

This article was downloaded by: [Tufik, Sergio]

On: 26 May 2010

Access details: Access Details: [subscription number 922553229]

Publisher Psychology Press

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Memory

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713683358>

The Prospective and Retrospective Memory Questionnaire: A population-based random sampling study

D. C. Piauillino^a; O. F. A. Bueno^a; S. Tufik^a; L. R. Bittencourt^a; R. Santos-Silva^a; H. Hachul^a; C. Gorenstein^b; S. Pompéia^b

^a Universidade Federal de São Paulo (UNIFESP), Brazil ^b Universidade de São Paulo (USP), Brazil

First published on: 20 April 2010

To cite this Article Piauillino, D. C. , Bueno, O. F. A. , Tufik, S. , Bittencourt, L. R. , Santos-Silva, R. , Hachul, H. , Gorenstein, C. and Pompéia, S.(2010) 'The Prospective and Retrospective Memory Questionnaire: A population-based random sampling study', *Memory*, 18: 4, 413 – 426, First published on: 20 April 2010 (iFirst)

To link to this Article: DOI: 10.1080/09658211003742672

URL: <http://dx.doi.org/10.1080/09658211003742672>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

The Prospective and Retrospective Memory Questionnaire: A population-based random sampling study

D. C. Piauilino, O. F. A. Bueno, S. Tufik, L. R. Bittencourt, R. Santos-Silva, and H. Hachul

Universidade Federal de São Paulo (UNIFESP), Brazil

C. Gorenstein

Universidade de São Paulo (USP), Brazil

S. Pompéia

Universidade Federal de São Paulo (UNIFESP), Brazil

The Prospective and Retrospective Memory Questionnaire (PRMQ) has been shown to have acceptable reliability and factorial, predictive, and concurrent validity. However, the PRMQ has never been administered to a probability sample survey representative of all ages in adulthood, nor have previous studies controlled for factors that are known to influence metamemory, such as affective status. Here, the PRMQ was applied in a survey adopting a probabilistic three-stage cluster sample representative of the population of São Paulo, Brazil, according to gender, age (20–80 years), and economic status ($n = 1042$). After excluding participants who had conditions that impair memory (depression, anxiety, used psychotropics, and/or had neurological/psychiatric disorders), in the remaining 664 individuals we (a) used confirmatory factor analyses to test competing models of the latent structure of the PRMQ, and (b) studied effects of gender, age, schooling, and economic status on prospective and retrospective memory complaints. The model with the best fit confirmed the same tripartite structure (general memory factor and two orthogonal prospective and retrospective memory factors) previously reported. Women complained more of general memory slips, especially those in the first 5 years after menopause, and there were more complaints of prospective than retrospective memory, except in participants with lower family income.

Keywords: Memory Questionnaire; Prospective memory; Retrospective memory; Metamemory.

Typically, studies that assess memory complaints focus on questions that involve recall of past events, commonly referred to collectively as retrospective memory. This type of complaint is often found in the elderly, but less is known about

the pattern of subjective feeling of performance on retrospective memory in middle-aged and young adults (Mendes et al., 2008). Self-reports of slips in memory for future intentions, or prospective memory (Brandimonte, Einstein, &

Address correspondence to: Sabine Pompéia, R. Napoleão de Barros 925. 04024-002. São Paulo, SP, Brazil. E-mail: spompeia@gmail.com

For financial support, the authors thank Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP; grant no. 1998/14303-3; 2006/05847-8) and Associação Fundo de Incentivo à Psicofarmacologia (AFIP), non-profit organisations that sponsor research in Brazil. Thanks to Fernando Colugnati for help in statistical analysis. The authors had full control of all primary data.

McDaniel, 1996; McDaniel & Einstein, 2007), have also been little investigated in the literature, particularly in young individuals.

Prospective memory can be defined as the ability to become aware of a previously formed plan or intention at the right time and place, in the absence of an explicit prompt for recall, which then enables the initiation of recovery operations (retrospective memory) (Graf & Utzl, 2001; Utzl, 2008). For instance, in order to remember to buy bread at the end of the day we must first recall that something must be done when leaving work (prospective memory) so that we can then bring to mind what it is that we have to buy (bread: retrospective memory). Therefore prospective memory tasks also include a retrospective component, so that some degree of correlation exists between prospective and retrospective memory (Uttl, 2008). Nevertheless, there is evidence that objective performance (Graf & Utzl, 2001; Henry, MacLeod, Phillips, & Crawford, 2004; Kvavilashvili, Kornbrot, Mash, Cockburn, & Milne, 2009; Martin et al., 2007; Maylor, 1993; Utzl, 2008) and subjective evaluation (Crawford, Henry, Ward, & Blake, 2006; Crawford, Smith, Maylor, Della Sala, & Logie, 2003; Maylor, 1993; Reese & Cherry, 2006; Rodgers et al., 2001; Smith, Della Sala, Logie, & Maylor, 2000) of prospective and retrospective memory reflect different cognitive processes.

