Association of perceived health and depression with older adults' subjective memory complaints: contrasting a specific questionnaire with general complaints questions

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Abstract The objectives of this paper were to evaluate the association of subjective memory complaints (SMC) with perceived state of health, mood and episodic memory (associative and everyday memory). We studied these areas using two different complaint assessment methods (three general questions and a validated scale). The study included 269 older adults (aged 65–87) with age-related memory changes, but without cognitive impairment. They were evaluated with Mini-cognitive Exam, Rivermead Behavioural Memory Test (a test of everyday memory), Paired Associates Learning Test, Memory Failures of Everyday Questionnaire, three memory complaints questions, Nottingham Health Profile and Geriatric Depression Scale. The results indicated that memory for everyday

performance, mood and perceived health were independent predictors of SMC, with mood and perceived health being stronger predictors than actual memory performance. Age was not associated with subjective memory and, with regard to level of education, only the illiterate level was associated with SMC. A specific questionnaire on subjective memory was found to be preferable to an aggregate of complaints questions on self-reported memory; only health profile was found to predict the outcomes on memory complaints questions. Our conclusion is that a group of underlying factors other than everyday memory were playing a role in SMC; these SMC of subjects with age-related memory changes were mainly associated with subjective evaluations of their health.

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Introduction

Subjective memory complaints (SMC) in older adults are currently a matter of growing interest, mainly due to their possible validity as an indicator of cognitive impairment or even dementia (O'Brien et al. 1992). The prevalence of SMC among older adults has been reported to be between 25 and 50 % in most studies (Tobiansky et al. 1995).

Reporting SMC corroborated by an informant, if possible, is included as a criterion in clinical profiles such as mild cognitive impairment (Petersen et al. 2001). In their review about the relationship between SMC and dementia, Jonker et al. (2000) pointed out that SMC should not be regarded as harmless or linked to depression, but as an early sign of dementia, particularly in certain groups such

as subjects with a high level of education. However, other authors have stated that when SMC are presented without any other cognitive impairment, there is no higher risk of cognitive decline (Flicker et al. 1993).

Empirical background

How SMC are related to performance on memory tests is still a matter of debate. Some authors did not find any association using different tests (O'Connor et al. 1990). Nevertheless, Sunderland et al. (1983) found an association, particularly, when the evaluated tasks were linked to the daily activity of episodic memory, such as remembering stories. However, there have been few studies with everyday memory tests. A review by Jonker et al. (2000) showed a negative association between cognitive performance and SMC using various assessment methods. Studies of clinical samples have also revealed inconsistent results, insofar as links between SMC and cognitive or memory performance have been reported in some cases (Christensen 2004), but not in others (Soares Cianciarullo et al. 2008). Riedel-Heller et al. (1999) described an association between SMC and certain types of memory (immediate memory and short-term memory). Aside from memory, SMC have been directly related to other cognitive domains such as attention, working memory, executive functions and processing speed (Braver and Barch 2002; Mol et al. 2006; Carriere et al. 2008).

Depression is one of the conditions that has been most frequently related to SMC. In their longitudinal study, Jorm et al. (2001) concluded that SMC experienced at a given time are, above all, associated with anxiety and depression. Moreover, SMC have also been proposed as an indicator of depression in older adults (Reid and MacLulich 2006). Schmand et al. (1997) found that SMC were linked to depression, but they also reflected realistic observations of cognitive decline itself. At present, many doubts on the relationship between depression and cognitive impairment remain unclear. Although, some researchers raise that people with depression are most at risk of developing dementia (Ownby et al. 2006), the debate remains open. We can consider depression as a disorder or consider the depressive symptomatology: results of the studies may be different. A recent 3 years longitudinal study (Neubauer et al. 2013) showed that the depressive symptoms assessed by the Geriatric Depression Scale (GDS; Sheikh and Yesavage 1986) are not good predictors of dementia. The association between SMC and depression is likely independent of cognition. A population-based study found that SMC were independently associated, in order of importance, with lower cognitive performance, depression (as a disorder) and quality of life (Montejo et al. 2011).

