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Do memory complaints indicate the presence of cognitive impairment? – Results of a field study

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Abstract *Background:* In the context of suspected cognitive disorders, the validity of memory complaints is subject to considerable debate. This investigation documents the prevalence of memory complaints and assesses the validity of memory complaints for detecting cognitive impairment. *Methods:* The sample comprises 349 randomly selected non-institutionalized individuals, aged 75 and over living in the city of Leipzig. Twenty individuals who suffer from moderate and severe dementia according to DSM-III-R were excluded. Memory complaints were measured by means of a single item question. The Mini-Mental State Examination (MMSE) and a wider range of cognitive tests which constitute the short neuropsychological battery of the SIDAM (Structured Interview for the Diagnosis of dementia of Alzheimer type, Multi-infarct dementia and dementias of other etiology according to ICD-10 and DSM-III-R) were used to test cognitive performance. *Results:* One in three individuals aged 75 and over complained about memory deficits. The MMSE is not significantly related to memory complaints, whereas poorer performance on 2 out of 8 tests regarding specific areas of cognitive function (immediate recall, short-term memory) were found to be significantly associated with memory complaints. Despite these statistically significant associations, it is shown that memory complaints do not have diagnostic validity in detecting cognitive impairment on the individual level. *Conclusion:* Memory self-assessment should not be used as a substitute measure of cognitive performance. Initiation of further diagnostic and therapeutic steps should be based on cognitive performance testing. Relaying solely on memory complaints would miss individuals in need and allocate resources to worried but cognitively healthy persons.

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Introduction

The clinical interest in early indicators of dementia had focused attention on memory complaints. Memory complaints feature in several classificatory systems and concepts dealing with mild cognitive impairment such as age-associated memory impairment (Crook et al. 1986), ICD-10 mild cognitive disorder (World Health Organization 1994) or age associated-cognitive decline (Levy 1994). The validity of memory complaints is taken as a prerequisite in research and clinical work applying these concepts.

However, it remains an open question whether memory complaints do actually indicate cognitive impairment. Consensus is reached about an existing association between depression and memory complaints. Researchers are in general agreement that memory complaints are exacerbated in those who are depressed. Teasing out the relationship between subjective memory complaints, objective memory impairment and depression has proved to be difficult. Studies on the relationship between memory complaints and cognitive performance yielded complex and controversial results (Riedel-Heller et al. 1999). Considerable differences in the investigated samples, the instruments used to assess memory complaints and memory performance, as well as in the statistical methods applied may account for these controversial results.

The majority of more recent case-control and cross-sectional studies investigating highly selective samples did not find an association between memory complaints and memory performance (Dobbs and Rule 1987; Williams et al. 1987; Derouesne et al. 1989; McGlone et al. 1990; Rabitt and Abson 1991; Brown et al. 1991; Bolla et al. 1991; Feher et al. 1994; Förstl et al. 1995, 1996). However, a few studies reported the opposite (Larrabee et al. 1991; Cipolli et al. 1990; Cavanaugh and Poon 1989). Studies investigating samples nested in a population re-

vealed mixed results (O'Connor 1990; Grut et al. 1993; Hänninen et al. 1994; Johansson et al. 1997). Only a few studies dealt with representative community samples (Bassett and Folstein 1993; Jorm et al. 1994; Gagnon et al. 1994; Tobiansky et al. 1995; Jonker et al. 1996). Those who employed relatively simple measures of cognitive performance like the Mini-Mental State Examination score or parts of it, detected no or weak associations between memory complaint and memory performance in the elderly (Bassett and Folstein 1993; Jorm et al. 1994). Others who employed tests measuring performance in specific areas of cognitive function reported an association of memory complaints and cognitive performance (Gagnon et al. 1994; Jonker et al. 1996). The diagnostic validity of memory complaints was not explicitly taken account of in cross-sectional research on memory complaints to date.