Despite some contrary findings (Derouesne et al., 1989; Troyer & Rich, 2002), subjective evaluations of one's own retrospective memory seems to account for objective retrospective memory performance (Jonker, Launer, Hooijer, & Lindeboom, 1996; Riedel-Heller, Matschinger, Schork, & Angermeyer, 1999; Singer, Falchi, Macgregor, Cherkas, & Spector, 2006; Treves, Verchovsky, Klimovitzky, & Korczyn, 2005). However, this relation between objective performance and metamemory rating is usually of modest magnitude. In contrast, metamemory for future intentions has been shown to provide a more sensitive task criterion than memory for past events for assessing individual differences in self-reports of episodic memory problems (Mantyla, 2003). This—added to the fact that slips such as forgetting an appointment, to turn off the oven, or to take medication can have dire consequences and, in many cases, may be a barrier to independent living (Bisiacchi, Tarantino, & Ciccola, 2008)—makes the detailed

study of prospective memory complaints necessary.

Few of the many validated metamemory instruments available in the literature include items related to prospective memory forgetting, and when they do so usually only one or a few questions are dedicated to this type of cognitive failure. However, there have been few attempts to establish the frequencies of everyday prospective and retrospective memory errors in people throughout their adult lives using the same questionnaire. To do so it is crucial both (1) to have an instrument that can satisfactorily elicit reports of memory failures that are clearly retrospective or prospective in nature—the only published memory questionnaire that has this characteristic is the Prospective and Retrospective Memory Questionnaire (PRMQ) (Crawford et al., 2003; Smith et al., 2000)—and (2) to determine patterns of response in healthy individuals so that they can be contrasted with that of patient populations. In this case, the study of a population-based sample is warranted and it must be representative of healthy adults of all ages, genders, schooling and socioeconomic statuses.

The PRMQ contains 16 questions, split equally between items asking about retrospective and prospective memory failures such as, respectively, “Do you fail to recall things that have happened in the last few days?” and “Do you forget to tell someone something you had meant to mention a few minutes ago?”. In addition, half of the prospective and half of the retrospective items refer to short-term and long-term memory problems; that is, memories remembered over brief periods of time, as in the second example above, or after longer delays, as in the first example (see Smith et al., 2000). The PRMQ also considers whether or not external cues are available to elicit remembering of a previous event or action to be taken. An example of an item in the PRMQ that refers to an external cue failure is “Do you forget to buy something you planned to buy, like a birthday card, even when you see the shop?”; one that relates to an internal cue failure is “Do you decide to do something in a few minutes time and then forget to do it?”. This can be relevant for both prospective memory—e.g., event-based cues versus time-based cues in laboratory prospective tasks (see Utzl, 2008)—and retrospective memory, and for both short- and long-term remembering. For example, tasks that do not involve external cues depend on internally generated information, such as occurs in free recall, and are therefore

often considered self-generated or internally generated cues. These tasks are considered different from those that include external cues, such as in cued-recall and recognition tests (see Smith et al., 2000).

The PRMQ has been shown to be reliable in both British (Crawford et al., 2003) and Swedish (Ronnlund, Mantyla, & Nilsson, 2008) populations. In these studies confirmatory factor analyses of the PRMQ items indicated a superior fit of a three-factor model, with a general memory factor plus two orthogonal specific factors of prospective and retrospective memory (Crawford et al., 2003; Ronnlund et al., 2008). Aside from this factorial validity, Ronnlund et al. (2008) have provided evidence of concurrent validity of this questionnaire, and predictive validity was shown by Smith et al. (2000), Mantyla (2003), and Kliegel and Jäger (2006). Heritability for prospective memory and retrospective memory complaints using this questionnaire has also been proposed (Singer et al., 2006).