Other kind of variables such as age, education, emotional stress, depression and anxiety, perceived state of health, neuroticism and a number of chronic diseases have also been identified as potential predictors of SMC (Bolla et al. 1991; Comijs et al. 2002; Montejo et al. 2011). Among them, age and education have been the most widely studied factors. Regarding age, more SMC have been reported in older adults, in relation to self-perceived memory decline (Schofield et al. 1997). Most epidemiological studies have revealed an association between SMC and age (Blazer et al. 1997), but not all (Jorm et al. 2001). This discrepancy is especially found in non-epidemiological studies and above all in studies conducted in a clinical context (Barker et al. 1995). Conversely, an inverse relationship between education and SMC has been reported, in which a low level of education implies more SMC (Blazer et al. 1997; Jonker et al. 2000).

There has been growing interest in the relationship between Health-Related Quality of Life and SMC in recent years (Mol et al. 2007). Pearman and Storandt (2004) associated perceived health with SMC; self-assessed health of young adults was identified as a predictor of both objective and subjective memory performance. Cutler and Grams (1988) identified that self-reported health status, perceived change in health status and functional limitations (such as difficulty walking or standing) were predictors of SMC.

Measurement issues

One topic of interest is how to determine whether or not a subject has SMC. The measurement of SMC may lead to different results depending on the method used and the environment in which it is carried out (Mol et al. 2006). SMC are usually assessed by means of either a structured questionnaire or one/several questions. Although, these two methods may correlate with one another (Abdulrab and Heun 2008), their results are not equivalent. Despite this, few studies use both types at once for comparison. In many studies, assessment of SMC may involve a single question (e.g. 'Do you have any memory problems?') coded 'Yes' or 'No'. Other studies posed several questions included in clinical interviews that detect cognitive impairment, such as the Cambridge University Structured Clinical Interview (CAMDEX) by Roth et al. (1986). The high or low prevalence of SMC and their relationship with cognitive decline or depression are sometimes explained by the method used to select subjects (Blazer et al. 1997). The assessment of SMC through questionnaires provides information on frequency and severity of forgetfulness, strategies employed to recall, association with self-perception, effort needed to memorise, etc. One of the most frequently used questionnaires is the Memory Failures of Everyday (MFE) Questionnaire by Sunderland et al. (1983). The MFE has been

used in clinical contexts to assess patients' memory failures and to evaluate their recovery (Sunderland et al. 1984), as well as in tasks of rehabilitation (Wilson 1987), dementia (Seltzer et al. 1995), multiple sclerosis (Richardson 1996) and epilepsy (Goldstein and Polkey 1992). It has also been employed to study subjective memory in older adults (Sunderland et al. 1986) and to evaluate the results of memory training programs (Montejo et al. 2006).

In summary, the empirical evidence is contradictory regarding the association of SMC with overall cognitive performance and with traditional tests of memory. However, available data seem to show a clearer association of SMC with depression, perceived health and other kinds of memory, like everyday memory. This would indicate that SMC in older adults are more related to perceived health status and mood than real impairment of memory, particularly the episodic memory disorders.

The interest of the present study was to investigate memory complaints in a population of community-dwelling older adults without cognitive impairment. To date, there have been few studies on memory complaints comparing everyday memory with traditional tests and studying perceived state of health. We used two complaint assessment methods that have not often been contrasted in previous studies (a simple assessment with three questions, and a wider assessment using a questionnaire).

Our objectives were: (i) to analyse the association between SMC in older adults and variables that measure perceived state of health and mood, (ii) to study the relationship between objective memory performance and SMC and (iii) to compare the results using two different SMC assessment methods. Variables such as age and educational level were included in our analysis since they have been frequently studied in the area of SMC. Our hypothesis was that SMC would relate to memory performance, particularly everyday memory, but also to other variables such as mood and perceived state of health. Regarding the two SMC assessment methods, we predicted that, compared to responses to individual questions concerning memory complaints, a more structured scale such as MFE would be more strongly related to memory test performance, mood and perceived health.

