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University Nancy 2, France

RÉSUMÉ

Cette recherche a pour objectif l'étude des qualités psychométriques d'une version française du Multifactorial Memory Questionnaire (MMQ) (Troyer et Rich, 2002). Le MMQ a été élaboré pour être utilisé à la fois dans une perspective clinique et dans une perspective de recherche. Il évalue le fonctionnement mnésique subjectif (c'est-à-dire les affects relatifs aux aptitudes de mémoire, l'occurrence de problèmes survenant dans différentes situations et l'utilisation de stratégies dans la vie quotidienne). Le questionnaire a été administré à 294 sujets adultes et âgés (de 46 à 94 ans). Les résultats permettent de conclure que notre version présente de bonnes qualités psychométriques. En effet, ils ont montré la fiabilité du questionnaire (les coefficients α de Cronbach varient de 0,79 à 0,88 pour les différentes sous-échelles) et des corrélations significatives dans le sens attendu avec d'autres constructs (les coefficients de corrélation varient entre -0,34 et 0,39). La validité convergente des scores au MMQ a été mise en évidence par des corrélations significatives positives avec plusieurs sous-échelles du Metamemory in Adulthood (MIA), à savoir les sous-échelles *anxiété, changement, capacité* et *stratégie*. Cependant, la solution à trois facteurs obtenue avec la version originale n'a pas été validée dans notre étude. Une analyse factorielle exploratoire a montré qu'une solution à quatre facteurs permet une interprétation plus adéquate des scores. Deux des dimensions proposées par Troyer et Rich (2002) ont été répliquées : les dimensions *satisfaction* et *problèmes*. La troisième sous-échelle (*stratégies*) a été subdivisée en deux facteurs : *stratégies internes* et *stratégies externes*.

ABSTRACT

The aim of this study was to examine the psychometric properties of a French version of the Multifactorial Memory Questionnaire (MMQ) (Troyer & Rich, 2002). The MMQ, which is suited to clinical and research purposes, evaluates subjective memory functioning (i.e., affect related to memory abilities, frequency of problems remembering in different situations, and strategy use in everyday life). The questionnaire was administered to 294 French adult or elderly subjects (46–94 years old). The results allowed us to conclude that the French version of this scale is psychometrically sound. Indeed, the scores proved to be highly reliable (Cronbach's α for the subscales ranged from 0.79 to 0.88) and correlated in the expected directions with measures of other constructs (correlation coefficients ranged from -0.34 to 0.39). Convergent validity evidence for MMQ scores was provided by their statistically significant positive correlations (from 0.56 to 0.73) with several dimensions of the Metamemory in Adulthood scale (MIA) (i.e., the *anxiety change, capacity* and *strategy* dimensions). However, the three-factor model found in the original version was not validated here. An exploratory factor analysis revealed that a four-factor solution offered the most interpretable pattern for the factor scores. Two of the dimensions proposed by Troyer and Rich (2002) were replicated: *ability* and *contentment*. The third subscale (*strategy*) was divided into two factors: *internal strategies* and *external strategies*.

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Prof. Kamel Gana
Groupe d'Analyse Psychométrique des conduites
Université Nancy 2
B.P. 3397
54015 Nancy – France
(kamel.gana@univ-nancy2.fr)

Metamemory is commonly defined as the knowledge one has of general memory functioning, along with the monitoring and control processes that allow subjects to regulate their memory activity and content (Boucheron, 1993). This definition includes two domains that refer to knowledge of memory functioning and to monitoring and control processes that are used to perform memory tasks. According to Hultsch, Hertzog, Dixon, and Davidson (1988), the knowledge domain itself has two kinds of content: (a) factual knowledge about tasks, processes, and memory strategies; and (b) the subject's beliefs about her/his own memory abilities. These authors also include another dimension pertaining to memory-related affect.

Metamemory has been studied mainly within two fields: educational psychology and the psychology of aging. In the latter field, it is considered to offer a possible explanation for the aging of memory abilities. According to Hertzog, Dixon, and Hultsch (1990), "Metamemory, in turn, may be a contributing factor to deficient strategy utilization by older persons in two ways: (a) failure to construct and /or identify the strategic behavior necessary to optimize task performance, (b) inadequate ability to monitor the contents of memory" (p. 168). They add that older people may have accurate knowledge about memory functioning but negative beliefs about their own abilities (Hertzog et al., 1990). Many studies about age differences in metamemory support this hypothesis, demonstrating that older subjects provide lower self-ratings of ability than younger subjects, report more memory problems, and use external aids more often (Ryan, 1992; Chaffin & Herrmann, 1983; Cavanaugh & Poon, 1989; Erber, Szuchman, & Rothberg, 1992; Loewen, Shaw, & Craik, 1987; West, Thorn, & Bagwell, 2003).

