might happen that therapists will not implement a cognitive assessment which can cause underdiagnoses for cognitive disorders. Not recognising these disorders interferes with the treatment which causes a higher chance of developing a delirium and less therapy/ medication dedication. A delayed diagnose is a missed chance to prevent emergency hospitalisation as well (Voisin, Sourdet, Delrieu & Vellas, 2009). A quick screening method might be able to identify persons with undiagnosed cognitive disorders and thereby permit patients and their family to receive care at an earlier stage in the disease process (Iliffe, Manthorpe & Eden, 2003). Therefore, it is important to conduct a routine based cognitive screening, which might help to recognize cognitive disorders at an early stage.

Previous research on quick cognitive screening methods showed that there will be an increase in dementia diagnoses with 4% by using a quick cognitive screening method (Borson et al., 2007). If patients receive a diagnosis in the beginning of their treatment because of this method, it can help them understand their condition and makes them able to plan recording to their finances, safety and health care (Boustani at al., 2003). Since the lack of deterioration in cognitive function at the early stage of Alzheimer, an early diagnosis followed by therapy could potentially be effective in maintaining a good quality of life for patients, family members and their care-givers (Llife et al., 2003). Efficient healthcare interventions that increase the independence and wellbeing of the patients and their relatives can lead to a more efficient use of the healthcare money. Early diagnosis and therapy might reduce this healthcare costs because of improved independence in patients and competence in their care givers which might result in lower costs of hospitalization and delayed admission to nursing homes (O'Bryan et al., 2008).

Additionally, cognitive screening can provide a start condition of global functioning before psychiatric treatment. Advantages of knowing this condition might be less Neuro Psychological Assessments (NPA), better treatment and a shorter waiting list for conducting an NPA. This start condition of global functioning can also help to document the progress and might reveal the underlying courses of MCI. Nowadays in 40% of the cases there is no progress

or the condition exacerbates, while in 20% of the cases the condition improves (Gauthier, 2006). Unless the knowledge about cognitive side effects it is not clear if this is caused by the sometimes-prescribed Lithium (Manchia et al., 2013). If the psychiatric and pharma logical causes can be excluded, then the percentage of progress might be increased. More information about the progress can also help to make a distinction between psychiatric, pharmaco logical and neurodegenerative causes from cognitive complaints and disorders.

Moreover, a quick screening method might differentiate at an earlier stage between cognitive diagnoses. This is important because different cognitive disorders need other treatment approaches. Whilst Alzheimer and vascular dementia have an overlapping treatment, symptom-modifying medications appeared to work only for Alzheimer (Turner et al., 2004). An early diagnosis might also reduce the anxiety and depression for their relatives because of the additional information. Psychoeducation appeared to have a significant effect on burden, depression, subjective well-being and knowledge of the symptoms for care givers from people with dementia (Ostwald, Hepburn, Caron, Burns & Mantell, 1999; Pinquart & Sorensen, 2006). Furthermore, a quick diagnosis might prevent further NPA, what nowadays, will be conducted to objectivize the cognitive complaints and to detect (cognitive) disorders when there is no clear judgement (Portet et al., 2006). When there stays an ambiguous judgement, this comprehensive research will be repeated after one year. NPA's are experienced stressful, time-consuming and are expensive (Harrison & Owen, 2002). It will be estimable if a quick screening method can differentiate between different diagnoses and therefore prevent these stressful and expensive NPA's.

Therefore, the current study came forth with routine based cognitive screening at the elderly psychiatric department Altrecht Leidsche Rijn, the Netherlands in 2008. With this routine based cognitive screening, Altrecht in cooperation with the University of Utrecht, hopes to answer the following research question: 'Does routine based cognitive screening (MoCa) influences the (early) diagnose, treatment and the frequency of conducting NPA's at the elderly psychiatric department Altrecht?' For the cognitive screening in this study, the Dutch translated version of the Montreal Cognitive Assessment (MoCa) is used. The MoCa is a psychiatric instrument which is developed in 2005 for assessing MCI. Nowadays this instrument is used for the assessment of several cognitive disorders. With a cut of score from $\leq$25 (cognitive decline) the sensitivity is 72% and the specificity is 73% respectively for the MoCa. With a cut of score

of ≤20 this was even 100% for severe dementia and 75% for MCI (Thissen, Bergen, Jonghe, Kessels & Dautzenberg, 2010). An example of the Dutch MoCa is provided in appendix 1.