Methods

Participants

The study included 269 older people [mean age 71.47, standard deviation (SD) = 5.03; range 65–87 years], 24.2 % male, who came to Madrid Municipal Health Centres and/or Madrid City Council Centres for Older Adults. Participants were contacted by means of posters, mailing and via social and health services to carry out a

free neuropsychological examination. All of them were non-institutionalised users of the Madrid City Council Centres for Older Adults and were interested in knowing the performance of their memory; they frequented the older adults centres for various activities: cultural, fitness, leisure or health prevention activities. They represented the population of community-dwelling older adults with age-related memory changes only, without pathological memory decline. These subjects had not consulted health professionals (primary care, specialists in neurology, geriatrics, psychology, etc.) about memory complaints. Therefore, it was not a clinical sample, although assessment was performed in a clinical context. All tests and assessments were administered by psychologists and psychiatrists. Of the 303 people who attended, those younger than 65-years-old and those that scored below 24 on the Mini-cognitive Exam (MCE) by Lobo et al. (1979) (indicating probable cognitive impairment) were eliminated from the sample. Subjects with neurological or psychiatric pathology, that might have compromised the results, were also excluded (Parkinson, stroke, other serious neurological disorders, psycho-affective disorders such as moderate or severe depression, other psychiatric disorders, chronic use of anxiolytics, neuroleptics, anticonvulsants or sedative hypnotics). To rule out the possibility of these pathologies, a clinical interview (complete clinical story: socio-epidemiological data, diseases, treatments) was carried out.

Distribution of demographic variables is shown in Table 1.

Table 1 Sample descriptives

Characteristics (<i>N</i> = 269)	<i>N</i>	%
Gender		
Male	65	24.2
Female	204	75.8
Age groups		
65–69	110	40.9
70–74	89	33.1
75–79	49	18.2
80 and above	21	7.8
Marital status		
Single	24	9.1
Married	130	48.4
Widow/er	104	38.6
Separated	11	3.9
Education		
Functionally illiterate	11	4.1
Primary education	182	67.6
Lower secondary education	32	11.9
Upper secondary education	33	12.3
University	11	4.1

Measures

Assessment of general cognitive functioning

The MCE is a Spanish version by Lobo et al. (1979), of the Mini-mental State Examination (MMSE) by Folstein et al. (1975). The MMSE measures orientation in terms of time and place, attention, recall, language, and visual construction; it is a screening test that is also widely used to assess general cognitive performance. Scores range from 0 to 35, and 23 or less indicates probable cognitive impairment; the sensitivity is 84.6 % and the specificity is 82 %.

Assessment of depression

The GDS by Yesavage et al. (1983) is a self-report measure of current depressive symptomatology. There are several versions of this instrument. We used the GDS 30 items with two response alternatives (Yes/No). It has been adapted and validated for use with older Spanish adults (Ramos et al. 1993). Possible scores range from 0 to 30. Higher scores indicate a greater degree of depression; the internal consistency is Cronbach's $\alpha = 0.94$.

Assessment of SMC

To assess SMC, we used the MFE Questionnaire (Sunderland et al. 1983) and three memory complaints questions (CQs). The MFE includes 28 items about everyday life situations and activities, such as 'forgetting where things are left' or 'forgetting something he/she has just said'. The original scoring on a 9-point Likert scale (from 'not at all in the last three months' to 'more than once a day') has been adapted for older people into a more simple-to-use 3-point scale ('never or rarely,' 'sometimes,' and 'often') (Montejo et al. 2012). Scores range from 0 to 56, with higher scores indicating more memory failures; internal consistency Cronbach's $\alpha = 0.83$. This questionnaire was adapted for use with Spanish adults by García-Martínez and Sánchez-Cánovas (1993). Three memory CQs were asked: one general question and two more specific questions with two response alternatives (Yes/No) taken from the CAMDEX (Roth et al. 1986). The questions were as follows: 1st: 'Do you have any memory problems?', 2nd: 'Do you forget where things are left (purse, keys, glasses...)?' and 3rd: 'Do you sometimes forget the names of people you should know, like friends, relatives or celebrities?'. These questions were scored according to the number of affirmative responses (0–3).

Assessment of memory

Memory was assessed using the Rivermead Behavioural Memory Test (RBMT; Wilson et al. 1985) and a Paired

Associates Learning Test (PALT). The RBMT is a test of episodic memory, which was developed to detect impairment in everyday memory performance (recalling names, faces, a story immediately and after a delay, an appointment, a route immediately and again after a delay, a message, where you put something, orientation in time and place and recognising pictures). It has a global score range of 0–12; internal consistency Cronbach's $\alpha = 0.65$. The PALT, which was prepared by our group, is similar to the Wechsler memory scale verbal paired associates subtest (1997) and it assesses episodic memory by focusing on association strategies. It consists of three parallel versions and a total score ranging from 0 to 24 points, where higher scores indicate better memory capacity.

