The Identification of Attention Complaints in the General Population and Their Effect on Quality of Life

Dymphie M. J. M. Scholtissen-In de Braek, Petra P. M. Hurks, Martin P. J. van Boxtel, Jeanette B. Dijkstra, and Jelle Jolles

Abstract

Objective: To provide more insight into subjective attention complaints in a healthy adult and elderly population and how these affect Quality of Life (QoL). Method: A group of 1,550 healthy Dutch participants complete a postal questionnaire including items from the Maastricht Attention and Memory Checklist (MAC). The impact of attention complaints on QoL is investigated in a subsample of 499 participants. Results: Factor analysis (N = 1,550) reveals two factors: Attention and Memory. Attention complaints are related to depressed mood, anxiety, vitality, and sleep problems that can have serious consequences for daily life functioning and QoL (n = 499). Memory complaints are related to other aspects of health, such as pain and changes in health. Conclusion: Attention complaints in the healthy population are common and related to depression, anxiety, and sleep and several aspects of QoL, such as problems with social functioning, emotional problems, and vitality.

Keywords

cognitive complaints, attention, ADHD, Quality of Life (QoL), healthy population

Introduction

It is well-known that forgetfulness is common in the healthy adult and elderly population (Commissaris, Ponds, & Jolles, 1998; McDougall, Becker, & Arheart, 2006; Mol, van Boxtel, Willems, & Jolles, 2006; Ponds, Commissaris, & Jolles, 1997). Other cognitive complaints, like focus and concentration, might be equally important, but are less investigated within the population. It is essential to investigate attention complaints, especially attention problems as well as objective impairment, in terms of cognitive performance on attention tasks, which are frequently found in several clinical samples like Parkinsons Disease (PD), fibromyalgia, chronic fatigue (CF), mild cognitive impairment (MCI), and ADHD; Bronnick et al., 2006; Leavitt & Katz, 2006; Ribeiro, de Mendonca, & Guerreiro, 2006).

ADHD is one of the most common neurodevelopmental disorders in childhood and adulthood that is also characterized by attention problems. ADHD in adults has gained more attention in the last decade. The estimated prevalence of ADHD in adults is between 2% and 4.4% (Kessler et al., 2006). These prevalence rates are much higher than expected as is the level of comorbid disorders, like depression, anxiety, and substance abuse (Biederman, Wilens, Spencer, & Adler, 2007; Kessler et al., 2006; Kooij et al., 2005). Furthermore, ADHD can result in a heavy burden and serious consequences for the affected individuals, their families, their mental health, and society in general (Barkley, 2002). Until now, most research of attention complaints has focused on clinical populations, and no large-scale research has investigated the healthy population. Family genetic studies in the field of ADHD show that functions like attention control and mental flexibility may be suitable endophenotypes of ADHD, as problems in these areas exist among family members of persons with ADHD. In addition, in 1997, Levy suggested that ADHD is best viewed as the extreme of a behavior that varies genetically throughout the entire population on the basis of data from a large-scale twin sample (Levy, Hay, McStephen, Wood, & Waldman, 1997).

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This current study wants to investigate the impact of attention complaints as a dimensional construct in the general population.

Prevalence figures of attention complaints are important because these may lead to more psychiatric and emotional complaints and a lower life satisfaction, as suggested in a study of students (Gudjonsson, Sigurdsson, Eyjolfsdottir, Smari, & Young, 2009; Lewandowski, Lovett, Codding, & Gordon, 2008). This would indicate that there is a relative large group of adults with attention complaints and subclinical mental health problems, who may seek help in the future. Insight into the prevalence and character of attention complaints can lead to better understanding and, if necessary, adequate prevention and specific treatment.

The first aim of this study is to gain insight into the frequency of attention complaints in the general population. There are indications that healthy persons may have memory complaints, which, on closer inspection, should be more accurately classified as belonging to the domain of attention problems. Moreover, attention difficulties and attention deficits may underlie many of the cognitive failures of everyday life (Broadbent, Cooper, FitzGerald, & Parkes, 1982; Pollina, Greene, Tuncik, & Puckett, 1992).