Based on the previously discussed research there will be hypothesized that there will be more (early) diagnosis of cognitive disorders when there is a routine based cognitive screening. Conducting the MoCa routine wise provides a start condition of global functioning and can therefore lead to less NPA's, a shorter treatment duration and more noticed cognitive disorders. Getting an overview of someone's MoCa progression (ΔMoCa) can also lead to less NPA. Furthermore, a differentiation was expected between the test region and the control region. In the test region, where more MoCa's have been done, there is expected that the MoCa progression (ΔMoCa) causes shorter treatment duration and less NPA.

Method

Design

This study aimed to investigate the effect of routine based cognitive screening (MoCa) on the (early) diagnosis, treatment duration and amount of NPA's. For this study the work area psychiatric disorder policlinic (PSO) was divided in two areas. Utrecht- East and -City, maintained their working method (control region), where Utrecht-West applied the MoCa at the intake procedure (test region). The test region was strongly advised to take a routine wise cognitive test (MoCa) at intake for patients starting therapy between 2009 and 2015. In the control region, there were no changes. The therapist was free to conduct a cognitive screening for cognitive disorders. After intake, age, diagnosis and medical information was collected by the therapist. The research data was among other things contained from the Routine Outcome Monitoring (ROM), a systematic evaluation of treatment response during the progression of the treatment. This provides professionals in healthcare information about the progression of the patient (Carlier et al., 2012; Ware et al., 1995). This research is part of a bigger research commissioned by Altrecht elderly psychiatry. Conducting the MoCa routine wise, might have taken some extra time and effort from both patient and therapist. However, this study fulfills the ethical principles of Helsinki and is therefore approved by the CWO (JAMA, 2013).

Participants

The patients are recruited from the elderly psychiatric department Altrecht (FPS). These patients are usually above sixty and have psychical or psychiatric problems as depression, anxiety, physical unexplained symptoms, autism or psychotic disorders. Besides the psychiatric problems, they have symptoms that are caused by aging. The research groups, recruited from two regions in Utrecht, are expected to be similar. A power analyses was done to calculate the number of participants needed for this study. With the assumption that 15% has a cognitive disorder and 50% will be known at start, a Fischer exact test is carried out. A reliability of 95% would be possible in a sample of N=2 x 400 (n=386). This study used 4399 participants and therefore has enough power to find an effect for significance at a 0.05 level.

Instruments

This study is carried out using the Dutch translated version of the MoCa. Other information of the patients is collected from the ROM.

MoCa. The MoCa is a screening instrument to detect MCI and other cognitive disorders (Nasredinne et al., 2005). It assesses different domains as: attention and concentration, executive functioning, memory, language, conceptual thinking, visuospatial ability, math and orientation. Executive functioning is tested using a *trail making- B task* (one point), a *phonemic fluency task* (1 point), and a *two-item verbal abstraction task* (2 Points). The *short-term memory recall task* involves two leaning trials (5 points). The patient should recall 5 nouns after approximately five minutes. A *clock drawing task* (3 points) and a *three-dimensional cube copy* (1 point) are used to administer visuospatial abilities. A *sustained attention task* (1 point), a *subtraction task* (3 points) and a *digits forwards and backwards task* (1 point each), measures attention, concentration and memory. Language is assessed using a *naming task* with low-familiarity animals as lion, camel and rhinos (3 points), a repetition of two complex sentences (2 points) and *the fluency task*. Finally, orientation is measured by asking for the date and place (six points) (Lee et al, 2008; Nasredinne et al., 2005; Thissen et al., 2010). It takes approximately ten minutes to administer the MoCa. The maximum score for the MoCa is 30, a score of 26 or above is normal (Nasreddine, 2010).

DSM-5. The Diagnostic Statistical Manual (DSM-5) is the most used system for diagnosing mental disorders. The therapists from Altrecht based the cognitive disorders in the study on this manual (5th ed.; DSM–5*;* American Psychiatric Association [APA], 2013).