Assessment of quality of life

The Nottingham Health Profile (NHP) is a questionnaire that measures subjects' perceived overall health state and it includes items from the categories energy, pain, emotional reaction, sleep, social isolation and physical mobility (Hunt and McEwen 1980). It has been adapted and validated for Spanish people (Alonso et al. 1990). Scores range from 0 to 45, with higher scores indicating a worse health profile; internal consistency Cronbach's $\alpha = 0.89$.

The whole protocol was administered in a single session by two psychologists and two psychiatrists.

Statistical analysis

An SPSS 19 (IBM SPSS Statistics 19 for Windows, SPSS Inc., Chicago, IL) program was used for statistical analysis. Pearson and Spearman correlation coefficients were used to examine the relationship between MFE scores and other variables. The relationship between MFE scores and demographic, health, depression and memory variables was examined by means of hierarchical regression analysis. The first block contained demographic variables such as age, sex, level of education and marital status; the second block included depression and health variables such as NHP, MCE and GDS; finally, the third block included memory variables such as RBMT and PALT. The categorical predictors were previously transformed by generating the corresponding dummy variables. Moreover, a logistic regression model was utilised to select variables that were useful to correctly classify subjects into the memory CQs' four categories. A prior analysis of variance established that groups '0 affirmative responses' to memory CQs and '1 affirmative response' to memory CQs were indistinguishable in this test in terms of the variables that showed significant differences in their ANOVAs, MFE and GDS scores. Therefore, we considered only three groups of subjects for this test: less than two memory CQs (0/1 CQs),

two memory CQs (2 CQs) and three memory CQs (3 CQs). We assessed the performance of the model by means of classification tables together with standard Hosmer and Lemeshow (1989) goodness-of-fit tests. The efficiency of the final model was assessed by the area under the receiver operating characteristic (ROC) curve in conjunction with the usual goodness-of-fit tests.

Results

Descriptive data analysis

Table 2 shows means and SDs for the main tests and correlations among the MFE and other variables.

The MFEs highest Pearson's correlation coefficients with the independent variables were with the variables NHP and GDS, which measure one's subjectively perceived state of general health and mood, respectively. Its correlations with the MCE and RBMT were lower, but significant. No significant correlation was observed with PALT. The age variable was found to be associated with objective memory assessment (RBMT and PALT), but was not significant in relation to the subjective assessment (MFE). Moreover, MFE was strongly correlated with CQs.

Multivariate examination of predictors of MFE Questionnaire

We conducted a hierarchical regression analysis to study MFE predictors (see Table 3). The selected variables in block 1 were level of education and marital status, both dichotomised. The results were as follows: marital status—married compared to all others; level of education—illiterate and primary school compared to all others. Age and sex were not significant. The selected variables in block 2

were NHP and GDS. MCE was not significant. The selected variable in block 3, third stage, was RBMT. PALT was not significant. All coefficients of the final model were statistically significant except for the marital status and illiterate-primary; this is not surprising because of the hierarchical method of adjustment. Table 3 shows a positive relationship between MFE and each predictor except for the married category and RBMT. That is, when a person is married, MFE decreases more than it does for the rest of the marital status categories, and in the same way MFE decreases as RBMT increases. The value of R^2 in the final model is 0.236; that is, the set of all predictors accounts for 23.6 % of variance in MFE. The R^2 column indicates the contribution of each block of predictors to the final model: all were statistically significant.

Multivariate examination of predictors of memory CQs

With respect to the other method used to measure SMC, that is, the three CQs, 6.1 % did not respond positively to any questions, 18.6 % of subjects responded affirmatively to one question, 45.3 % to two questions and 30 % to three questions.

A preliminary analysis of variance was conducted to examine the differences in memory, depression and health variables across the four categories of the memory CQs. Significant differences were found ($p < 0.01$) between groups for MFE and GDS only. The post-hoc analysis yielded the following results: in the case of the MFE variable, there were no significant differences between groups 0 CQs and 1 CQs ($p > 0.05$), but significant differences were observed between all other groups (all $p < 0.01$); in the case of GDS there were significant differences between groups 1 CQs and 3 CQs only ($p < 0.05$). Therefore, we established only three groups of subjects, namely: less than two memory CQs (0/1 CQs), two memory CQs (2 CQs) and three memory CQs (3 CQs).