The current study also investigates whether subjective attention difficulties are related to Quality of Life (QoL). On the basis of the literature on ADHD, we expect to find that subjective attention complaints are related to the subjects’ QoL, psychiatric and emotional complaints, as well as lower life satisfaction (Barkley, Fischer, Smallish, & Fletcher, 2006; Biederman et al., 1993). In the case of disorders such as chronic fatigue, depression, MCI, and ADHD, it has already been noted that attention problems reduce the QoL of individuals (Bronnick et al., 2006; Leavitt & Katz, 2006; Ribeiro et al., 2006). Therefore, the study intends to test to what extent attention complaints exist in a healthy population sample and to investigate the relationship with daily life functioning and mental health.

Finally, it is important to know whether subjective cognitive complaints can be confirmed by neuropsychological test performance, as it is suggested that an attention complaint is the reflection of an underlying neuropsychological problem. However, the literature is inconclusive on this point and an association, for example, between a memory complaint and memory performance, has not always been found (Bolla, Lindgren, Bonaccorsy, & Bleecker, 1991). Our hypothesis is that subjective cognitive complaints are related to objective cognitive test performance, as neuropsychological measures are designed to tap specific brain functions.

To test the aforementioned hypotheses, the relationship of attention complaints with QoL was assessed. Unfortunately, in the literature no checklist for general attention complaints exists. Only disease-specific instruments for memory complaints like dementia and electroconvulsive therapy (ECT) are described (Meguro et al., 2004; Prudic, Peyser, & Sackeim, 2000). Therefore, to achieve the aims of this study, we developed a checklist of memory and attention complaints in the general population, the Maastricht Attention and Memory Checklist (MAC). Memory items were included in this checklist because we wanted to investigate the possible differences between attention and memory complaints. The research conducted in this study is based on the Maastricht Aging Study (MAAS). This is a large, prospective study into the determinants of cognitive aging conducted at Maastricht University in the Netherlands. This study has made it possible to compare data on cognitive performance, age, and level of education (Van der Elst, van Boxtel, van Breukelen, & Jolles, 2006a, 2006b, 2006c, 2007).

Method

Participants

Data used for this research were taken from the Maastricht Aging Study (MAAS), a large-scale longitudinal study on the determinants of cognitive aging (Jolles, Verhey, Riedel, & Houx, 1995; van Boxtel et al., 1998). In MAAS, a range of experimental and standardized instruments of health and psychological functioning were used to collect data at baseline and on three follow-up occasions, each separated by a 3-year interval (Jolles, Verhey et al., 1995; van Boxtel et al., 1998). Participants were recruited by postal questionnaire from 15 family practices in the southern region of the Netherlands, all of whom participated in the Registration Network of Family Practices (Metsemakers, Hoppener, Knothnerus, Kocken, & Limonard, 1992). Participants were aged between 24 and 81 years, and, at the moment of inclusion, were without medical conditions known to interfere with normal cognitive functioning, such as neurodegenerative disease, mental retardation, and cerebrovascular disease. Overt visual and auditory handicaps also led to exclusion at baseline. The MAAS sample was stratified by age (5-year age group; 25 ± 1, 30 ± 1, etc.), sex, and general ability level. For this study, age was used as a continuous variable. Education level was measured on an 8-point scale in accordance with a Dutch scoring system that ranges from primary to university education (De Bie, 1987). Data from those participants who had completed the postal questionnaire prior to the sample selection for the MAAS study, but were not seen at follow-up (N = 1,550), were used to validate a new attention checklist: the Maastricht Attention and Memory Checklist (MAC; see the following). In addition, cognitive test data were used of participants who had received a full neuropsychological examination at baseline and who agreed to follow-up testing (n = 499). The study was approved by the local ethics committee. All participants gave their informed consent.
Maastricht Attention and Memory Checklist (MAC)