NPA. A neuropsychological assessment (NPA) is an assessment to detect cognitive disorders. This assessment is carried out among other things when there is no certainty about the diagnosis. When there is still no unilateral judgement after an NPA, this assessment will be repeated approximately one year later. The assessment contains a *complex figure*, a *tauten burger questionnaire*, a *behavioral assessment of dysexecutive syndrome* (BADS), *the WAIS-IV*, a *key search test, Zung visual association test (VAT*), *proverbs*, *GIT fluency*, clocks, spelling, 15 or 8 words test, 15 or 8 words recall or recognition, *cross bell test*, *Dutch read test for adult* (NLV) and a *Visual organization test Hooper* (VOT). This test is spread over several days (O'Bryan et al., 2012; Thissen et al., 2010).

Processing and analyzing the data

Demographical data. First, the differences between the groups are examined using independent tests comparing gender (X^2) and age (t-test). A Chi^2 test was performed to test if more first MoCa's were conducted over the years in the test region. Furthermore, a validation check by testing if the doctors referred to the correct healthcare service (comparing the number of cognitive disorders) is carried out, between the elderly cognitive disorder department (CS) and the elderly psychiatric department (SPS) using X^2. If there are significant more disorders in CS, this study only uses the elderly psychiatric department, while it might be able to find more unnoticed cognitive disorders here.

MoCa scores and NPA's conducted. An independent sample t-test was used to test if patients were referred to an NPA with a different first MoCa mean between both regions.

(Early) diagnosis cognitive disorders. Second, X^2 tests are conducted to find differences in the amount of cognitive disorders at start diagnosis, end diagnosis and the difference (end-start diagnosis), between both regions (when controlled for age). The start diagnosis is a cognitive diagnosis based on the DSM-IV in the beginning of the therapy, while the end diagnosis is the most recent diagnosis. With logistic regression, the difference was tested between the regions in conducting a MoCa (yes/no) as a predictor for a cognitive disorder (yes/no) for patients who got NPA. Additionally, conducting a MoCa as a predictor for cognitive disorders (end diagnosis) in the test region is examined, using linear regression.

MoCa predicts NPA's. Third, the amount of NPA's was compared (Chi^2) for both regions. Furthermore, there was tested if conducting a MoCa was a significant predictor for referring to an NPA (logistic regression) and for the different MoCa's in the test region (MoCa 1, MoCa 2 and MoCa 3), using linear regression.

Treatment duration. Fourth, the treatment duration was compared between both regions using an independent sample t-test, controlling for age. Furthermore, the score on the first MoCa as a predictor for the treatment duration was tested using a linear regression (test region).

Progression trough MoCa scores (ΔMoCa). Finally, the progression of the MoCa scores (ΔMoCa= MoCa 2- MoCa 1) as a predictor for the implementation of an NPA was tested, using logistic regression. Additionally, is tested if the progression of the MoCa (ΔMoCa) is a predictor for the treatment duration using linear regression.

Results

Demographical data

This study used a sample of 4399 patients, *(n= 1586 test, n= 2813 control region). G*ender was equally divided between both groups $X^2(1) = .54$ $p = .463$. However, age differed significant between the control (*M=73.89, SD=9.27)* versus the test region (*M=71.89, SD=8.*), t (2308.91) = 4.11, $p<0.001$. Therefore, gender was used as a covariate in further analysis. In the test region, significant more MoCa's *(n*=274) were conducted compared to the control region (*n= 104*), t=-11.80 (1319.04), $p<0.001$. A Chi^2 test was carried out to test if there were significant more first MoCa's conducted over the years in the test region compared to the control region, and this revealed a significant difference, $X^2(6) = 32{,}03$, $p<0.001$. Furthermore, a validation check showed significant more patients with cognitive disorders in the elderly cognitive disorder department than the elderly psychiatric department, $X^2(1) = 5628.54$ $p<0.001$. Therefore, only the psychiatric department is used for further analysis.