Our study is aimed at determining the prevalence of memory complaints and at investigating the relationship between memory complaints and cognitive performance in the elderly to answer the question as to whether memory complaints are actually based on cognitive impairment. Our target population comprises all individuals not meeting the criteria of moderate and severe dementia since the validity of memory as early indicator of cognitive impairment is the central issue. The angle in investigating the complex relationship between memory complaints, depression and cognitive performance is defined using memory complaints as an outcome. Controlling for depression, the impact of memory performance on memory complaints will be assessed. Our focus are the implications of a possible association for the diagnostic validity of memory complaints. Thus, our work goes beyond merely detecting a possible association.

Methods

The present study is based on data collected in the Leipzig Longitudinal Study of the Aged (LEILA75+), an epidemiological study on the prevalence and incidence of dementia and its risk factors.

Subjects

Community-dwelling individuals (n = 528) aged 75 and over living in three sub-districts of Leipzig-South were identified by systematic random sampling from an age-ordered list provided by the official registry office (sampling interval 3.4). The investigation is based on 349 individuals interviewed face-to-face. Twenty individuals who suffered from moderate and severe dementia according to DSM-III-R were excluded. Therefore, the sample analyzed comprises 329 individuals not meeting the criteria of moderate and severe dementia. Regarding their sociodemographic background, respondents did not differ significantly from the original sample (see Table 1). Data on memory complaints were available for 322 of 329 individuals.

Table 1 Sociodemographic characteristics of respondents and original sample

Sociodemographic characteristics	Respondents (n = 329)	Original sample (n = 528)
Age (mean, SD)	81.3 (4.8)	81.17 (4.69)
Gender (female)	224 (68.1%)	380 (72%)
Marital status		
single	7.6%	7.0%
married	30.1%	30.5%
divorced	8.8%	8.3%
widowed	53.3%	54.2%

Instruments

A fully structured interview was administered by trained physicians and psychologists at a home visit during the time period from December 1996 until June 1997. The Core component of the interview was the SIDAM (Structured Interview for the Diagnosis of dementia of Alzheimer type, Multi-infarct dementia and dementias of other etiology according to ICD-10 and DSM-III-R, Zaudig et al. 1991). The SIDAM test performance part consists of a range of cognitive tests which constitute a short neuropsychological battery. This was extended by several other structured inquiries on risk factors of dementia, general physical health, depression, social network, service use, medication, and self-reported cognitive function. Relevant aspects regarding the current study question will be described in more detail.

Rating of memory complaints

Before testing cognitive performance subjects were asked: "Do you have any problems with your memory?" Responses where coded with 0 if no problems were reported. If problems were admitted, the question as to whether they occur 'seldom' (1), 'often' (2) or 'always' (3) was asked and coded.

Cognitive performance

The Mini-Mental State Examination (MMSE), developed by Folstein et al. (1975) and originally introduced as a mean for clinicians to grade the cognitive status of their patients had been widely used in community studies. Measurement for cognitive performance is a score from 0 to 30 which is derived from the number of solved items. The present study used the German version of the MMSE developed by Zaudig and Hiller (1995), as it is incorporated in the SIDAM. A modified version (MMSE-Blind), where all items requiring visual capacity were excluded was used in case of severe visual impairment or blindness. The MMSE-Blind scores ranging from 0–22 were adjusted to the original scores. Since the MMSE was often criticized for being a relatively blunt test, a wider range of cognitive tests which constitute a short neuropsychological battery of SIDAM is used to evaluate performance in specific areas such as orientation, immediate recall, short-term memory, long-term memory, intellectual abilities, verbal abilities/calculation, constructional abilities, and aphasia/apraxia (Zaudig et al. 1991; Zaudig and Hiller 1995). In each specific area sum scores were derived based on the items solved, in which higher scores indicate better performance. The assessment of specific cognitive functions demonstrated satisfying reliability (Zaudig et al. 1991).