Table 2 Means, standard deviations and correlations among cognitive measures (Pearson's 'r' and '+' Spearman correlation)

Test (range)	Mean (SD)	Age	MFE	GDS	NPH	MCE	RBMT	PALT	CQs
MFE (0–56)	19.45 (9.2)	0.050							
GDS (0–30)	9.96 (6.67)	0.038	0.347**						
NPH (0–45)	12.13 (8.11)	0.068	0.427**	0.536**					
MCE (0–35)	30.99 (2.8)	2.8	−0.171**	−0.196**	−0.213**				
RBMT (0–12)	7.75 (2.46)	−0.226**	−0.211**	−0.079	−0.157*	0.368**			
PALT (0–24)	14.17 (5.39)	−0.200**	−0.117	−0.150*	−0.145*	0.306**	0.382**		
CQs+ (0–3)	–	−0.065	0.456**	0.182**	0.306**	−0.067	−0.137*	−0.023	
Level of education+	–	0.050	−0.187**	−0.100	−0.228**	0.285**	0.094	0.077	−0.066

MFE Memory Failures of Everyday Questionnaire, GDS Geriatric Depression Scale, NPH Nottingham Health Profile, MCE Mini-cognitive Exam, RBMT Rivermead Behavioural Memory Test, PALT Paired Associates Learning Test, CQs Memory complaints questions, SD Standard deviation

** $p < 0.01$, * $p < 0.05$

Table 3 Predictors of SMC with MFE as a dependent variable. Hierarchical regression analysis

Models	Unstandardised coefficients		Standardised coefficients β	t	Significance		
	B	Standard error					
1							
(Constant)	18.015	1.195		15.081	0.000		
Illiterate-primary	3.673	1.268	0.179	2.896	0.004		
Married	−2.669	1.150	−0.143	−2.320	0.021		
2							
(Constant)	11.874	1.405		8.449	0.000		
Illiterate-primary	2.336	1.175	0.114	1.988	0.048		
Married	−1.318	1.068	−0.071	−1.234	0.219		
NHP	0.363	0.078	0.315	4.636	0.000		
GDS	0.211	0.094	0.151	2.237	0.026		
3							
(Constant)	16.522	2.364		6.989	0.000		
Illiterate-primary	2.201	1.165	0.107	1.890	0.060		
Married	−1.535	1.062	−0.082	−1.446	0.150		
NHP	0.341	0.078	0.296	4.361	0.000		
GDS	0.204	0.093	0.146	2.188	0.030		
RBMT	−0.527	0.217	−0.138	−2.432	0.016		
Model summary							
Models	R	R^2	R^2 corrected	Standard error	R^2 change	Change statistics	
						F change	F change significance
1	0.229	0.053	0.045	9.096	0.053	6.902	0.001
2	0.466	0.217	0.205	8.300	0.165	26.007	0.000
3	0.486	0.236	0.220	8.219	0.018	5.915	0.016

MFE Memory Failures of Everyday Questionnaire, *GDS* Geriatric Depression Scale, *NPH* Nottingham Health Profile, *RBMT* Rivermead Behavioural Memory Test

A polytomous logistic regression was performed on this new three-category variable. Two non-redundant Logit functions were calculated using ‘0/1 CQs’ as the reference category, Logit 1 for the ‘0/1 CQs’ versus ‘2 CQs’ comparison and Logit 2 for the ‘0/1 CQs’ versus ‘3 CQs’ comparison. The process of selecting the predictive variables began with a careful univariate analysis of each variable, using the likelihood ratio test as a selection criterion. Four variables (GDS, RBMT, NHP and level of education) demonstrated predictive power in the univariate analysis. In particular, the categories of educational level were significant, considered in three groups: illiterate-primary, lower-upper secondary and university. A model containing all of the selected variables was fitted. An examination of the Wald statistic for each variable and a comparison of each estimated coefficient with the corresponding coefficient from the univariate model, containing

only that variable, allowed verification of the load of each variable in the model. Based on these criteria, all of the variables except for GDS demonstrated weight in the multivariate model.

The results were as follows: for the NHP variable, regression coefficients were significant for the Logit 1 ($\beta = 0.089$, $p < 0.001$) and Logit 2 functions ($\beta = 0.122$, $p < 0.001$), indicating that NHP would permit a good classification of ‘0/1 CQs’ versus ‘2 CQs’ patients, and of ‘0/1 CQs’ versus ‘3 CQs’ patients. Moreover, the similarity in the values of the two coefficients suggests the statistical homogeneity of groups ‘2 CQs’ and ‘3 CQs’ in relation to the NHP variable. The ‘level of education’ variable with three categories was significant for the Logit 1 function (all $p < 0.05$), but not for the Logit 2 function (all $p > 0.48$); and the RBMT variable was significant for the Logit 2 function ($p = 0.035$), but not for the Logit 1 ($p = 0.622$).