In the field of aging psychology today, we are witnessing an evolution in the place given to metamemory, insofar as the relationships between metamemory and concepts from social cognition are now being considered. Cavanaugh (1998) and Cavanaugh, Feldman, and Hertzog (1998) feel it is useful to integrate other concepts into a model of these relationships in order to specify the nature of knowledge and beliefs about memory. For instance, according to Cavanaugh, *schematicity* concerning memory loss is one of the characteristics of cognitive structures, which in turn determines some of the representations or stereotypes associated with memory aging. Schematicity shows up in the elderly in an increase in memory problems over those of young people, and this leads to negative self-ratings among older subjects. This relationship between general beliefs about memory aging and beliefs about one's abilities has been empirically supported by Lineweaver and Hertzog (1998). Hence, stereotypes concerning memory aging will influence the way subjects answer questions dealing with the self-evaluation of abilities.

Another specificity of the concept of metamemory, as it is considered in aging studies, is that it encompasses the concept of memory complaint. Memory complaint refers to an impression that one's memory abilities become impaired with age (Dérouesné, 1996). While ability self-rating is itself a dimension of metamemory, it also seems to underlie memory complaint. Moreover, theoretical (Dérouesné, 1996) and empirical (Plotkin, Mintz, & Jarvik, 1985; Bolla, Lindgren, Bonaccorsy, & Bleecker, 1991; Johansson, Allen-Burge, & Zarit, 1997) evidence have been found regarding the relationship between memory complaint and depression. Studying the link between depression and self-evaluation of ability could help us gain a partial understanding of how self-ratings are elaborated.

Measuring Subjective Memory Functioning

A person's awareness and knowledge of her/his own memory functioning are mainly measured by self-report. Some measures deal only with self-ratings of memory in various situations or with the frequency of forgetting in everyday life. Others deal with a more diverse range of topics, such as changes in a subject's abilities during the past, her/his reaction to a memory failure, or the influence of affective factors (Herrmann, 1982; Gilewski & Zelinski, 1986).

The most widely used questionnaire dealing solely with frequency of forgetting and ability self-rating is the Inventory of Memory Experiences (IME), discussed by Herrmann and Neisser (1978). A short version of this questionnaire (the Short Inventory of Memory Experiences [SIME]) is described by Herrmann (1982). Like the original version, it has two components. The first contains 24 items related to forgetting and covers the following areas: intentions, people, names, geographical information, conversations, things learned by rote, absent-mindedness, and failure to retrieve something one knows. The second part contains two sections: recall of early childhood (four items) and recall of various specific events (four items). This version has been used in several studies pertaining to age differences or to the relationships between metamemory and memory (Chaffin & Herrmann, 1983; Cavanaugh & Poon, 1989; Erber et al., 1992; Ryan, 1992). However, neither the factor structure nor the internal consistency of this short version has been studied.

The most frequently used questionnaires dealing with diverse topics are the Memory Functioning Questionnaire and the Metamemory in Adulthood Questionnaire (Ryan, 1992; Boucheron, 1993; Cavanaugh & Poon, 1989; Gilewski, Zelinski, & Schaie, 1990; Loe-

wen et al., 1987, McDonald-Miszczak, Gould, & Tychynski, 1999; Lane & Zelinski, 2003). The Memory Functioning Questionnaire was designed as a self-report measure of daily-memory functioning in adults. It was derived from Zelinski, Gilewski, and Thompson's (1980) Metamemory Questionnaire and was shortened by factor analysis, using the principle-axes method (Gilewski et al., 1990). The authors obtained a final questionnaire containing 63 items. The factor analysis revealed four factors that accounted for 36.6 per cent of the variance: Factor 1 was interpreted as a *general frequency-of-forgetting* factor, factor 2 as called *seriousness of forgetting*, factor 3 was interpreted as a *retrospective-functioning* factor, and factor 4 included items about strategy use and was named *mnemonic use*. This factor structure was shown to be stable. Moreover, the α coefficients of the different factors varied from 0.83 to 0.94, indicating good internal consistency within each factor. The MFQ has been translated into French (Israël & Waintraub, 1996), but the psychometric properties of this version have not been investigated.