Depression symptom level

Depressive symptomatology was measured using the Center for Epidemiological Studies Depression Scale (CES-D) presented in large-print for fill in (Radloff 1977; German version by Hautzinger and Bailer 1993). It has been shown to be a suitable instrument for the assessment of depression symptom level in older adults (Radloff and Teri 1986; Weyerer et al. 1992). The 20 items of the CES-D are scored on a 4-point Likert scale. The severity of depressive symptoms during the last week is addressed by means of

16 items with answer points ranging from never or seldom coded as 0 to always coded as 3. In order to avoid acquiescence the remaining 4 items (item number 4, 8, 12, 16) inquire about well-being and, hence, measure depression by the absence of the latter. This implies that the coding for these items is reversed, i.e., never or seldom is coded as 3 and always is coded as 0. Sum scores range from 0 to 60, where higher scores are supposed to indicate a higher severity of depressive symptoms. During the interviews, we observed that some of the respondents did not recognize the 4 items referring to well-being and, thus, continued following their pattern of answering. With some of these respondents, this can be ascribed to their being inattentive. For others, however, this change in phrasing was beyond their cognitive capabilities. Simply using the sum score as a measure for the severity of depression would lead to an overestimation of the severity of depression for this group. We addressed this problem by using a latent class model to the statistical analysis of the depression data (Matschinger et al. 1999).

Statistical analysis

The frequency of memory complaints is described in terms of percent prevalence. Cognitive performance, depressive symptomatology, and sociodemographic characteristics are described descriptively for the different groups of complainers. Univariate statistics are performed employing Chi^2 Test for investigation for associations of categorical variables (gender, depression symptomatology) and complaint status. Association of continuos variables (age, MMSE, SIDAM syndrome scores) and complaint status are investigated using one-way ANOVA. An ordinal logit model was used as a multivariate analysis to assess the impact of objective memory performance on subjective memory complaints, since the outcome measure (memory complaints) was coded following an order (never, seldom, often, always). The ordinal logit model is a straightforward extension of the logistic regression model for more than 2 categories using a set of ancillary parameters as cut-points of the probability distribution. Unlike the multinomial logit model, it provides (just as an ordinary regression model) one effect parameter for each exogenous variable and facilitat the interpretation of the empirical results considerably (Brant 1990). Likelihood ratio tests revealed that the less parsimonious multinomial logit model does not result in a better fit. Thus, we will interpret the parameters obtained by the ordinal logit model.

In the first set of analysis (model 1A and 1B) the memory performance was measured by the Mini-Mental State Examination, whereas cognitive performance in specific areas measured by SIDAM syndrome scales were employed in the second set of analysis (model 2A and 2B). Potentially important variables which might influence subjective memory complaints in addition to memory performance such as age, gender, and depression symptom level were included in the models. Models, with and without depression variables, are shown since the number of subjects included in the models differs due to listwise deletion. Of those individuals who did not completely fill in the CES-D, 50% had no memory complaints, whereas 34% reported memory problems to be present seldom, 10% experienced them often, and 6% always. Compared to those included in the analyses, there is no selective loss of individuals regarding the outcome measure (Chi square: 3.44 for 3 = df, p = 0.33). Since only subjects who had no missing values in the SIDAM test performance part were included in the second set of analysis (model 2A and 2B), the number of subjects was further reduced due to listwise deletion. Those individuals having missing values in the SIDAM test performance part do not differ from those included in the analysis regarding their complaint status (Chi square: 0.133 for df = 3, p = 0.99). A sub-sample of respondents failed to cope with the complexity of the CES-D scale which leads to an overestimation of depression when using the sum score. Employing a simple 4-class latent class model (Formann 1984), it was shown that it is possible to identify this subsample at least in a probabilistic sense (Matschinger et al. 1999). Classes 1, 2, and 4 are ordered classes with respect to the dimension "depression", since the mean scores are 8, 19, and 32, respectively. The third class shows a sum score of 12.5 which cannot be interpreted as a valid depression score. Thus, the membership-probability of the 4-class solution was used to create a 4-category nominal variable, assigning each respondent to one of these classes according to the highest probability. This class variable is used instead of a total score. So individuals which are not handling the scale properly appear as class 3 in the analysis. It would have been possible to constrain the analysis to only those not falling into class 3 using the usual CES-D score. This would result not only in a decreased sample size but – what is even more important – in a heavy selection bias, since class allocation is not independent of other exogenous variables used.