Thus, the fitting of two individual binary logistic regression models, seemed more appropriate.

Comparison of positive responses: ‘0/1’ versus ‘2’ in the CQs

The same criteria used to select the univariate model in the previous polytomous regression were applied for selection in the multivariate model. Out of the four variables with predictive power in the univariate analysis, only NHP and level of education were selected (Table 4).

The model-building process continued by ascertaining the correct scale in the Logit for the NHP variable. This analysis showed evidence of linearity. We then searched for an NHP $\times$ level of education interaction, but it was not found to be significant ($p = 0.201$). The Hosmer and Lemeshow goodness-of-fit statistic was 5.24 ($p = 0.732$). The area under the ROC curve was 0.715 [95 % confidence interval (CI) = 0.633–0.798]. Sensitivity and specificity were 73.6 % and 55.2 % respectively, when a 0.60 cut-off point was adopted.

Comparison of positive: responses ‘0/1’ versus ‘3’ in the CQs

The only variable selected as significant for the final model was NHP ($p < 0.001$). After confirming the linear scale in the Logit for that variable, the adjustment was completely finished. The Hosmer and Lemeshow statistic was 6.578 ($p = 0.583$). The area under the ROC curve was 0.735 (95 % CI = 0.647–0.823). The sensitivity and specificity of Model 2 were 72.5 and 67.2 % respectively, when a 0.50 cut-off point was adopted.

Discussion

The main objective of this study was to identify what variables were associated with SMC in community-dwelling people with age-related memory changes only, without cognitive impairment. In order to achieve this aim, we evaluated our subjects in two different ways: a questionnaire and three CQs. We hypothesised that a more structured tool like MFE, would be more strongly correlated with other variables than CQs. Based on our results, the MFE appeared to be a more accurate measure than CQs in detecting SMC predictors, so we analyse SMC here mainly in terms of the MFE results.

Our hypothesis was that SMC were associated with memory, especially everyday memory, and with depression and perceived state of health. We found that the three predictors of SMC were in decreasing order of effect size, subjective health perception, depression and objective daily memory performance. The first conclusion that emerges from our study is that, when explaining SMC, both self-perceived health and emotional aspects outweighed cognitive performance in these subjects who did not display cognitive impairment.

We have outlined the general traits of a possible theoretical interpretation of our data largely based on Health-Related Quality of Life. Health-Related Quality of Life has two dimensions. One is the objective dimension, that is, the objective state of health: disease, disability and various disturbances, including reduced cognitive and memory performance. Another dimension is the subjective perception of health status: pain, perceived lack of energy, etc.; low mood and the SMC belong to this dimension. Both dimensions are interdependent and, above all, the factors in the subjective area are dependent on each other. SMC are

Table 4 Predictors of SMC with CQs as a dependent variable, reference category ‘0/1 CQs’. Logistic regression analysis, final model

Variables	<i>B</i>	Standard error	Wald	Significance	OR (95 % CI for OR)	χ^2 significance
“0/1 CQs” versus “2 CQs”						
NHP	0.089	0.027	11.235	0.001	1.093 (1.038–1.152)	<0.001 0.036
Level of education						
Lower–upper secondary education	0.539	0.400	1.814	0.178	1.714 (0.783–3.753)	
University	–2.030	1.172	2.999	0.083	0.131 (0.013–1.307)	
Constant	–0.381	0.337	1.283	0.257	0.683	
“0/1 CQs” versus “3 CQs”						
NHP	0.116	0.028	17.445	0.000	1.123 (1.063–1.186)	<0.001
Constant	–1.110	0.350	10.082	0.001	0.330	

0/1 CQs “less than 2 memory complaints questions”, 2 CQs “2 memory complaints questions”, 3 CQs “3 memory complaints questions”, CQs memory complaints questions, NHP Nottingham Health Profile, OR Odds ratio, CI Confidence interval

related to factors that are in the subjective dimension (perceived state of health and mood) and are also, to a lesser extent, related to those factors that are in the objective dimension (everyday memory performance). In accordance with this explanation, our results have revealed two interconnected dimensions in the study of SMC: subjective and objective. The subjective dimensions were evaluated by the NHP and GDS, and the objective ones by the RBMT, MCE and PALT. The association between SMC and subjective variables had a higher effect size than their association with objectives ones. Likewise, subjective variables were the strongest predictors. Regarding the objective aspects, both the RBMT and the MFE share the objective characteristic that they refer to facts of daily life (although RBMT evaluates it objectively). This could explain why the daily memory measure (RBMT) turned out to be the third predictor of SMC, while neither the MCE nor the PALT were predictors.