The Metamemory in Adulthood (MIA) scale was developed by Dixon and Hultsch (1983). The authors aimed to devise a multifactorial psychometric instrument to represent a multidimensional construct of metamemory in adulthood. After an examination of questionnaires and interviews about semantic memory, episodic memory, metamemory, metacognition, and self-perception, an initial pool of 206 items was generated. A content analysis of this pool led the authors to retain 120 items, assessing the following dimensions: *strategy* (memory strategy use), *task* (knowledge about memory processes and tasks), *capacity* (knowledge about one's own abilities), *change* (perceived evolution of one's memory), *activity* (activities maintaining memory), *anxiety* (memory and anxiety state), *motivation* (importance of succeeding in a task), and *locus* (locus of control in memory abilities). Alpha coefficients indicated relatively high estimates of internal consistency (from 0.61 to 0.93), except in the case of the activity dimension (0.50). The results of a factor analysis showed that seven of the eight dimensions were clearly distinct, but the capacity dimension was correlated with the change dimension. Moreover, within the strategy dimension, one could distinguish between use of internal strategies and use of external strategies (Dixon & Hultsch, 1983). Although the reliability and validity of the MIA have been supported by previous research, its dimensionality has not been demonstrated (Hertzog, Hultsch, & Dixon, 1989). Moreover, the MIA has been validated in French (Boucheron, 1993). Boucheron (1993) conducted a principal component analysis of the MIA. With the exception of activity, all of the dimensions were identified. She also found satisfactory estimates of the internal consistency of the dimensions ($\alpha = 0.78$ to 0.94), with the exception of motivation ($\alpha = 0.62$).

Troyer and Rich (2002) considered the existing questionnaires to have several drawbacks that made their clinical use difficult. The drawbacks were related to the content of the items, the fact that some items are not relevant for all subjects, the length of the questionnaires, and the diversity of the topics covered. Therefore, Troyer and Rich (2002) designed the Multifactorial Memory Questionnaire (MMQ). The MMQ consists of 57 items, aimed at measuring three hypothetical dimensions of metamemory judgements: *memory contentment*, *memory ability self-appraisal*, and *strategy use in everyday life*. The authors were careful to create short items and to include only items dealing with situations where action is possible, along with some situations relevant to memory use in everyday life. Memory contentment deals with the feeling subjects have about their current memory ability (confidence, satisfaction, embarrassment, irritation) and with the self-rating of abilities. It includes 18 items in 5-point Likert format, ranging from *strongly agree* to *strongly disagree*, with higher scores indicating higher satisfaction with one's memory. Memory ability addresses frequency of forgetting in different situations. It contains 20 items that ask the subject to rate the frequency of trouble that she/he has experienced in the last 2 weeks on a 5-point Likert-type scale, ranging from *never* to *always*, with higher scores indicating more memory problems. The strategy dimension deals with strategy use in everyday life. It includes 19 items. Participants answer on 5-point Likert-type scales, ranging from *never* to *always*, in accordance with how often they used the strategies in the last 2 weeks. Higher scores indicate a greater propensity to use mnemonic strategies. The MMQ was used by Troyer (2001) in a study about the effects of an intervention program for older adults.

Troyer and Rich (2002) examined the internal consistency, test–re-test reliability, and construct validity of scores on the MMQ scales among 130 middle-aged and elderly subjects (79% were female) aged from 40 to 91 years ($M = 71.7$, $SD = 9.9$). The mean level of education was 13.8 years (ranging from 3 to 21, $SD = 2.8$). Cronbach's α was 0.95 for MMQ-contentment, 0.93 for MMQ-ability, and 0.83 for MMQ-strategy. Test–re-test correlations after a 4-week interval were strong, ranging from 0.86 to 0.93 ($N = 24$). The convergent validity of the MMQ scales was demonstrated by their correlations with the Memory Functioning Questionnaire (MFQ), the Memory in Adulthood Questionnaire (MIA), and objective memory tasks. Discriminant validity was demonstrated by the lack of a correlation between the MMQ scales and

attention tests. A principal component analysis with varimax rotation identified three factors corresponding to the hypothesized questionnaire scales. The MMQ seems to be psychometrically sound and ready for clinical use.

The aim of the present study was to develop a French version of the MMQ and to examine its psychometric properties in order to provide a tool for research and clinical purposes. Indeed, to our knowledge, the psychometric properties of a French version of a metamemory questionnaire have been investigated only for the MIA. Therefore, this study will provide researchers and practitioners with the opportunity to select among several questionnaires to assess metamemory.

Method

Translating and Adapting the MMQ

The MMQ was translated in three steps. Firstly, four translations were produced by four English-speaking persons, one of whom was a professional translator. Secondly, for each item, each translator was asked to select which of the four translations best represented the meaning of the original item. Finally, an experimental version generated from the answers given by the translators was discussed, revised, and approved by a committee of psychologists working in the field of psychological measurement.[1] The final version is presented in the Appendix.

Participants and Procedure

The study participants were 294 French adults (196 women and 98 men). Their average age was 65.9 years (ranging from 46 to 94, $SD = 10.9$); 93.8 per cent lived in their own homes, 5.8 per cent lived in retirement houses, and 33.9 per cent had 12 or more years of education. They were contacted by the authors' students or through retirement clubs and associations. Participants were informed of the voluntary and anonymous nature of the study.

Measures

The participants filled out the MMQ individually, in the format originally proposed by Troyer and Rich (2002). The other measures described below were used to evaluate the construct validity of this scale.