MoCa scores and NPA's conducted

The test region referred to an NPA with a significant lower fist MoCa mean *(M=21.18, min=5, max=30*) compared to the control region *(M=21.45, min=15 max=29*), using an independent sample t-test, t (449.347) = -6.27, $p<0.001$.

(Early) diagnosis cognitive disorders

The amount of cognitive disorders did not differ at start diagnosis *(N=160)* in the test region compared to the control region (*N=267*) when controlled for age, $X^2(1) = 1.79(.097)$ $p = .181$. Similarly results were found at end diagnosis in the test region (*N=195*) compared to the control region (*N=323*), when controlled for age, $X^2(1) = 3.45(0.086)$, $p = .063$. There appeared no difference between the regions in conducting a MoCa (yes /no) as a predictor for a cognitive disorder (yes/no) for patients who were conducted to an NPA, with logistic regression, $b = .19(.150)$, $X^2(1) = .20$, $p = .654$. Conducting a MoCa appeared however, a significant predictor for the amount of cognitive disorders at end diagnosis in the test region, using linear regression, $b = .12(.031)$, $t = 3.77$, $p<0.001$, $R^2 = .01$.

MoCa predicts NPA's

A Chi^2 demonstrated no difference between the proportion of NPA's that was conducted in the test region (17%) compared to the control region (12%), $X^2(5) = 10.41$, p=.065. Conducting a MoCa appeared a significant positive predictor for an NPA in the test region, using a logistic regression, b=1.10 (.150), X^2=53.18, $p<0.001$, *Nagelkerke* R^2= .05. The score on the first MoCa appeared a significant predictor for conducting an NPA, using linear regression, b= .01(0.00), t=.5.38, $p<0.001$. The second MoCa score appeared however, no significant predictor for an NPA, b=.01(0.01) t=1.45, p=.147. The third MoCa score appeared nevertheless a significant positive predictor for conducting an NPA, b=0.031(0.01), t=3.31, p=0.001. The results of the first MoCa score are presented in figure 1.