Before fitting the models, we checked for curvilinear associations. All explanatory variables were plotted against memory complaints and inspected for non-linear trends, but none was found. The predictive value of the models will be assessed, identifying the predicted complaint status according to the model and comparing observed and predicted complaint status using Kappa-statistic.

Results

Memory complaints were commonly reported: 39% of the individuals admit memory problems. 24% experience these problems seldom, 10% often, and 5% always.

Sociodemographic characteristics, depression symptomatology, and cognitive performance of the whole sample and of the individuals grouped according to their complaint status are summarized in Table 2. The univariate analysis showed significant associations of depression and complaint status as well as of immediate recall and short term memory as measured by the SIDAM syndrome scores and complaint status.

The results of the ordinal logit analyses connecting self-reported memory problems to several sets of predictors are summarized in Table 3. The first set of analyses revealed that cognitive performance measured by means of the Mini-Mental State Examination is not related to memory complaints controlling for age and gender in the first model (model 1A) and age, gender and depression symptom level in the second model (model 1B). Gender and depression are significantly and independently related to memory complaints. Men are more likely to complain compared to women. It could be shown that individuals with a moderate level of depressive symptomatology (CES-D-class 2) complain more about their memory compared to non-depressive individuals (CES-D-class 1). Looking at the coefficients of moderate and high level depressive symptomatology (CES-D-class 2 and 4), it is obvious that both have the same direction and nearly the same magnitude. However, the coefficient for high level depressive symptomatology did not reach a significant level, certainly due to the small number of individuals in the severely depressed class. Individuals who are not scaleable regarding their depression score due to inappropriate handling of the scale (CES-D-class 3) were found to be not significantly related to memory complaints. Despite the significant impact of gender and depression symptomatology on memory complaints, it has to be stressed that a small Pseudo R^2 reflects a little predictive value of the model which will be evaluated in detail. Using the model 62.3% of the individuals are predicted cor-

Table 2 Sociodemographic characteristics, cognitive performance, and depression symptomatology of the whole sample and of the individuals grouped according to their complaint status

Characteristics		Whole sample		Complaint status			Univariate statistics[2]
		n = 329[1]	no n = 196[1]	seldom n = 79[1]	often n = 31[1]	always n = 16[1]	P
Age	mean (SD)	81.3 (4.8)	80.9 (4.6)	81.1 (4.7)	81.4 (4.1)	82.7 (5.2)	0.472
Gender	female	68.9%	71.9%	64.5%	54.8%	56.2%	0.153
Depression	no depressive symptoms	40.8%	42.7%	46.8%	26.9%	15.4%	0.019
	moderate depressive symptoms	33.8%	28.1%	37.1%	53.9%	53.8%	
	not scalable	20.9%	25.1%	14.5%	7.7%	23.1%	
	severe depressive symptoms	4.4%	4.1%	1.6%	11.5%	7.7%	
MMSE	mean (SD)	26.6 (2.7)	26.8 (2.6)	25.7 (2.2)	25.7 (2.8)	26.0 (2.4)	0.081
Orientation (10)[3]	mean (SD)	9.5 (1.0)	9.6 (0.7)	9.6 (1.0)	9.2 (1.0)	9.8 (0.4)	0.125
Immediate recall (5)	mean (SD)	4.6 (0.6)	4.7 (0.5)	4.6 (0.5)	4.6 (0.5)	4.4 (0.5)	0.052
Short-term memory (8)	mean (SD)	4.7 (2.2)	5.1 (2.2)	4.5 (2.0)	4.0 (2.3)	3.2 (1.9)	0.004
Long-term memory (7)	mean (SD)	6.2 (1.2)	6.2 (1.1)	6.3 (1.0)	6.2 (1.2)	5.9 (1.4)	0.645
Intellectual abilities (5)	mean (SD)	4.4 (1.0)	4.5 (1.0)	4.4 (0.9)	4.3 (0.9)	4.5 (0.7)	0.840
Verbal abilities/calculation (7)	mean (SD)	5.5 (1.7)	5.6 (1.6)	5.4 (1.7)	5.1 (2.1)	5.5 (1.5)	0.511
Constructual abilities (3)	mean (SD)	1.5 (1.1)	1.6 (1.1)	1.5 (1.1)	1.7 (1.0)	1.2 (0.8)	0.582
Aphasia/apraxia (10)	mean (SD)	9.5 (1.2)	9.5 (1.1)	9.6 (0.7)	9.4 (1.1)	9.7 (0.5)	0.672