Relevant questions about subjective attention complaints, which were included in the postal questionnaire and used to select participants for the MAAS study, were selected by using the DSM-IV criteria for ADHD (American Psychiatric Association, 1994). This led to a screening instrument of subjective attention difficulties that consisted of 11 items (including 9b, 10a, and 10b; see appendix). Item 9 was scored as “present,” if one of the first three reasons for forgetfulness mentioned was “concentration problems.” Answers to other questions were also recoded as “present” or “not present.” Thus, if a participant answered the following item: “In comparison to other people of my age, I have . . . problems concentrating on more than one task (e.g., driving a car and having a conversation; preparing a meal and listening to the radio),” with “far less,” “less,” or “the same,” the answer would be recoded as “not present” (i.e., value 0). In a similar manner, if a participant answered this item with “more” or “far more,” it would be recoded as “present” (i.e., value 1). After recoding, reliability analyses were conducted.

The Cronbach’s alpha of the MAC items was subsequently calculated for the participants who were not selected for the follow-up study (N = 1,550). This revealed a satisfactory reliability coefficient of .72, which did not increase by leaving out single items. Next, a correlation matrix of the MAC-items was generated. It displayed no significant correlation among items higher than .60. To detect underlying factors of the MAC, we performed a principal components analysis on the MAC items by using an orthogonal rotational procedure (Varimax). The following criteria were used to determine the most appropriate number of factors to retain: (a) minimum eigenvalues of 1, (b) minimum factor loadings of 0.30, and (c) meaningful interpretation of the factor. The results of the factor analyses indicated that the most comprehensive model meeting the criteria was a two-factor model containing the following factors: “Attention” (Factor 1) and “Memory” (Factor 2). Together, both factors explained 39.2% of the variance in the items. Table 1 shows factor loadings and communalities. One item of the MAC features symptoms of hyperactivity-impulsivity. The decision to include just one item was a pragmatic one because we examined historic data. However, it offers an opportunity to investigate the prevalence of “restlessness” in a large-scale population. Furthermore, the item loaded on the same factor as the inattention items, suggesting that it is part of the same construct. Also, in the adult ADHD population, symptoms of inattention (inattentive subtype and combined subtype) are more prevalent than symptoms of hyperactivity-impulsivity alone (Biederman, Mick, & Faraone, 2000).

The two factors, Attention and Memory, were used as independent variables for further analyses. Bivariate correlation coefficients between MAC items showed positive small and medium effects.

Quality of Life

The Satisfaction With Life Scale (SWLS) measures the cognitive component of subjective well-being (Pavot, Diener, Colvin, & Sandvik, 1991). This 5-item self-reported scale assesses the individual’s satisfaction with life as a whole using a 7-point Likert scale. Internal consistency and temporal stability of this scale are believed to be satisfactory (Pavot et al., 1991). In the present study, we used the SWLS total score as the dependent variable. The scale scores range from 5 to 35, with a higher score indicating more satisfaction with life.

The SF-36 (Short Form 36) is a validated, self-administered questionnaire used to measure health status with respect to several dimensions, including physical functioning (score range 10-30), social functioning (score range 2-10), role limitations due to physical problems (score range 4-8), emotional problems (score range 5-25), pain (score range 11-60), mental health (score range 5-30), vitality (score range 4-24), and general health perception (score range 5-25; Aaronson et al., 1998; Ware & Sherbourne, 1992; van der Zee, Xanderman, & Heyink, 1993). The dimensional scores were treated as dependent variables. A higher score indicates better health within each domain.