Prospective memory was rated as more impaired than retrospective memory in healthy participants (Crawford et al., 2003; Kliegel & Jäger, 2006; Mantyla, 2003; Smith et al., 2000). Although age did not influence PRMQ scores in several investigations (Crawford et al., 2003, 2006; Smith et al. 2000) Ronnlund et al. (2008), who studied older individuals, found that higher age was associated with minor decrements in self-reported prospective memory failures. In contrast, evidence from a subset of 2 items in 25 pertaining to prospective memory from the Cognitive Failures Questionnaire (Broadbent, Cooper, FitzGerald, & Parkes, 1982) indicates that normal elderly people complain more about retrospective memory than prospective memory failures in comparison with young people (Maylor, 1993; Reese & Cherry, 2006). However, younger individuals were found to complain more of prospective memory than the elderly (Reese & Cherry, 2006). This would confirm findings that the elderly perform substantially better than their younger counterparts in certain naturalistic prospective memory tasks, despite younger participants having been found to outperform older ones in laboratory-based prospective memory tasks (Henry et al., 2004; Uttl, 2008).

Regarding gender effects, which throughout the literature have received modest attention (Vestberg, Passant, Risberg, & Elfgrén, 2007), Crawford et al. (2003) showed that women reported fewer retrospective memory failures

than men (minor effect) using the PRMQ, the opposite finding having been observed through the use of other metamemory instruments (Crook, Feher, & Larrabee, 1992; Jonker, Geerlings & Schmand, 2000), while Mendes et al. (2008) found no gender effects. Hormonal status in women has been shown to be important in determining perceived retrospective cognitive difficulties (Devi, Hahn, Massimi, & Zhivotovskaya, 2005; Hartley, Elsabagh, & File, 2004; Nusrat, Nishat, Gulfareen, Aftab, & Asia, 2008), but neither objective nor subjective prospective memory changes throughout the reproductive life of females have been investigated.

Hence different studies have shown distinct age and gender metamemory effects. Concerning the samples used in previous PRMQ studies, it is clear that none was representative of all the adult population, especially younger individuals, despite care having been taken to include a large number of participants (around 500 individuals per study) who were selected so as to have people of both genders and of various ages and educational levels. Crawford et al. (2003, 2006), Ronnlund et al. (2008), and Smith et al. (2000) used non-probability population-based sample surveys, which contrast to probability samples in which each member of the surveyed population of interest has a known, non-zero probability of selection. In population-based surveys people are also randomly sampled so that results can be generalised to the entire population (Ezzati-Rice & Curtin, 2001). It thus follows that a probabilistic sample would be ideal to provide unbiased estimates of memory complaints in healthy individuals throughout adulthood, and could possibly resolve the effects of age and gender on metamemory. The use of this methodology is not often feasible, however, mainly because of operational and financial limitations.

In addition to the lack of use of a representative adult population, former studies of the PRMQ did not control for factors that are known to interfere with people's subjective assessment of their own memory, such as depression (e.g., Bassett & Folstein, 1993; Blazer, Hays, Fillenbaum, & Gold, 1997; Levy-Cushman & Abeles, 1998; Tsai, Green, Benke, Silliman, & Farrer, 2006), anxiety (e.g., Bassett & Folstein, 1993; Derouesne, Lacomblez, Thibault, & LePoncin, 1999; Treves et al., 2005; Vestberg et al., 2007), presence of neurologic and other psychiatric disorders (e.g., Mendes et al., 2008), and use of psychotropic substances including alcohol

(Mendes et al., 2008). Exclusion criteria were not reported in the study by Crawford et al. (2003), and Ronnlund et al. (2008) only excluded participants who had dementia diagnoses, major sensory impairment, and mental retardation.

Hence the objective of the present study was to evaluate the factorial structure of the PRMQ in a population-based survey in Brazil featuring random sampling of an adult population (20 to 80 years of age) after excluding participants who presented factors that are known to influence memory (indications of depression and anxiety; use of psychotropic legal and illegal substances; reports of present or past history of neurologic and/or psychiatric disorders; see method section for details). We also investigated age, gender (including details of the reproductive status in women), schooling, and economic effects in memory complaints throughout healthy adulthood using the PRMQ. The latter two factors were not taken into account in previous studies of this questionnaire, possibly because they do not vary a great deal between individuals in western Europe, where other PRMQ studies were undertaken. However, in less-egalitarian societies, vast ranges in economic status, and as a consequence in schooling, are found. Therefore understanding how these factors influence metamemory may be of use for the application of this instrument in third-world countries.