[1] n varies slightly due to missing values, [2] chi[2] for categorical variables (gender, depression) and complaint status, One-way-ANOVA for continuos variables (age, MMSE, SIDAM syndrome scores) and complaint status, [3] maximum reachable score indicating best performance given in brackets

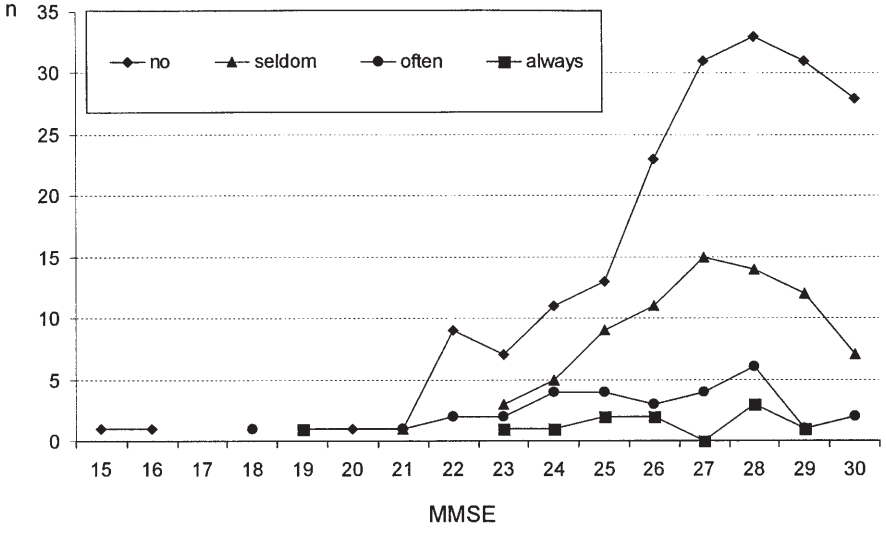

Fig. 1 Number of individuals and the corresponding MMSE score according to their memory complaint status

rectly. This indicates that if we know the predictor variables of our respondents (age, gender, memory performance measured by MMSE; depression symptomatology), we are able to correctly predict for 167 out of 268 cases whether our respondents complain of memory problems. The kappa statistic interpreted as chance corrected proportional agreement was calculated, demonstrating extremely poor agreement between self-reported memory complaints and assigned complaint status by the model, or, in other words, an agreement not much better than one arrived at by chance (kappa = 0.0053). Figure 1 shows the number of individuals and the corresponding MMSE scores according to their memory complaint group (no, seldom, often, always). Focusing on the group of individuals regarding their complaint status, the figure illustrates that 22 individuals free of memory complaints scored below 24 on the MMSE, the common cut-off for suspected dementia. On the other hand, 10 individuals, who seldom and often admitted memory complaints demonstrated best performance on the test. Drawing attention to individuals with similar test performance, e.g., individuals scored 23 on the MMSE, 8 admitted no memory complaints, and 6 complaint about their memory (3 seldom, 2 often, 1 always). The figure illustrates that cognitive performance measured by means of the MMSE is not related to memory complaints.