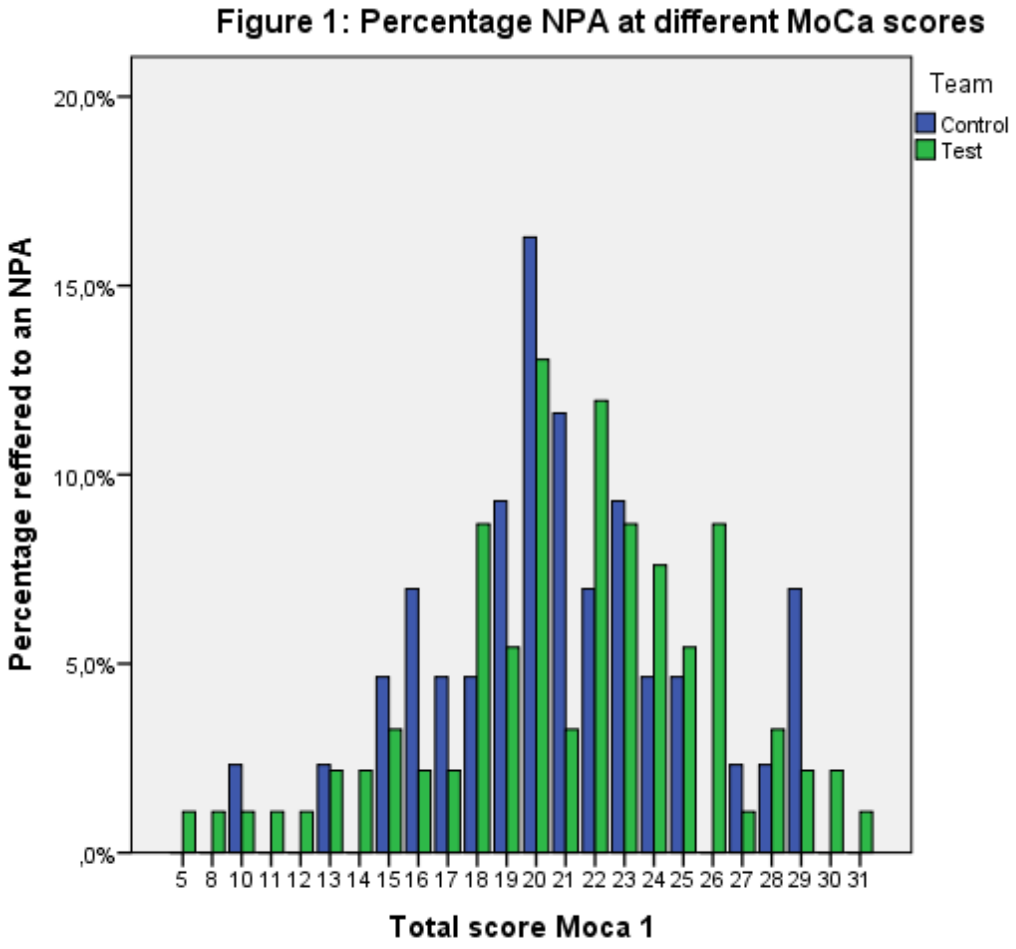

Figure 1: This figure presents the percentage that is reffered to an NPA at different MoCa scores (first MoCa) for both regions (test N=92, control N=43).

Treatment duration

An independent sample t-test when controlled for age, demonstrated no difference in treatment duration between the test (*M=343 days*) and the control (*M=326 days*) region, *t (3450.46)* = .87, *p*=.383. A significant effect was found in the test region when predicting treatment duration from the score on the first MoCa, using linear regression, *b*= 7.81(1.64), *t*=4.76, *p*<0.001, R^2=.014.

Progression trough MoCa scores (ΔMoCa)

The progression of the MoCa scores (ΔMoCa) as a predictor of conducting a NPA was examined using a logistic regression and appeared a significant negative predictor in the test region, *b=-.04* (0.01), $X^2(1) = .96$, *p*<0.001, *Nagelkerke* R^2=.03. The progression of the MoCa (ΔMoCa) in the test region appeared also a significant negative predictor of the treatment duration using linear regression, *b*=-5.18(1.72), *t*=-3.01, *p*=.003. The MoCa progression (ΔMoCa) as a predictor for the treatment duration is presented in figure 2.

Figure 2: Moca progression predicts treatment duration

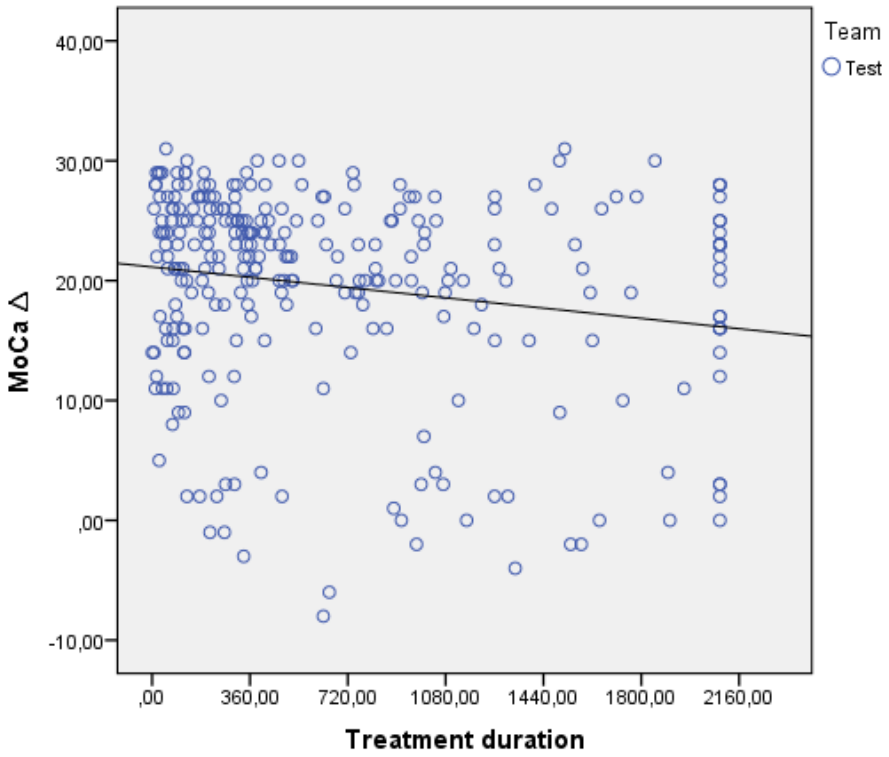

Figure 2. This figure presents the MoCa Δ (MoCa 2- MoCa 1) as a predictor for the treatment duration (in days). The latest follow up is after 6 years (2160 days).