Finally, feelings of depression, anxiety, and sleep were measured with three subscales of the Symptom Check List (SCL-90) to gain insight into recent subjective complaints. The SCL-90 is a multidimensional, self-reported inventory of psychopathology (Derogatis, Rickels, & Rock, 1976). The subscales were used as dependent variables, with a

<p>| Table 1. Factor Analysis on the Items of the Maastricht Attention and Memory Checklist (MAC) |
|-----------------------------------------------|------------------|------------------|</p>
<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAC1</td>
<td>0.465</td>
<td>0.209</td>
</tr>
<tr>
<td>MAC2</td>
<td>−0.002</td>
<td>0.769</td>
</tr>
<tr>
<td>MAC3</td>
<td>0.137</td>
<td>0.721</td>
</tr>
<tr>
<td>MAC4</td>
<td>0.416</td>
<td>0.009</td>
</tr>
<tr>
<td>MAC5</td>
<td>0.662</td>
<td>0.167</td>
</tr>
<tr>
<td>MAC6</td>
<td>0.705</td>
<td>0.003</td>
</tr>
<tr>
<td>MAC7</td>
<td>0.387</td>
<td>0.017</td>
</tr>
<tr>
<td>MAC8</td>
<td>0.672</td>
<td>−0.031</td>
</tr>
<tr>
<td>MAC9b</td>
<td>0.410</td>
<td>0.272</td>
</tr>
<tr>
<td>MAC10a</td>
<td>0.645</td>
<td>0.155</td>
</tr>
<tr>
<td>MAC10b</td>
<td>0.675</td>
<td>0.228</td>
</tr>
<tr>
<td>Eigenvalues</td>
<td>3.215</td>
<td>1.101</td>
</tr>
<tr>
<td>% of Variance</td>
<td>29.230</td>
<td>10.010</td>
</tr>
</tbody>
</table>

Note: N = 1,550. Factor loadings and communalities of the MAC-items. Factor 1 = Attention and Factor 2 = Memory.
higher score indicating more symptoms in these domains. The scores for the anxiety, depression, and sleep subscales ranged from 0 to 50, 0 to 80 and 0 to 15, respectively.

Cognitive tests
The LDST is a modification of the conceptually identical symbol-digits modalities test (SDMT; Smith, 1968; Van der Elst et al., 2006c). On a sheet of paper, a box has been drawn with nine numbers uniquely coupled to nine letters. Below the box, the letters are presented without the corresponding numbers. The participant is asked to fill in as many corresponding numbers as possible in 90 s. Some cognitive processes involved are visual scanning, working memory, visuoconstruction, and motor functions (e.g., Lezak, 1995). This test is a commonly used neuropsychological measure of information processing speed. The dependent variable was the total number of correctly copied digits after 90 s.

The Stroop color-word test involves 3 cards with 100 stimuli each (Stroop, 1935; Van der Elst et al., 2006b). The first card contains color words printed in black ink that have to be named. The second card contains colored patches that have to be named. The third card displays color names printed in incongruously colored ink. Test participants are instructed to name the ink color of the printed words. By subtracting the time needed for the last part from the mean score of the first and second part, an interference score can be calculated. This interference score is regarded as a measure of habitual response, which depends on adequate levels of attention and executive functioning (Hanninen et al., 1997). The variables of interest for this study were the total time needed to read Part 1 (reading), the total time needed to read Part 2 (color naming), the total time needed to complete Part 3, and the interference score.

The CST is a modified version of the trail-making test (TMT) and is used to measure simple speed and cognitive flexibility (Van der Elst et al., 2007; Vink & Jolles, 1985). The test consists of three stimulus cards. On each test sheet, 16 small circles are grouped in one larger circle. In the smaller circles, the test items appear in a fixed random order. On the first card, the smaller circles contain numbers in a fixed random order and participants are asked to cross out the numbers in the right order as quickly and accurately as possible. In the second part of the test, the circles contain letters, which have to be crossed out in alphabetical order. In the third part of the test, the card displays both numbers and letters, and participants are requested to alternate between numbers and letters. The scores correspond to the time needed to complete each card. The mean reaction time (RT) taken by the participants to respond to the first two cards are used as a reflection of simple speed and attention (CSTA + CSTB). The difference between the RT for the last card and the mean RT of the two previous cards is considered to reflect the extra time needed to shift between two sets of stimuli. This serves as a measure of cognitive flexibility.