An abridged French version of the MIA scale (Dixon & Hultsch, 1983) validated by Boucheron (1993) was administered. This is a 48-item questionnaire in 5-point Likert format assessing four dimensions of metamemory: *anxiety* (8 items, such as "I do not get flustered when I am put on the spot to remember new things"), *change* (15 items, such as "The older I get, the harder it is to remember things clearly"), *capacity* (11 items, such as "I am good at remembering names") and *strategy* (14 items, such as "Do you write appointments on a calendar to help you remember them?"). Alpha coefficient estimates of reliability for the scores on each dimension were 0.85, 0.91, 0.61, and 0.87, respectively.

A French version of the short version of the Geriatric Depression Scale (GDS) (Sheikh & Yesavage, 1986; Burke, Roccaforte, & Wengel, 1991) validated by Bourque et al. (1990) was used to assess mood disorders. This is a 15-item, dichotomously scored scale, in which respondents are asked to respond *yes* or *no* to each item. A sample item from this scale is, "Are you in good spirits most of the time?" Note that the scale was designed especially for the elderly, but it is also suitable for younger participants. Kuder-Richarson's estimate of reliability for scores on the GDS was 0.78. Because research has demonstrated that mood affects not only cognitive functioning but also self-confidence, we hypothesized that scores on the MMQ would be positively correlated with scores on the GDS (Ide, McDougall, & Wykle, 1999; McDougall, 1998).

Fort's (2000) Memory Aging Questionnaire (MAQ) was administered to assess how participants conceived of memory changes with advancing age. The MAQ is a 12-item scale in 5-point Likert format, with lower scores indicating stronger beliefs that aging is associated with declining memory performance. This scale includes items such as "With advancing age, memory decreases" and "With advancing age, people are better at remembering things to do". The reliability of the scores on this scale was satisfactory ($\alpha = 0.80$). We hypothesized that negative beliefs about age-related memory performance would be negatively associated with metamemory judgements.

Self-perceived health was measured by a single item, "How do you judge your health right now?" Answers were given on a 5-point scale (ranging from *very poor* to *excellent*), with higher scores indicating greater satisfaction with one's health (better self-perceived health).

Results

Comparisons with the English-Speaking Sample

The MMQ means are presented in Table 1, along with scores from an English-speaking sample (Troyer & Rich, 2002). To compare the two samples, t tests were performed. The results showed that our sample had higher scores than the English-speaking sample on the contentment and ability dimensions of metamemory, but scored lower on the strategy dimension. Note, though, that our sample was younger than the English-speaking sample ($M = 65.9$ in our study and $M = 71.7$ in the original study, $p < 0.000$).

Table 1: Descriptive statistics for the dimensions of the MMQ

	Contentment		Ability		Strategy		Age	
	French-speaking sample *N* = 294	English-speaking sample *N* = 115	French-speaking sample *N* = 294	English-speaking sample *N* = 115	French-speaking sample *N* = 294	English-speaking sample *N* = 114	French-speaking sample *N* = 294	English-speaking sample *N* = 115
Mean	45.0	39.3	53.9	45.0	26.8	40.0	65.9	71.7
Standard Deviation	10.5	14.0	9.2	11.3	10.2	10.0	10.9	9.9

Factorial Structure

A maximum-likelihood confirmatory factor analysis was conducted to evaluate the three-dimensional model proposed by Troyer and Rich (2002). This model did not adequately fit the data: $\chi^2 = 1{,}522.5$ ($df = 1{,}081$, $p = 0.00$), AGFI = 0.80, RMSEA = 0.04. A principal component analysis, followed by a varimax rotation, was then performed. The conditions for use of a factor analysis were evaluated by applying Bartlett's dimension test and the Kaiser-Meyer-Olkin test. The χ^2 value on Bartlett's test was 6,032.5 ($df = 1{,}596$, $p = 0.000$) and the value on the Kaiser-Meyer-Olkin test was 0.88, both indicating data factorability. The number of factors extracted was based on the eigenvalues greater than 1, a scree plot, and the interpretability of the solution. The initial analysis was run without specifying the number of factors to be extracted. This procedure resulted in 16 factors with eigenvalues greater than 1. However, after many trials, the four-factor solution provided the best interpretable factor patterns. This solution accounted for 36.4 per cent of the total variance in the questionnaire responses. Items with structure coefficients greater than or equal to $|0.30|$ were treated as meaningful for the interpretation.

Factor 1 (eigenvalue = 12.11) accounted for 21.3 per cent of the common variance and included all items on the ability dimension of the MMQ. Factor 2 (eigenvalue = 3.39) accounted for 5.9 per cent of the total variance and included all but one item of the contentment dimension. Factor 3 (eigenvalue = 2.84) accounted for 4.9 per cent of the common variance and included nine items from the strategy dimension. It was labelled the *internal strategy* factor. Factor 4 (eigenvalue = 2.40) accounted for 4.2 per cent of the common variance and included nine other items from the MMQ strategy dimension. This factor was named the *external strategy* factor. Only two items (C9 and ST3) did not have high coefficients (0.30 or above) on any factor.