The impact of perceived health, measured by the NHP questionnaire, is especially striking; it was found to be the most powerful predictor of SMC, which is consistent with the findings of other studies (Montejo et al. 2011). In our multivariate study, this was the factor that explained the highest amount of variability in MFE, and the only one retained in the final model in the CQs study. This indicates that SMC are a component of the overall assessment of health along with perceived lack of energy, emotional reaction, low mood, sleep disturbances, pain, social isolation and problems with physical mobility. Older people who begin to perceive negative changes in their general health are prone to complain. All dimensions of NHP have been linked to SMC: diseases, particularly chronic diseases (Comijs et al. 2002), somatic complaints like insomnia, pain and physical problems (Collins and Abeles 1996), lack of social support or social isolation (Mol et al. 2008), pain in older adults independent of concurrent affective disorders (Westoby et al. 2009). Perceived health is associated with SMC in several ways. Health problems such as insomnia or lack of energy directly affect memory performance (Stickgold 2005); and therefore, everyday memory failures and SMC. In addition, people with a low perception of their health status usually worry about their problems, and those worries may produce disturbances in attention and concentration, leading to even more memory failures and SMC (Levy-Cushman and Abeles 1998). A further factor is that there is a psychological tendency to generalise, such that people with a poor perception of their physical health may also have a low perception of their memory and overestimate their everyday memory difficulties. People exhibiting features of hypochondria judge both their health and memory to be worse. Perhaps, then, SMC are a manifestation of a general feeling or perception that health and well-being in general are in decline.

The relationship between depression and SMC has been well-established by previous research into this issue. Our work has revealed that SMC correlate with GDS both according to the MFE and CQs. Furthermore, mood has been found to predict SMC as evaluated by the MFE. Two groups of factors are likely to play a role in this phenomenon: (a) aspects directly related to depression, as memory and attentional impairment, are part of depressive symptomatology; Podewils et al. (2003) stated that shifts in attention and interest may lead to worrying about memory; (b) people with low mood will tend to complain about many aspects of their lives, including memory performance. Sachs-Ericsson et al. (2008) have explained this phenomenon in terms of negative attributional style. This psychological attribute is a strategy focused on negative emotions that depressive subjects tend to exhibit. These individuals tend to perceive themselves as having memory impairment, which leads them to interpret their everyday memory failures as quite serious (Jorm et al. 2004). These two groups of factors (a and b above) are not contradictory and reflect our views. To summarise, SMC may be very sensitive to the cognitive changes originated by low mood and may also be an expression of feelings of general decline caused by depression.

The way in which cognitive and memory performance are linked to SMC is a controversial issue. Reid and MacLulich (2006), in their review of several papers on SMC and cognitive and memory performance, pointed out that the available evidence does not allow a clear conclusion to be reached. Our results found a statistically significant correlation between MFE and general cognitive performance (MCE) and also between MFE and everyday memory performance (RBMT). Nevertheless, no statistically significant correlation was observed with the PALT, which is not directly related to daily life. Additionally, everyday memory performance was found to predict SMC, as measured by the MFE, however, everyday memory performance explained a relatively low proportion of variance compared with other predictors. Indeed, other authors have drawn similar conclusions (Snitz et al. 2008). With respect to SMC measured by CQs, neither general cognitive performance nor memory performance were found to be predictors. According to the present results, SMC as evaluated by the MFE, partially reflect a realistic view of memory performance, along with the presence of others factors. Considering the differences in our results between MFE and CQs, we can deduce that methodology is a key point in this issue: general memory questions show little or no association with memory performance. Conversely, more specific questions like those included in questionnaires showed a stronger association with performance, especially with everyday memory performance. However, we must take into account that our sample is made up of

nonimpaired subjects. As a result, our findings clearly cannot be applied to people with cognitive or memory impairment.