The verbal learning test (VLT) was used to evaluate learning capacity and retrieval from memory (Brand & Jolles, 1985). In this test, 15 words are presented in a fixed order on a computer screen, one after another. Participants are asked to recall as many words in whatever order suits them best. This procedure is repeated 5 times. After 20 min, delayed recall was tested. Dependent variables were the total number of words in five trials (range: 0-45) as a measure of learning capacity, and the delayed recall score (range: 0-15) after 20 min is an estimate of delayed recall.

Statistical Methods
Descriptives on the MAC were calculated using the data of participants who completed the postal questionnaire (N = 1,550). Participants were aged between 24.2 and 88.1 years. The total score on the MAC was calculated. For further statistical analyses on the MAC, only data derived from participants who were recruited for follow-up (n = 499) were used.

The influence of age (as a continuous variable) and education on separate MAC items and MAC total score was calculated by means of ANOVA. The effect of sex on MAC items was determined with a chi-square test. A small, negative correlation was found between the MAC total score and education (r = -.146).

Multiple linear regression analyses were used to investigate the nature of the specific relationships between the two factors of the MAC and the earlier mentioned dependent variables of QoL and cognition. Age (as a continuous variable), education, and sex were also included in the statistical analyses, due to the known effects of these factors on cognitive functioning (Van der Elst et al., 2006b, 2006c).

The Statistical Package for the Social Sciences (SPSS) for Windows was used for all statistical analyses (Version 12, SPSS inc., USA). A p value of .05 or more was considered statistically significant.

Results
The descriptors of the MAC total score are shown in Figure 1. At least 57.3% of all participants reported one attention complaint. In total 26.8% of the participants reported at least three complaints on the MAC. It should be noted that the Memory items (Items 2 and 3) were excluded from these calculations, as we were primarily interested in attention complaints. ANOVA further revealed a significant relation between age and MAC total score (F = 3.853, p = .05). A significant relationship between education and MAC total score was also found (F = 7.264, p = .007). In particular, a higher education reflected fewer attention complaints. Sex
Figure 1. Frequency of the MAC total score from the participants who were included in the follow-up examination (N = 499)

did not have any effect on MAC total score ($F = .473, p = .492$), but it did have an effect on MAC Item 10a (“trouble concentrating”). Specifically, more women scored positively on this item ($\chi^2 = 7.587, p = .006$).

Table 2 presents the results of the regression analyses.

Linear regression analyses revealed a significant relationship between Attention (Factor 1) and the satisfaction with life total score (SWLS), social functioning, emotional problems, vitality, and general health perception as measured by the SF-36. Attention (Factor 1) was also related to depression, anxiety, and sleep as measured by the SCL-90. Memory (Factor 2) was significantly related to SWLS, pain, and changes in health, which were measured by the SF-36. No association with psychiatric symptoms (SCL-90) was found.

Attention (Factor 1) was not related to any of the neuropsychological test measures. Memory (Factor 2) was only related to Stroop Part 1 (color–word reading, a measure of general speed of information processing; $\beta = -.014, p = .031$).

**Discussion**

The aim of the present study was to gain insight into the frequency and relationship of attention complaints with daily life functioning in the general population, by using a dedicated sample from a large-scale longitudinal study (MAAS; Jolles, Houx, van Boxtel & Ponds, 1995). In our sample, 57.3% of the participants reported at least one attention complaint and more than one quarter of the participants reported several (three or more) attention complaints. This suggests that attention complaints are common in the general adult population. Furthermore, factor analysis on the MAC items revealed two factors of difficulties: Attention and Memory. This is an important finding and suggests that in a healthy population, attention and memory complaints are not the same and may refer to different underlying mechanisms. Hence, the evaluation of cognitive complaints must be thorough.