Discussion

This study explored the effect of quick cognitive screening on the elderly healthcare. As outlined previously a quick cognitive screening was expected to cause more detected cognitive disorders, shorter treatment duration and less NPA's. Furthermore, knowing someone's progression (ΔMoCa) was expected to shorten the treatment duration and cause less NPA. However, routine based cognitive screening appeared equally effective as conducting a MoCa on indication. The MoCa (progression) appeared in both regions effective in predicting cognitive disorders and is a significant negative predictor for the treatment duration. While the MoCa was expected to increase the amount of NPA, it appeared even a positive predictor for an NPA.

First, routine based cognitive screening as a predictor of cognitive disorders is tested. Nevertheless, no difference was found in the amount of cognitive disorders between both regions. An explanation could be that the MoCa is more effective in giving qualitative information that adds to the basis score then for setting a diagnosis (Cullen, O'Neill, Evans, Coen & Lawlor, 2007). However, the current study found that conducting a MoCa appeared a significant predictor for the amount of cognitive disorders at the end of the treatment for both regions. This is in line with the research of Thissen et al. (2010) whereas the Dutch translated version of the MoCa is effective in recognizing severe dementia in 100% of the cases and in 75% of the cases for MCI. The absence of an effect on the amount of cognitive disorders can be caused by the fact that not all patients in the test region were conducted to a MoCa (M=24%). It is possible that, while otherwise advised, the therapists referred in most cases solitary on indication in both regions. Therefore, not more cognitive disorders were found in the test region. Concluding, the MoCa is a predictor for cognitive disorder but does not lead to more cognitive disorders in the test region.

Second, the effect of conducting the MoCa routine wise on the amount of NPA's was tested. However, no difference was found between the proportions of NPA's that was conducted in both regions. The MoCa appeared even a positive predictor for conducting an NPA in both regions. This positive predictive value can be caused by the warning that a (low) MoCa score might give. To clarify these complaints and set a good diagnosis, an NPA might be needed (Ritchie, 2004). For both regions, the means of the MoCa scores were compared for people who undertook an NPA. The test region conducted an NPA at a lower MoCa mean than the control region. This could be caused by the additional information that is given by the MoCa and

therefore solitary necessary to send exceptional MoCa scores for further research (Cullen et al., 2007). This could explain why there were equal NPA's unless more MoCa's were conducted in the test region. These results should however, be interpreted with caution because of the small sample size with NPA and MoCa's in the control region. Concluding, a MoCa might be a predictor for an NPA for people with a lower MoCa mean but NPA might be spared for people with higher MoCa means by conducting MoCa ('s) routine wise.

Third, the treatment duration is measured, whereas no difference was found between the test and the control region. Routine based screening was expected to have a positive effect on the treatment duration because of the differentiation between cognitive disorders at an early stage (Turner et al., 2004). This effect was not found in the current study. However, the score on the first MoCa appeared a significant predictor for the treatment duration in both regions. A MoCa at the start of treatment might differentiate at an earlier stage between different cognitive diagnoses and therefore lead to an accurate prediction of the treatment duration in both regions (Turner et al., 2004). As mentioned before, information about their diagnosis can help patients understand their condition and makes them able to plan recording to their finances, safety and health care (Boustani at al., 2003). Criticism on quick cognitive screening method suggests however, that it may harm the patients and their relatives by creating anxiety and depression (Boustani et al., 2003). If these symptoms start after the cognitive screening they are nevertheless mainly caused by a misinterpretation of the information and can be partly prevented by good psychoeducation. Psychoeducation has a positive effect on the care givers from people with dementia (Pinquart & Sorensen, 2006; Ostwald et al., 1999). As mentioned, a quick screening method (MoCa) might be able to identify persons with undiagnosed cognitive disorders and thereby permit patients and their family to receive shorter specialised care which could be a more effective use of the healthcare money (Iliffe, Manthorpe & Eden, 2003).