When cognitive performance in specific areas was measured by means of the different SIDAM syndrome scales, a second set of analyses revealed that 2 out of 8 sub-scales (immediate recall and short-term memory) are

Table 3 Ordinal logit models, assessing impact of sociodemographic characteristics, depression, and cognitive performance on memory complaints

	Model	1 A		1 B		2 A		2 B	
		coefficient	p	coefficient	p	coefficient	p	coefficient	p
Sociodemographic characteristics	Age	0.0200	0.432	0.0345	0.230	0.0101	0.740	0.0304	0.387
	Gender (Female	–0.5347	0.023	–0.6736	0.011	–0.5365	0.051	–0.5612	0.072
Depression	Class 2: moderate depression symptoms			0.6648	0.023			0.5772	0.085
	Class 3: not scalable			–0.3800	0.310			–0.6228	0.137
	Class 4: severe depression symptoms			0.6948	0.275			0.4428	0.535
Cognitive performance	MMSE	–0.0750	0.106	–0.0818	0.165				
	Orientation					0.0987	0.556	0.0361	0.862
	Immediate Recall					–0.5948	0.026	–0.6337	0.032
	Short-term Memory					–0.2577	0.001	–0.2868	0.001
	Long-term Memory					0.1862	0.242	0.2934	0.130
	Intellectual Ability					–0.0143	0.929	–0.0610	0.752
	Verbal Abilities/Calculation					–0.0072	0.937	0.0625	0.548
	Constructional Abilities					0.0518	0.703	0.0928	0.550
	Aphasia/Apraxia					0.2173	0.170	0.1614	0.470
	n/Chi^2 /Pseudo R^2	316/9.20/0.0141		268/21.40/0.0398		266/27.16/0.0502		230/34.40/0.0750	
	cut 1/cut 2/cut 3	–0.3148/1.0353/ 2.2399		0.8496/2.1872/ 3.4402		1.1044/2.5571/ 3.7953		2.3401/3.7452/ 5.0357	

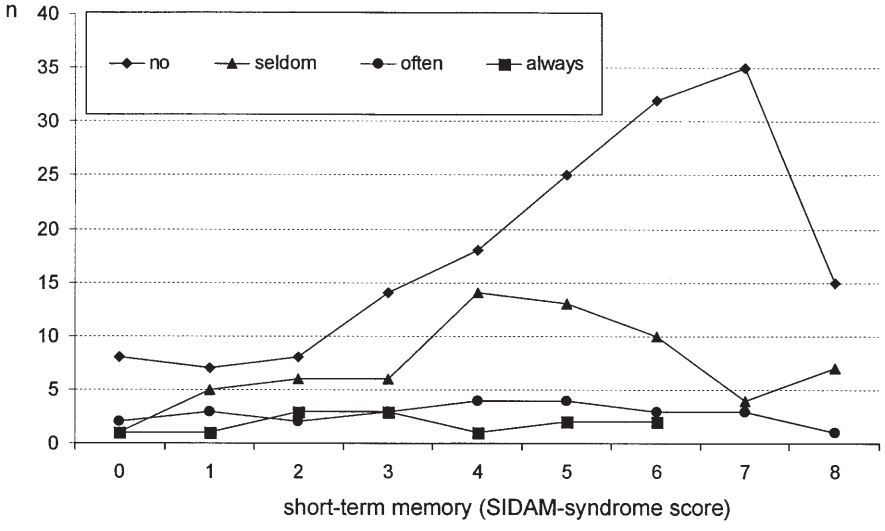

Fig. 2 Number of individuals and the corresponding SIDAM syndrome score for short-term memory according to their memory complaint status

significantly related to memory complaints in a model controlled for age and gender (model 2 A) as well as in a model controlled for age, gender, and depression level (model 2 B). Coefficients for gender and depressive symptomatology showed the same direction and magnitude like in the first set of analyses, but missed the significance level. Despite the significant impact of immediate recall and short-term memory on memory complaints, it has to be pointed out that a small Pseudo R^2 mirrors again a small predictive value of the model. Using the model 2 B, 60.9% of the individuals are correctly predicted. If we know the predictor variables of our respondents, we are able to correctly predict for 140 out of 230 cases whether our respondents will complain of memory problems. The kappa statistic demonstrates again extremely poor agreement between self-reported memory complaints and assigned complaint status by the model, an agreement not better than one generated by chance (kappa = 0.0374). Figure 2 shows the number of individuals and the corresponding SIDAM syndrome scores for short-term memory according to their memory complaint group (no, seldom, often, always). Despite the statistical significant impact of short-term memory performance on memory complaints Fig. 2 illustrates that memory complaints are not a powerful clinical sign for the memory deficits. This reasoning should be backed up by following examples: Of

the 12 individuals, who did not solve one of the tasks testing short-term memory, 8 individuals did not complain at all about memory problems. 23 individuals solved all tasks perfectly. Only 15 of them admitted no memory complaints.