The relationship between age and SMC is another controversial issue and findings have differed across studies. Of all the studies that address age and older adults, the ones that really provide solutions to this issue are population studies, although, how memory questions are asked must also be taken into account. According to our findings, there appears to be no significant correlation between SMC, measured by either the MFE or CQs, and the age variable. Clinical and non-clinical samples (such as the one described in the present study) may not show any association between age and SMC because subjects are either selected or assigned according to particular criteria. Age range may also play a role in these discrepancies: our study only admitted individuals between 65- and 87-year-old; research comparing young adults and older people has found that SMC increase progressively with age (Basset and Folstein 1993).

With respect to level of education, our results indicated that this factor is associated with SMC, but with some caveats. In order to more deeply analyse this association, we constructed dummy variables for all categories of the variable. Our results show that only the lowest level of education (illiterate-primary) is associated with SMC as measured by the MFE, but not the other levels of education; in the final regression model, level of education was not found to be significant. When we measured with CQs, the results were not consistent either, even though in Logit 1, it was significant. The literature on this issue shows that some studies (Blazer et al. 1997) find associations between SMC and level of education (the lower the level the more SMC), while others have not observed this relationship. In fact, some have observed more SMC in subjects with a high level of education (Comijs et al. 2002). In our opinion, these differences may be the consequence of the methodology used, which may involve aspects like the sources of samples, small overall effect size of the education variable, the presence of other factors related to education, etc.

Step 1 of our regression study indicated that the marital status variable was a predictor, with married people reporting fewer SMC than the other categories, but in the final model, this variable was found to be non-significant. Few studies have examined this variable, and their results have shown either no association or an association with a small effect size (Derouesnée et al. 1999).

Different procedures can be used to assess SMC and in the present study, this was achieved by means of the MFE and three CQs. Our data have shown that these two measuring tools were significantly correlated with each other, although, the results were not equivalent. The data collected through the MFE were broader and allowed us to establish more relationships than the data obtained from

CQs. Many researchers choose the methodology of CQs that permits the determination of which subjects had SMC and allows the scores to be made dichotomous (Reid and MacLulich 2006). Asking one, two or three general questions is a frequently used scoring method even when such questions have not been validated. In contrast, questionnaires like the MFE permit the subject to explore deeper into self-examination of their memory across a wide variety of everyday situations. The MFE evaluates frequency and severity in a more detailed fashion. The present results allow us to conclude that questionnaires, when available, are a desirable test of SMC. CQs are particularly useful in population studies, especially prevalence studies, in which it would be impossible to administer a questionnaire because of time constraints.

The present study has several limitations. Its cross-sectional design confers on it certain limitations and conditions associated with this methodology, e.g. this kind of study is not adequate to establish the relationships of causality. Taking into account that these are people who have some concerns about their memory functioning, the frequency of memory complaints is higher than the prevalence of complaints in the general population. We have not given a frequency data because the study does not apply to establish the prevalence of complaints. Also, there are variables that other investigations have found to be associated with SMC, but we have not studied (personality, anxiety, cognitive domains like attention, executive functions, chronic diseases, cerebral metabolism, etc.). In addition, the sample was not representative of the general population of older adults, since it is not the result of random sampling, stratified by age, sex, educational level etc. However, it should be pointed out that, except for population-based studies, most research on complaints are performed without random sampling, although this limits the generalisation of results. Moreover, the memory complaints questions are not validated, but we chose the most commonly used in studies on this topic (Reid and MacLulich 2006). Our work was performed in a clinical setting, not with patients but with people who attended due to interest in their own memory performance. The association of SMC with other variables depends at least in part on the method used and the scope of the study (clinical or epidemiological, subjects of all ages or only older adults, individuals with or without cognitive decline, a single question or questionnaires, etc.).

Conclusion

These results suggest important practical implications. Health professionals, particularly primary care providers (PCPs), are increasingly on the front line of cognitive impairment detection and treatment. They often rely on

SMC information provided by patients and their families to decide whether or not to take action. In light of the present results, when PCPs encounter people with SMC, it would be useful to consider not only cognitive status, but also self-perceived general health and mood. Another conclusion of our results is the need to help older adults in their subjective experience of age-related changes (Diehl and Wahl 2010) and by this means contribute to a more active and healthy lifestyle.

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