Internal Consistency of Scores on the French Version of the MMQ

The internal consistencies of the scores on the items constituting each MMQ dimension were examined using Cronbach's α coefficients. For the contentment dimension, α was 0.88 (0.95 in the original version); for ability, α was 0.88 (0.93 in the original version); and for strategy, α was 0.79 (0.83 in the original version).

We also conducted an item analysis in order to provide evidence of internal consistency and identify items that failed to contribute appreciably to the respective total dimension scores. All but two item–total correlation coefficients for the contentment dimension exceeded 0.30; all but one item–total correlation coefficient for the ability dimension exceeded 0.30; and all but three item–total correlation coefficients for the strategy dimension exceeded 0.30. However, dropping these items did not improve α coefficient estimates.

Construct Validity

Like Troyer and Rich (2002), we studied convergent validity between the MMQ and the MIA by computing correlation coefficients. Table 3 summarizes the results. The contentment dimension of the MMQ was significantly correlated with both anxiety and change on the MIA ($r = -0.56$, $p < 0.001$; and $r = 0.60$, $p < 0.001$), which is similar to the results reported by Troyer and Rich (2002): $r = -0.57$, $p < 0.001$; and $r = 0.61$, $p < 0.00$. These results indicate that a high degree of memory satisfaction was associated with a low level of anxiety and a feeling of stability concerning one's abilities. Strong, significant correlations ($r = 0.61$, $p < 0.001$) were found between the MMQ ability dimension and the MIA ability dimension (as reported by Troyer and Rich [2002], $r = 0.60$, $p < 0.001$). This association indicates that an optimistic rating of one's abilities was associated with few reports of difficulty. The strategy dimension of the MMQ was strongly and significantly correlated with the strategy dimension of the MIA ($r = 0.76$, $p < 0.001$).

Table 2: Varimax rotated structure matrix for the MMQ (*N* = 294)

MMQ Item[a]	Structure coefficients[b]				Communalities
	Factor1	Factor 2	Factor 3	Factor 4	
C1	0.353	**0.640**	0.151	-0.185	0.603
C2	0.311	**0.682**	-0.070	0.015	0.570
C3	0.303	**0.300**	0.059	0.144	0.206
C4	0.132	**0.598**	0.201	-0.070	0.432
C5	0.207	**0.482**	0.097	0.099	0.295
C6	0.459	**0.596**	0.078	-0.143	0.603
C7	0.253	**0.671**	0.002	-0.025	0.533
C8	0.144	**0.586**	0.268	0.134	0.481
C9	0.015	0.154	0.086	0.125	0.064
C10	0.100	**0.383**	0.104	-0.132	0.195
C11	0.234	**0.593**	0.152	-0.041	0.431
C12	0.356	**0.629**	0.010	-0.183	0.582
C13	0.011	**0.429**	-0.014	-0.197	0.236
C14	0.205	**0.510**	0.303	-0.072	0.418
C15	0.225	**0.511**	0.280	0.166	0.434
C16	0.083	**0.407**	0.142	-0.210	0.261
C17	0.349	**0.568**	0.109	-0.010	0.510
C18	0.006	**0.770**	0.196	-0.064	0.608
A1	**0.359**	0.025	0.256	0.238	0.377
A2	**0.489**	0.060	0.119	0.033	0.264
A3	**0.479**	0.337	0.010	-0.145	0.377
A4	**0.511**	0.241	0.083	-0.217	0.407
A5	**0.660**	0.114	0.019	-0.081	0.458
A6	**0.512**	0.109	0.258	0.157	0.433
A7	**0.416**	0.224	0.008	-0.377	0.461
A8	**0.628**	0.115	0.080	-0.107	0.431
A9	**0.402**	0.284	0.029	-0.278	0.500
A10	**0.422**	0.319	0.001	-0.278	0.379
A11	**0.576**	0.058	0.181	0.114	0.408
A12	**0.398**	0.303	0.050	-0.144	0.401
A13	**0.658**	0.097	0.129	0.025	0.461
A14	**0.455**	0.188	0.090	-0.229	0.494

a C = Contentment; A = Ability; ST = Strategies

b Entries in bold are coefficients for salient items with a factor.