Fourth, the progression of the patient through MoCa scores (ΔMoCa) was tested as a predictor for the treatment duration and the amount of NPA. The progression appeared a significant negative predictor for the treatment duration. The different MoCa scores might give information about the progress of the disorder and could clarify the complaints of the patients. The early diagnosis and information about the progress might even reduce the healthcare costs by effective therapy based on the needs of the patient and their family on that given time (O'Bryan et al., 2008). Furthermore, the progression of the MoCa scores (ΔMoCa) appeared a

significant negative predictor for a NPA. Documenting the progress can help differentiating between different cognitive disorders and might reveal the underlying course of cognitive disorders. A disadvantage might be that this (multiple) cognitive screening is time-consuming. However, when there is no cognitive screening method, diagnosing can take more time and even cause further neuropsychological assessment (NPA). Concluding, documenting the progress by conducting MoCa's shortens the treatment duration and can prevent time-consuming and expensive NPA what can lead to a more efficient use of the healthcare money (Boustani at al., 2003).

Furthermore, the demographical factors of the regions were tested. In the control region, the patients were older and therefore more at risk for the development of cognitive disorders (Lindsay et al., 2002). Because this unequal division of age, it was used as a covariate in further analysis. As expected more MoCa's were conducted in the test region. However, no significant increase over time was found in the control region while this was expected because of the growing popularity of the MoCa. This could be explained because the Mini Mental State Examination (MMSE) is still the most used test to detect cognitive disorders (Nasredinne et al., 2005). Although the MMSE is a more used test, for this study the MoCa is chosen, since the MoCa showed greater specificity in detecting MCI (90%) and Alzheimer (100%) and other cognitive disorders in comparison to the MMSE (Nasredinne et al., 2005; Pendlebury et al., 2015). Patients with less education tend to have a lower score on the MoCa than people with more years of education. To correct for this effect, people with twelve years or less education were graded with one extra point (Nasredinne et al., 2005). A validation check is carried out by testing if the healthcare professionals referred to the right healthcare service. In the USA, more than 50% of the people with dementia have never received a diagnosis from a physician (Bousatani et al., 2003). To test if the doctors referred to the right service the number of cognitive disorders in the elderly cognitive disorder department (CS) and the elderly psychiatric department (FPS) is compared. There appeared significant more patients with cognitive disorders in CS. The MoCa might contribute in finding unnoticed cognitive disorders in FPS and therefore only this department is used for further analysis. With doctors referring to the right healthcare service and significant more MoCa's in the test region, there can be concluded that the randomization in the study went successful.

However, this study contains a number of limitations. Besides a lower MoCa mean for people conducted to an NPA, no differences were found between the test (routine based cognitive screening) and the control region. These results give the impression that routine based cognitive screening has no advantages compared to screening on indication. This could be caused by a good judgement of the therapists when to conduct a MoCa in the control region. However, as mentioned before, not everyone in the test region was conducted to a MoCa at the start of treatment. It seems like the therapists in the test region did not conduct the MoCa routine wise. Furthermore, there was a small sample size in the control group for patients who conducted a second MoCa or patients who both conducted a MoCa and an NPA. Therefore, these results should be interpreted with caution.

Further research in addition to strict guidelines for routine based screening, might clarify the current results. Additionally, further research might contain other information from the ROM that contributes to the knowledge about the treatment of people, who conducted the MoCa. This information could contain the Global Assessment of Functioning(GAF), Health often Nation Outcome Scale (Honos 65+) and the Geriatric Depression Scale (GDS 15). The GAF is a rating scale which evaluates the psychological, social and occupational functioning (Startup, Jackson & Bendix, 2002). Furthermore, the HONOS 65+ could give some information about the outcomes in people with mental health problems including depression, delusions in the presence of dementia, incontinence and agitation (Burns et al., 1999). The GDS 15 is developed to detect depression in the elderly (Kurlowicz, 2007). Furthermore, additional research might find more cognitive disorders in the test group when they compare only MCI. The MoCa is originally developed to detect MCI and might therefore be more effective in finding this (sometimes unnoticed) cognitive disorder (Thissen et al., 2010).