Discussion

The search for early indicators of dementia had drawn attention to memory complaints. Consistent with previous research, the present study found that memory complaints are common in the elderly. In our study, they occur in one in 3 people aged 75 and over. A British study investigating a community sample 65 years and over revealed a prevalence rate of 25% (Tobiansky et al. 1995). Gagnon et el. (1994) reported that 33.5% of the subjects of a French community 65 years and older reported problems in memorizing simple new information. A Dutch field study on elderly people 65–85 years, which excluded demented and depressed individuals, conducted by Jonker et al. (1996), reported a prevalence of memory complaints of 34.3%. Taking into account the higher average age in our sample, the results we found are in line with other European studies but lower than prevalence rates reported by American studies (Culter and Grams 1988; Bassett and Folstein 1993; Smith et al. 1996). However, comparison is difficult since slightly different questions were asked which might have led to the identification of different groups of complainers.

Despite a substantial body of literature on memory complaints and memory performance, it remains an open question whether memory complaints are a powerful clinical sign of cognitive impairment. The diagnostic validity of memory complaints was not explicitly taken into account in cross-sectional research to date.

Studies investigating representative community samples with large sample sizes employ either relative simple measures of memory performance like the MMSE or measuring cognitive performance in specific areas of cognitive function. In case of employing relatively simple measures of cognitive performance no associations between memory complaints and memory performance were detected (Bassett and Folstein 1993; Jorm et al. 1994). This is confirmed by our analysis based on the MMSE as a measure of cognitive performance. However, covering a broader range of cognitive functions employing the neuropsychological battery of the SIDAM, two out of eight areas of cognition, “immediate recall” and “short-term memory”, were found to be significantly related to memory complaints. The results are in line with the notion that minor cognitive deficits, all above those involving secondary memory, are the first sign of incipient disease (Petersen et al. 1994; Masur et al. 1994). Previous community studies based on tests measuring cognitive performance in specific areas of cognitive function also revealed statistically significant associations of memory complaints and cognitive performance in some domains (Gagnon et al. 1994; Jonker et al. 1996). In this way our results resemble the findings reported in the literature. Gagnon et al. (1994) compared self-reported memory problems (yes/no) and test performance in visual and verbal memory (subjects scored in the lowest quintile of a cognitive test/others) as dichotomized variables using Chi-square statistic. They found that those subjects who reported problems scored significantly more often in the lower quintile, e.g., had the lowest level of performance. The fact that 56.4% of the subjects at the lowest level of performance did not complain and 27.7% of those scored above did complain is appreciated by the authors as discordance between the two evaluations. This statement points to the issue of diagnostic validity challenging the usefulness of memory complaints as a powerful clinical sign of cognitive impairment. Jonker et al. (1996) asked about memory complaints and specific memory-related problems and grouped the respondents in 4 categories according to presence and absence of complaints and problems. Test performance was grouped as good, mid, and poor. Results of a logistic regression using those with no complaints and no problems as the reference group revealed that those reporting deficits and problems had an increased risk (odds ranging from 1.4 to 2.0) of performing poorly on some cognitive tests (recall, factual memory, orientation in time and place, concentration) derived from the sub-scales of the CAMCOG, the test part of the Cambridge Mental Disorder of the Elderly Examination (Roth et al. 1986; Lindeboom et al. 1993). Comparing both groups regarding the MMSE score, the authors reported that a higher proportion of the subgroups with complaints and problems scored in the lower range. However, a close inspection of a diagram given by the authors to illustrate their findings shows that nearly 20% those free of complaints and problems and 15% of those with complaints and problems score at the maximum reachable score.