Table 2 Continued

MMQ Item[a]	Structure coefficients[b]				Communalities
	Factor 1	Factor 2	Factor 3	Factor 4	
A15	**0.532**	0.173	-0.158	-0.020	0.395
A16	**0.383**	0.297	-0.082	-0.201	0.285
A17	**0.374**	0.121	-0.256	-0.098	0.231
P18	**0.545**	0.214	-0.014	-0.148	0.390
P19	**0.548**	0.144	0.052	-0.157	0.352
A20	**0.441**	0.319	-0.060	-0.127	0.338
ST1	-0.229	-0.064	0.084	**0.448**	0.292
ST2	-0.558	-0.025	0.169	**0.316**	0.452
ST3	-0.013	-0.023	0.240	-0.098	0.120
ST4	-0.098	-0.128	**0.579**	-0.092	0.449
ST5	-0.094	-0.064	-0.109	**0.657**	0.495
ST6	-0.106	-0.072	**0.457**	0.059	0.268
ST7	0.040	-0.017	0.239	**0.428**	0.257
ST8	-0.133	-0.191	**0.406**	0.207	0.264
ST9	-0.045	-0.196	0.326	**0.451**	0.354
ST10	-0.151	-0.033	-0.113	**0.686**	0.515
ST11	-0.074	-0.006	**0.458**	0.369	0.403
ST12	-0.290	-0.101	0.354	**0.540**	0.536
ST13	-0.180	-0.046	**0.643**	0.044	0.453
ST14	-0.144	-0.121	**0.667**	-0.052	0.521
ST15	0.047	-0.118	0.309	**0.382**	0.354
ST16	0.058	-0.046	**0.460**	0.012	0.234
ST17	-0.053	-0.120	**0.640**	0.170	0.466
ST18	-0.238	-0.020	0.309	**0.413**	0.379
ST19	-0.330	-0.065	**0.472**	0.293	0.422

a C = Contentment; A = Ability; ST = Strategies

b Entries in bold are coefficients for salient items with a factor.

This correlation is higher than that reported by Troyer and Rich (2002) ($r = 0.64$, $p < 0.001$) and signifies that frequent use of the strategies assessed by the MMQ was associated with frequent use of the strategies assessed by the MIA.

As expected, a significant correlation was found between depressed mood and metamemory judgements. Table 3 shows that the three dimensions of the MMQ were significantly correlated with the GDS scores. Clearly, a depressed mood was negatively correlated with satisfaction with one's memory abilities ($r = -0.34$, $p < 0.001$) and frequency of forgetting ($r = -0.25$, $p < 0.001$) and positively correlated with the use of mnemonic strategies, especially internal ones ($r = 0.16$, $p < 0.001$).

Also as expected, a significant correlation was found between metamemory judgements and beliefs about aging-related memory performance. Table 3 shows that the three MMQ dimensions were significantly correlated with stereotypes about aging memory. These results mean that beliefs in negative stereotypes about memory aging were associated with a low degree of satisfaction with one's abilities ($r = 0.29$, $p < 0.001$), substantial reporting of memory problems

Table 3: Correlations between the MMQ dimensions, the MIA dimensions, depression level, stereotypes about memory aging, and demographic variables

	MMQ—Contentment	MMQ—Ability	MMQ—Strategy	MMQ—Internal Strategies	MMQ—External Strategies
MIA—Capacity		0.61**			
MIA—Change	0.60**				
MIA—Anxiety	-0.56**				
MIA—Strategy			0.73**	0.57**	0.73**
Depression Level	-0.34**	-0.24**	0.16**	0.16**	0.11
Stereotypes about Aging	0.29**	0.39**	-0.20**	-0.09	-0.30**
Age	-0.11	-0.13*	0.09	0.03	0.14*
Education	-0.01	-0.05	0.15**	0.08	0.21**
Self-perceived Health	0.26**	0.20**	-0.15**	-0.08	-0.17**

**Significant at $p < 0.01$; * Significant at $p < 0.05$

($r = 0.39$, $p < 0.001$), and frequent use of mnemonic strategies, especially external ones ($r = -0.29$, $p < 0.001$).

Finally, correlations between metamemory judgements, on the one hand, and age, education, and self-perceived health, on the other, were computed. As shown in Table 3, only ability and external strategies exhibited small, but statistically significant, correlations with age: $r = -0.14$, $p < 0.03$; and $r = 0.15$, $p < 0.01$. With advancing age, subjects tended to report more memory problems and used external mnemonic strategies more frequently. Note that Troyer and Rich (2002) did not report any significant correlations between age and the MMQ dimensions in their English-speaking sample. Level of education was significantly correlated with the MMQ strategy dimension only (more precisely, for external strategies, $r = 0.21$, $p < 0.02$). Self-perceived health was positively correlated with contentment ($r = 0.26$, $p < 0.001$) and ability ($r = 0.20$, $p < 0.001$), and negatively correlated with strategy ($r = -14$, $p < 0.02$). Positive self-perceived health was related to a lesser propensity to use mnemonic strategies, fewer remembering problems, and greater satisfaction with one's abilities.