Concluding, although further research is needed to gain a better understanding of the impact of conducting the MoCa routine wise, this study found that conducting the MoCa is effective in finding before unnoticed cognitive disorders and predicting NPA by giving additional information and thereby permit patients and their family to receive shorter specialised care which could be a more effective use of the healthcare money.

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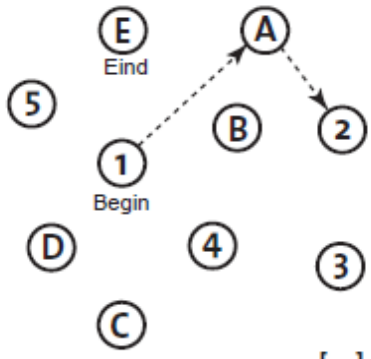
Appendix 1: MoCa Example

Nederlandse versie

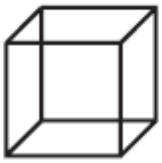
MONTREAL COGNITIVE ASSESSMENT (MOCA)

Geboortedatum: Naam:
Jaren opleiding: Datum:
Geslacht:

VISUOSPATIEEL/EXECUTIEF — PUNTEN



Kopieer de kubus



[ ] [ ]

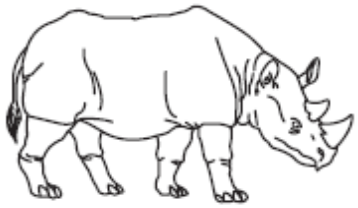
Teken een klok (tien over elf) (3 punten)

[ ] Omtrek [ ] Cijfers [ ] Wijzers

__/5

BENOEMEN

[ ]



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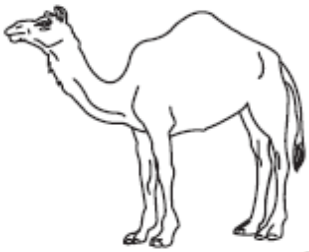

[ ]

__/3

GEHEUGEN

Lees de woorden op, proefpersoon moet ze nazeggen. Neem 2 maal af. Laat ze na 5 min. opnieuw opnoemen.

	GEZICHT	FLUWEEL	KERK	MADELIEF	ROOD
1e afname					
2e afname					

Geen punten

AANDACHT

Lees de rij cijfers op (1 cijfer/sec). Proefpersoon moet ze in dezelfde volgorde nazeggen [ ] 2 1 8 5 4
Proefpersoon moet ze in omgekeerde volgorde nazeggen [ ] 7 4 2 __/2

Lees de rij letters op. De proefpersoon moet bij iedere letter A met zijn hand op de tafel tikken. Geen punten bij ≥ 2 ft
[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B __/1

Serieel 7 aftrekken, beginnend bij 100 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65
4 of 5 goed: **3 pt** 2 of 3 goed: **2 pt** 1 goed: **1 pt** 0 goed: **0 pt** __/3

TAAL

Zeg na: Ik weet alleen dat Jan vandaag geholpen zou worden. [ ]
De kat verstopte zich altijd onder de bank als er honden in de kamer waren. [ ] __/2

Fluency: Noem binnen één minuut zo veel mogelijk woorden die beginnen met de letter D [ ] (N ≥ 11 woorden) __/1

ABSTRACTIE

Overeenkomst tussen bijv. banaan en sinaasappel = fruit [ ] trein-fiets [ ] horloge-liniaal __/2

UITGESTELDE RECALL

	Woorden moeten herinnerd worden zonder cue	GEZICHT	FLUWEEL	KERK	MADELIEF	ROOD
		[ ]	[ ]	[ ]	[ ]	[ ]
Optioneel	Categoriecue					
	Meerkeuzecue					

Punten alleen voor recall zonder cue

__/5

ORIËNTATIE

[ ] Datum [ ] Maand [ ] Jaar [ ] Dag [ ] Locatie [ ] Plaats __/6

Normaal ≥ 26 / 30

TOTAAL __/30

Tel er 1 pt bij op indien ≤ 12 jr opleiding

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