METHOD

Sampling methods and characteristics of the population under investigation

The present investigation was part of the São Paulo Epidemiologic Sleep Study. Santos-Silva, Tufik, Conway, Taddei, and Bittencourt (2009) present the rationale, design, sampling, and procedures used in this study. Briefly, to obtain a representative sample of the inhabitants of São Paulo, a probabilistic three-stage cluster sampling technique (Kish, 1965) was used. This city is the largest in the southern hemisphere, has a population of around 11 million individuals, and is located at the centre of one of the major metropolitan regions of the globe. The mean population age is 31 years, and 53% are females. There are great discrepancies in income and 38% of the population has low family income (less than US\$15,000 per year) (ABEP, 2003).

Data reported here were obtained through the use of questionnaires applied face-to-face by trained interviewers. These questionnaires were answered by 1042 participants selected so as to represent the population of the city in terms of age (20–80 years), gender, schooling, and economic status. Pregnant and lactating women, and people with physical or mental impairments that prevent self-care, were not included in the sample. Data gathering was conducted between July and December 2007. Only 5.4% of the sample refused to participate. The study protocol was approved by the Ethics Committee for Research of the Universidade Federal de São Paulo (CEP 0593/06) and registered with ClinicalTrials.gov (Identifier NCT00596713).

Questionnaires

Prospective and Retrospective Memory Questionnaire. The PRMQ (Crawford et al., 2003; Smith et al., 2000) is a 16-item questionnaire that includes items from eight categories reflecting different aspects of memory, with two questions for each category. The eight categories are: prospective short-term self-cued, prospective short-term environmentally cued, prospective long-term self-cued, prospective long-term environmentally cued, retrospective short-term self-cued, retrospective short-term environmentally cued, retrospective long-term self-cued, and retrospective long-term environmentally cued. Participants rate how often each type of memory failure occurs on a 5-point scale, ranging from never (1) to very often (5). The total memory scores were obtained by calculating mean response in all 16 items. Following this procedure, separate scores were calculated for prospective and retrospective items, of short- and long-term memory, as well as of self-cued and environmentally cued items. High scores indicate poorer self-reported memory.

The translated Portuguese version, which can be obtained upon request from the corresponding author, was constructed in the following manner following Hambleton and Bollwark (1991). After obtaining consent from the authors of the PRMQ, the questionnaire was translated by four experts on memory and included two cultural adaptations (substitution of kettle for pan and birthday-card for present; these are uncommon items in Brazil). A group of 20 other memory specialists then evaluated the content in Portuguese and made minor alterations. The back-translation, which

was carried out by a native speaker of English, was approved by the authors of the original questionnaire.

Demographic information. We obtained data on participants' age (in years), number of years of schooling, and ratings of economic status, determined following guidelines of the Brazilian Association of Market Research (see <http://www.abep.org.br>; ABEP, 2003). The questionnaire used for this purpose involves the determination of points based on the number of items present at responders' homes (e.g., number of cars, TVs, educational attainment of the family's major breadwinner). Participants are then classified into different status classes ranging from A to E. Approximate mean yearly family income at the time of the study in US\$ for each status was: status A (> 30,000), B (17,000–10,000), C (5500), D (2500), and E (1250) (ABEP, 2003). For security reasons, individuals who lived in slums and shanty towns were not included in the sample (see Santos-Silva et al., 2009), so few participants from the present sample belonged to status E. Those that did were grouped with individuals of economic status D.

Medical history. Participants were asked about current use of psychotropic medication, and previous or current neurologic and/or psychiatric disorders, including history of cranial trauma. For women, information on their menstrual cycle including date of the last menstruation was obtained, as well as type of hormone replacement therapies if in use. Plasma follicle-stimulating hormone (FSH), measured by competitive immunoassay (TOSOH Corporation, Tokyo, Japan), was determined to confirm menopause, defined as at least 1 year of amenorrhoea and an FSH level above 30 mUI/mL (WHO, 1996).