Discussion

This article focuses on the factor structure, construct validity, and reliability estimates of scores on the French version of the MMQ. The results allow us to conclude that our French version of this scale is psychometrically sound. Indeed, the scores on the French MMQ proved highly reliable and correlated in the expected directions with other constructs. Evidence for the convergent validity of the MMQ scores was provided by their statistically significant positive correlation with the MIA. Correlations between the MMQ subscales and the MIA subscales were strong, ranging from 0.56 to 0.73, and similar to those obtained by Troyer and Rich (2002) in their original study. Validity was evaluated by examining the relationships between subscale scores and external variables. We found that metamemory judgements were associated in the expected direction with depressed mood (as in previous studies; see Plotkin et al., 1985; Bolla et al., 1991; Johansson et al., 1997) and to negative beliefs about aging-related memory performance (as hypothesized by Hertzog et al., 1990). It should be noted that beliefs in negative stereotypes about memory aging were associated with the frequent use of external mnemonic strategies, which could be conceived of as a way of compensating for one's real or imaginary memory impairment. Also, we found that perceived good health was related to a lesser propensity to use mnemonic strategies, less frequent occurrence of memory problems, and more satisfaction with one's abilities. Our results revealed that, with advancing age, subjects tend not only to report more problems remembering but also to use external mnemonic strategies more often. These results are in line with those obtained by other authors who have examined the relationship between metamemory and age (Ryan, 1992; Chaffin & Herrmann, 1983; Cavanaugh & Poon, 1989; Erber et al., 1992; Loewen et al., 1987). Finally, we found that the higher the subjects' level of education, the more they relied on mnemonic strategies. These results can serve to establish the nomological validity of the MMQ scores.

Regarding the factor structure, the results of the confirmatory factor analysis did not support the a priori three-factor model of the MMQ. An exploratory factor

analysis revealed that a four-factor solution offers the most interpretable pattern of factor scores, accounting for 36.4 per cent of the common variance in the data set. Two of the dimensions proposed by Troyer and Rich (2002) were replicated here: ability and contentment. Note that, according to Cavanaugh et al. (1998), answers to self-rating memory ability (like those in the contentment subscale) and to frequency of forgetting items (like those in the problem subscale) are determined by *memory self-efficacy*, defined as "a set of beliefs about one's capability to use memory effectively in various situations" (Cavanaugh et al., 1998, p. 52). Hence, the contentment and ability dimensions of the MMQ can be seen as different measures of memory self-efficacy. The third subscale (strategy) was divided into two factors: internal strategies and external strategies. Internal strategies are strategies that rely on subjects' using mental elaboration in order to improve their memory (e.g., by creating a visual image, organizing information to retain, or rehearsing what they want to remember), while external strategies concern modifications of the subject's environment and the search for external clues to optimize performance (e.g., writing down things to do or setting an alarm clock). This distinction was established in an earlier study that validated the MIA (Dixon & Hultsch, 1983). Moreover, this measure allows us to gain further information about a possible preference of subjects for one type of strategy and to plan specific clinical services that fit with the subject's preferences.

Although the results provide support for the psychometric properties of the French version of the MMQ, additional research is needed to further examine predictive validity among clinical samples, using objective measures. Correlations between scores obtained by self-report measures reflect some shared method variance. Confirmatory factor analyses (CFA) on various samples (for instance, young subjects or cognitively impaired subjects) are needed to achieve factorial structure invariance of the MMQ. The usefulness of CFA in construct validation is now well known and well documented. In fact, standardized factor loadings generated by CFA can be regarded as "validity coefficients" (Bollen, 1989). In other words, a factor loading serves as an index of how good the item is at indicating the underlying construct it is intended to measure.

Note

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Appendix: French version of the MMQ

MMQ — Contentment

1. En général, mes capacités de mémoire me satisfont.
2. Ma mémoire flanche vraiment.
3. Si quelque chose est important, je m'en souviendrai probablement.
4. Lorsque j'oublie quelque chose, j'ai peur d'avoir un problème grave, du type maladie d'Alzheimer.
5. Ma mémoire est moins bonne que celle de la plupart des gens de mon âge.
6. J'ai confiance en ma capacité à me souvenir des choses.
7. Je suis mécontent quand je pense à la capacité de ma mémoire.
8. Je suis inquiet à l'idée qu'on remarque que ma mémoire n'est pas très bonne.
9. Lorsque j'ai du mal à me souvenir de quelque chose, je ne me juge pas trop sévèrement.
10. Je me soucie de ma mémoire.
11. Ma mémoire a vraiment baissé ces derniers temps.
12. Je suis généralement satisfait de ma capacité à me souvenir.
13. Je ne m'en fais pas lorsque j'ai du mal à me souvenir de quelque chose.
14. J'ai peur d'oublier quelque chose d'important.
15. J'ai honte de ma capacité de mémoire.
16. Cela m'agace ou m'énerve lorsque j'oublie des choses.
17. Ma mémoire est bonne pour mon âge.
18. Je m'inquiète à propos de ma mémoire.