In the present sample, a higher level of education was related to fewer attention complaints. Education may be a protective factor in the sense that cognitive complaints are less obvious in well-educated persons. It is plausible that persons with a high level of education are able to use more or different compensation strategies. Our finding also corresponds to the idea of “brain reserve capacity,” which suggests that a higher level of education leads to more cognitive reserve, which provides a higher threshold before clinical symptoms become manifest (Katzman, 1993; Kesler, Adams, Blasey, & Bigler, 2003; Satz et al., 1993; Timiras, 1995). On the other hand, the reverse explanation is also feasible: Persons with attention problems might be unable to finish their education.

The present study showed that the Attention factor was related to symptoms of depression, anxiety, and sleep but that the Memory factor was not. It is still unclear how this discrepancy can be explained. One explanation is that the selection of MAC items was done with the ADHD criteria in mind. Our approach was to investigate attention complaints in the general population based on the DSM-IV criteria of ADHD (APA, 1994). This can possibly account for differences that are also described in the literature. Earlier research found evidence for a strong relationship between memory complaints and symptoms of depression (Comijs, Deeg, Dik, Twisk, & Jonker, 2002; Lautenschlager, Flicker, Vasikaran, Leedman, & Almeida, 2005). Previous research also found that complaints of depression are common in middle-aged and elderly persons and are related to cognitive functioning (Baune, Suslow, Arolt, & Berger, 2006). The discrepancy found in the present study is, however, important. Previous studies did not look at specific cognitive complaints. Our findings show that it is important to investigate attention complaints in the general population. More research into specific cognitive difficulties, such as attention, is necessary to explain the discrepancy found in the current study. Our study suggests that there is a difference between cognitive complaints related to attention versus those related to memory in their contribution to different aspects of mental health. As the majority of studies performed by far have been devoted to memory, our findings provide new vistas with respect to the relationship of attention complaints and QoL. An elaboration on these findings is given as follows.

Attention was related to aspects of QoL, such as problems with social functioning, emotional problems, and vitality, whereas memory on the other hand, was related to other aspects of QoL, namely, pain and changes in health. In the
Table 2. Linear Regression Analysis With Beta Values for the MAC Factors

<table>
<thead>
<tr>
<th>Factor 1 Attention</th>
<th>Factor 2 Memory</th>
<th>Age</th>
<th>Education</th>
<th>Sex</th>
<th>R square change</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWLS tot</td>
<td>-0.12**</td>
<td>0.45n.s.</td>
<td>0.051n.s.</td>
<td>-0.255n.s.</td>
<td>0.063</td>
</tr>
<tr>
<td>PHF</td>
<td>-0.25n.s.</td>
<td>-0.177*</td>
<td>-0.177*</td>
<td>0.45n.s.</td>
<td>0.063</td>
</tr>
<tr>
<td>SOCF</td>
<td>-0.157*</td>
<td>-0.04n.s.</td>
<td>-0.088n.s.</td>
<td>0.051n.s.</td>
<td>0.063</td>
</tr>
<tr>
<td>RLPH</td>
<td>-0.054n.s.</td>
<td>-0.329***</td>
<td>-0.103n.s.</td>
<td>-0.255n.s.</td>
<td>0.063</td>
</tr>
<tr>
<td>RLEM</td>
<td>-0.12**</td>
<td>-0.46n.s.</td>
<td>-0.077n.s.</td>
<td>-0.04n.s.</td>
<td>0.063</td>
</tr>
<tr>
<td>PAIN</td>
<td>-0.035n.s.</td>
<td>-0.152***</td>
<td>-0.009n.s.</td>
<td>-0.024n.s.</td>
<td>0.063</td>
</tr>
<tr>
<td>MH</td>
<td>-0.063n.s.</td>
<td>0.253***</td>
<td>-0.04n.s.</td>
<td>-0.024n.s.</td>
<td>0.063</td>
</tr>
<tr>
<td>VIT</td>
<td>-0.041n.s.</td>
<td>0.152***</td>
<td>-0.009n.s.</td>
<td>-0.024n.s.</td>
<td>0.063</td>
</tr>
<tr>
<td>GHP</td>
<td>-0.182***</td>
<td>0.125*</td>
<td>0.057n.s.</td>
<td>0.125*</td>
<td>0.119</td>
</tr>
<tr>
<td>HC</td>
<td>-0.017n.s.</td>
<td>-0.247***</td>
<td>-0.115n.s.</td>
<td>-0.247***</td>
<td>0.119</td>
</tr>
<tr>
<td>SCLANG</td>
<td>-0.145*</td>
<td>0.147***</td>
<td>-0.115n.s.</td>
<td>-0.247***</td>
<td>0.119</td>
</tr>
<tr>
<td>SCLDEP</td>
<td>0.007n.s.</td>
<td>0.131*</td>
<td>-0.115n.s.</td>
<td>-0.247***</td>
<td>0.119</td>
</tr>
<tr>
<td>SCLSLA</td>
<td>0.027n.s.</td>
<td>0.027n.s.</td>
<td>-0.115n.s.</td>
<td>-0.247***</td>
<td>0.119</td>
</tr>
</tbody>
</table>