Statistically significant associations of memory complaints and cognitive performance do not necessarily prove the predictive value of memory complaints in detecting cognitive impairment on the individual level. Since our work is focused on the validity of memory complaints we evaluated our statistical model in this regard. To solely focus on the Type I error (p) is misleading since the predictive characteristics of the model are not taken into account. The predictive validity of these models is shown to be very poor. Although we found a statistical association between memory complaints and memory performance, it has been shown that on a individual level memory complaints do not serve as powerful clinical sign of cognitive impairment. Therefore, we conclude that memory complaints, assessed by a single question comparable to the kind of inquiry made during a GP consultation, have no diagnostic validity and are not very useful in detecting cognitively impaired individuals. This reasoning can be backed up by looking at Fig. 2. The increased proportion of memory complainers in individuals showing low level of test performance is reflected in a statistically significant association. However of those individuals performing at lowest level and solving not even one of the

tasks on short-term memory, 66% (8 out of 12) do not complain about their memory at all. The conclusion that memory complaints are not considered as a powerful clinical sign of impending decline does not exclude that for a subgroup of individuals, difficult to tease apart, memory complaints reflect cognitive impairment. However, for a great proportion of individuals memory complaints may rather information on attitudes related to a more general sense of self-efficacy and personal control which are, in turn, influenced by widely held theories on memory and aging. This has been suggested especially in non-clinical samples (Cavanaugh and Green, 1990; Smith et al. 1996).

Looking at the impact of depressive symptomatology, we found that individuals with depressive symptomatology are more likely to complain about their memory. This was expected and demonstrated in most of the previous studies. The relationship is not surprising since perceived disturbances in cognitive operations such as concentration and attention along with selective bias toward negative evaluations are associated with depression in general (Beck 1967). Complaining itself is a symptom of depression and it has been shown that memory complaints resolve if depression lifts (Plotkin et al. 1985). In our study, age appears to be not significantly related to memory complaints probably due to the small variance in our sample, since only individuals aged 75 years and over were included. We found that men are more likely to complain than women, when depression level is controlled for.

There are some limitations to our study. Mortality and refusal to participate in the study could have biased the sample. Unfortunately, there is no information available on whether the loss was selective regarding complaint status. Memory complaints have been assessed in a variety of ways ranging from single questions (Grut et al. 1993; Bassett and Folstein 1993; Gagnon et al. 1994) to multidimensional self-report inventories. The 'Memory in Adulthood Questionnaire' and the 'Memory Functioning Questionnaire' evaluate different aspects of metamemory (Dixon et al. 1988; Gilewski and Zelinski 1988). Our assessment of memory complaints is based on a single item and simple questioning. However, the questioning we used corresponds to the kind of inquiry that might be made in the course of a routine general practice consultation.

Since the present data stem from the first wave of a longitudinal study, it will be possible to assess if memory complaints might be useful in detecting future memory impairment. Individuals might be aware of subtle cognitive changes that are not detected yet by cross-sectional cognitive testing. Only few studies followed population-based samples. With exception of Jorm et al. (1997), the authors reported that self-evaluations predict future cognitive decline (Tobiansky et al. 1995; Schmand et al. 1996, 1997; Johansson et al. 1997), but the magnitude of association was reported to be small. A small amount of variance accounted for by self-evaluations in longitudinal studies suggests that memory complaints do not predict cognitive decline with great certainty.

In summary, our results suggest that memory self-assessments, while of considerable interest, should not be used as substitute measures of memory performance. Because of the poor diagnostic validity of subjective memory complaints, the initiation of further apparative diagnostic evaluation solely based on memory complaints is likely to miss those in need and allocate resources to worried but cognitively healthy individuals. In any case, diagnostic and therapeutic steps should be based on the results of objective performance testing.

Memory complaints feature as diagnostic criteria in concepts and classificatory systems such as age-associated memory impairment (Crook et al. 1986), ICD-10 mild cognitive disorder (World Health Organization 1994) or age associated-cognitive decline (Levy 1994). These concepts were introduced to describe the intermediate state of cognitive functioning in which a decline from a previous higher level has occurred but is not severe enough to fulfill the criteria of dementia. Our findings suggest that the inclusion of memory complaints in diagnostic criteria is not warranted.

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