MMQ — Ability

1. Vous arrive-t-il d'oublier de payer une facture à temps ?
2. Vous arrive-t-il de perdre quelque chose dont vous vous servez quotidiennement, comme vos clés ou vos lunettes ?
3. Vous arrive-t-il d'avoir du mal à vous souvenir du numéro de téléphone que vous venez de chercher ?

4. Vous arrive-t-il de ne pas vous souvenir du nom d'une personne que vous venez de rencontrer ?
5. Vous arrive-t-il d'oublier quelque chose que vous aviez prévu de prendre avec vous ?
6. Vous arrive-t-il d'oublier un rendez-vous ?
7. Vous arrive-t-il d'oublier ce que vous alliez faire, par exemple, d'entrer dans une pièce et d'oublier pourquoi vous y êtes venu ?
8. Vous arrive-t-il d'oublier de faire une course ?
9. Vous arrive-t-il d'avoir des difficultés à trouver le mot que vous cherchez ?
10. Vous arrive-t-il d'avoir des problèmes pour vous souvenir des détails d'un article de journal ou de magasine que vous avez lu plus tôt dans la journée ?
11. Vous arrive-t-il d'oublier de prendre vos médicaments ?
12. Vous arrive-t-il de ne pas vous souvenir du nom d'une personne que vous connaissez depuis assez longtemps ?
13. Vous arrive-t-il d'oublier de transmettre un message ?
14. Vous arrive-t-il d'oublier ce que vous alliez dire au cours d'une conversation ?
15. Vous arrive-t-il d'oublier un anniversaire ou la date d'un événement important dont vous aviez l'habitude de vous souvenir ?
16. Vous arrive-t-il d'oublier un numéro de téléphone que vous utilisez fréquemment ?
17. Vous arrive-t-il de raconter deux fois une histoire ou une blague à la même personne parce que vous avez oublié que vous la lui avez déjà racontée ?
18. Vous arrive-t-il de ne pas retrouver quelque chose que vous aviez rangé il y a quelques jours ?
19. Vous arrive-t-il d'oublier quelque chose que vous aviez l'intention d'acheter ?
20. Vous arrive-t-il d'oublier les détails d'une conversation récente ?

MMQ — Strategy

1. Vous arrive-t-il d'utiliser un minuteur ou une sonnerie pour vous rappeler de faire quelque chose ?
2. Vous arrive-t-il de demander à quelqu'un de vous aider à vous souvenir de quelque chose ou de vous rappeler de faire quelque chose ?
3. Vous arrive-t-il de créer une rime en rapport avec ce dont vous voulez vous souvenir ?
4. Vous arrive-t-il de créer une image mentale à partir de ce dont vous voulez vous souvenir, comme associer un nom et un visage ?
5. Vous arrive-t-il de noter vos rendez-vous ou des choses à faire sur un calendrier ?
6. Vous arrive-t-il de parcourir l'alphabet lettre par lettre dans l'espoir de vous rappeler un nom ou un mot ?
7. Vous arrive-t-il d'organiser l'information dont vous voulez vous souvenir, par exemple d'organiser votre liste de courses selon les rayons alimentaires ?
8. Vous arrive-t-il de répéter quelque chose à voix haute pour le mémoriser, comme un numéro de téléphone que vous venez de chercher ?
9. Vous arrive-t-il d'utiliser un rituel pour vous souvenir de choses importantes, comme vérifier que vous avez votre porte monnaie et vos clés quand vous partez de chez vous ?
10. Vous arrive-t-il de faire une liste, par exemple pour les commissions ou les choses à faire ?
11. Vous arrive-t-il d'ajouter ou de développer mentalement des détails autour de quelque chose dont vous souhaitez vous souvenir, par exemple pour vous souvenir de l'endroit où se trouve la maison de quelqu'un, vous vous rappelez qu'elle est au bout de la rue, à côté de la boulangerie ?
12. Vous arrive-t-il de mettre quelque chose bien en vue afin de vous souvenir de faire quelque chose, comme par exemple mettre votre parapluie près de la porte pour ne pas l'oublier ?
13. Vous arrive-t-il de répéter quelque chose à des intervalles de plus en plus longs de manière à vous en souvenir ?
14. Vous arrive-t-il d'inventer une histoire pour relier des informations dont vous voulez vous souvenir ?
15. Vous arrive-t-il d'écrire dans un calepin les choses dont vous voulez vous souvenir ?
16. Vous arrive-t-il de créer un sigle avec les premières lettres d'une liste de choses à vous rappeler ? Par exemple CPP: carottes, pommes et pain.
17. Vous arrive-t-il de vous concentrer intentionnellement sur quelque chose de manière à vous en souvenir ?
18. Vous arrive-t-il d'écrire des notes ou des pense bête (ailleurs que sur un calendrier ou un calepin) ?
19. Vous arrive-t-il de refaire mentalement votre parcours pour vous souvenir de quelque chose, par exemple pour savoir où se trouve un objet que vous avez perdu ?

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