Note: Linear regression analysis with beta values for the MAC factors; age, education, and sex are included in the model. SWLS tot = SWLS total score, PHF = Physical Functioning (SF-36), SOCF = Social Functioning (SF-36), RLPH = role limitations due to physical problem (SF-36), RLEM = role limitations due to emotional problem (SF-36), PAIN (SF-36), MH = Mental Health (SF-36), VIT = Vitality (SF-36), GHP = General Health Perception (SF-36), HC = Health Change (SF-36), SCLANG = Anxiety (SCL-90), SCLDEP = Depression (SCL-90), SCLSLA = Sleep (SCL-90), n.s. = nonsignificant. *p < .05. **p < .01. ***p < .001.

healthy population, different subsets of cognitive complaints (attention and memory) are related to different aspects of QoL, again indicating different underlying mechanisms. In the present study, attention complaints were primarily related to several aspects of mental well-being, like symptoms of depression and anxiety, whereas memory complaints were not. The current study suggests that attention complaints are related to mental health problems and diminished daily life functioning. These findings have several implications for the clinician. A thorough examination of subjective cognitive complaints, including attention complaints, is necessary. Furthermore, subjective cognitive complaints are equally important as objective test measures due to their relationship with several aspects of mental health. As attention complaints differ from memory complaints, management of these problems asks for a different approach. For instance, memory training might not be useful in the management of primary difficulties in attention, but dedicated interventions in the domain of goal management might be (Robertson & Levin, 2001; van Hooren et al., 2007). It is of interest that van Hooren et al. (2007) found effects of their goal management training in relatively healthy women (aged 55 years and older) who were characterized by complaints in the domain of attention and planning (van Hooren et al., 2007).

Another finding of the present study was that, overall, the two factors of the MAC were not related to neuropsychological test measures of speed of information processing, attention, and memory. This is in agreement with previous studies suggesting the weak or nonexisting relationship between subjective and objective cognitive measures (Bolla et al., 1991; Smith, Petersen, Ivnik, Malec, & Tangalos, 1996). One explanation is that cognitive complaints are situated on the level of health/QoL, whereas cognitive test performance is situated more on the level of functioning (WHO, 2001). For example, a person who reports problems with multitasking may show a good score on Stroop Part 3. In a structured setting, where neuropsychological testing is done, this person can function very well. However, in more complex work situations, where demands are high, problems may arise. It is likely that higher order attention dysfunction arises mainly in complex, unstructured situations, whereas neuropsychological testing is done in relatively structured settings.

To conclude, this study suggests that it is very important to recognize attention complaints in the healthy population because these complaints are common and related to depression, anxiety, and sleep, and several aspects of QoL, such as problems with social functioning, emotional problems, and vitality. Insight into factors contributing to specific cognitive complaints in the current sample can lead to a better understanding of cognitive problems and, in turn, to adequate prevention and specific treatment.

Limitations

In this study cognitive complaints as measured by the MAC were collected before neuropsychological testing. An interesting hypothesis is that cognitive complaints in the general population are not only related to actual mental health problems but may also predict mental health problems in later years. More research is required in this area. Due to the cross-sectional design of the study no conclusion about causality could be discerned.

Another point to consider in the present study is that we used clinical criteria in the general population. However, the aim of this study was to examine whether symptoms of ADHD exist in the general population. This seems to be the
case as more than half of the participants reported at least one attention complaint that corresponds to one ADHD symptom, and more than one quarter of the participants reported several (three or more) attention complaints.

Another point of attention is the fact that the MAC explained a relatively small proportion of variance, possibly due to the large number of 0 scores on the MAC or skewed distribution of scores. In general, a z transformation of scores would be in order to make the scores follow the normal distribution pattern. However, in this study, the number of participants ($N = 499$) made the analysis robust against the skewed score distribution. Also, the MAC included just one item on hyperactivity-impulsivity. Still, this item loaded on the same factor as the other Attention items, suggesting that it is part of the same construct. Furthermore, in the adult ADHD population, symptoms of inattention (inattentive subtype and combined subtype) are more prevalent than symptoms of hyperactivity-impulsivity alone.

The attention–memory questionnaire contains items that ask respondents to make their own normative comparisons to same-aged peers. This is a procedure that has been used regularly in, for instance, studies on aging (Jolles, Houx et al., 1995; Ponds et al., 1997). The idea is that by asking respondents to compare their complaints to other same-aged peers, more information is gained compared to general, subjective questioning. Moreover, it also rules out the factor of age on cognitive complaints and aging. By using this kind of questioning there is a greater possibility of finding differences between no complaints and complaints.

Finally, the current study has not considered the role of personality or insight as a mediating factor between cognitive complaints and objective test measures. One can envisage, for example, lower objective test scores in more neurotic participants (Reid & Maclullich, 2006).

Appendix

**Maastricht Attention and Memory Checklist (MAC)**

1. Generally speaking, are you able to put in firm mental effort (e.g., are you able to work, read, talk, concentrate for a longer period of time)? Yes/No

2. I have no problems keeping up my appointments.
   a. Totally disagree
   b. Disagree
   c. Do not agree/disagree
   d. Agree
   e. Totally agree

3. I have no trouble remembering where I laid my things.
   a. Totally disagree
   b. Disagree
   c. Do not agree/disagree
   d. Agree
   e. Totally agree

4. To what degree were you, in the past week (including today) troubled by restlessness, in the sense that you could not sit still.
   a. Not at all
   b. A little bit
   c. Somewhat
   d. Rather
   e. A lot

5. In comparison with other people of my age, I am able to concentrate . . . on things I hear, see, or read.
   a. Much easier
   b. Somewhat easier
   c. The same
   d. More difficult
   e. Much more difficult

6. In comparison with other people of my age, I can focus my attention . . . on one task for a longer time.
   a. Much easier
   b. Somewhat easier
   c. The same
   d. More difficult
   e. Much more difficult

7. In comparison with other people of my age, I have . . . problems concentrating on more than one task (e.g., driving a car and having a conversation, and preparing a meal and listening to the radio).
   a. Far less
   b. Less
   c. The same
   d. More
   e. Much more

8. In comparison with other people of my age, I am easily distracted from what I am doing.
   a. Much less
   b. Less
   c. Just as
   d. More
   e. Much more

9a. Are you forgetful? Yes/No

b. If the answer is “Yes,” what are the most important causes? Give an account by filling in the number of importance, for instance, most important cause is “1”; the next is “2,” and so on. More answers are possible.

   | | Age
   | | Stress and emotional problems
   | | Sickness/trauma
   | | Concentration problems
   | | Interest
Appendix (continued)

- Cognitive decline
- Little mental exercise
- Medication
- Surgical procedure under general anaesthesia
- Other, namely.............................................

10a. I have trouble concentrating (sustaining attention)
Yes/No
b. If the answer is “Yes,” to what degree?
   - Sometimes
   - Often
   - Always

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Conflict of Interest
None.

References


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