Depression and anxiety. Beck Depression (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and Anxiety (Beck, Epstein, Brown, & Steer, 1988) Inventories—adapted for local use (Cunha, 2001)—were used. The scales consist of 21 items, which include symptoms and attitudes whose intensity ranges from neutral to maximum severity, rated on a 4-point scale ranging from 0 to 3. The items are summed to obtain a total score that can range from 0 to 63. Participants with scores higher than 15 (indicative of dysphoria or minor or major depression in general populations; Gorenstein & Andrade, 1996) in the depression inventory, and higher than 30 (indicative of high

levels of anxiety; Cunha, 2001) were excluded from the sample.

Current use of psychoactive substances. Participants were asked whether they were on any medication at the time of the study. Those who used anticonvulsants, benzodiazepines, antidepressants, antipsychotics, anticholinergic drugs, or medication for thyroid dysfunction at the time of the study were excluded.

Non-prescribed substances. The Alcohol, Smoking and Substance Involvement Screening Test of the World Health Organisation (WHO-ASSIST; Humeniuk et al., 2008), adapted for local use by Henrique, De Micheli, Lacerda, Lacerda, and Formigoni (2004), was used. This is a brief screening questionnaire that provides information about use of non-prescribed substances across responder's lifetime and in the past 3 months. Responders are asked to answer various questions by choosing one of five possibilities, ranging from never to daily/almost daily. In the present study people who had scores higher than 16, indicative of drug/alcohol dependency (Henrique et al., 2004), excluding for tobacco, were not included in the sample.

Statistical methods

Latent structure of the PRMQ. Confirmatory Factor Analyses (CFA; robust maximum likelihood) were performed on the variance-covariance matrix of the PRMQ items using Statistica 7.0 (StatSoft v. 7) following Crawford et al. (2003): the fit of CFA models was assessed using the chi-square statistic (χ^2), the comparative fit index (CFI), the standardised root-mean-squared residual (SRMR), and the root mean squared error of approximation (RMSEA). Small chi-square values indicate that the model is a good one for the data (Hu & Bentler, 1998). Hu and Bentler (1999) empirically examine various cut-offs for many of these fit measures, and their data suggest that, to minimise Type I and Type II errors under various conditions, one should use a combination of one relative fit index, such as the comparative fit index (CFI) (good model < 0.95), and the standardised root-mean-squared residual (SRMR) (good models < 0.08) and the root mean squared error of approximation (RMSEA) (good models < 0.06; and below 0.05 indicative of a close fit; see Hu & Bentler, 1998; Loehlin, 1998).

All models studied here were proposed by Crawford et al. (2003). The first (Model 1) was a

single-factor model which expresses the hypothesis that the variance in the Brazilian version of the PRMQ can be partitioned into one general factor plus error variance associated with each individual item (error variance here refers to the combination of true variance in the item that is independent of the factor, plus random error). Model 2a expresses the hypothesis that the present version of the PRMQ measures two uncorrelated factors, Prospective and Retrospective Memory, which explain the covariance among items (i.e., non-orthogonal). Models 2b and 2c also express two independent factors, Long-term/Short-term memory and Environmental/Self-cued, respectively. Models 3a, 3b, and 3c express the same two factors as Models 2b and c, but consider that they are correlated. Model 4a represents variants on the hypothesis that the present version of the PRMQ has a tripartite structure, parameterised so that all 16 items are indicators of a common factor (representing general self-rated memory). In addition, the eight prospective items are also indicators of a factor reflecting the variance specific to prospective memory, and the eight retrospective items are indicators of a specific retrospective memory factor. In this case the specific factors are constrained to be orthogonal to each other and to the common factor. Models 4b and 4c represent the same tripartite structure, however omitting one specific factor of memory type. Model 4b omits Retrospective memory and 4c, Prospective memory. Cronbachs α to test reliability of the scales was also calculated.

Demographic effects in the PRMQ. To study the effects of age, gender, schooling, and economic status we employed General Linear Models (GLMs). The factors used in the analyses will be described in the results section. Data that did not show significant or near significant effects ($ps > .08$) will not be cited below. The p value adopted was .05.

RESULTS

The reasons for excluding participants from the initial sample were scores above cut-off in the Beck Depression Inventory alone or in combination with the following exclusion criteria ($n = 159$), use of psychotropics including indication of drug/alcohol dependence ($n = 106$), Beck Anxiety Inventory only ($n = 11$), non-medicated neurological/psychiatric disorders without concur-

rent high ratings of depression and anxiety ($n = 7$), and participants for whom there were missing data (e.g., did not complete the PRMQ due to time constraints) ($n = 95$). Information on the factor analysis and demographic effects in the PRMQ were then determined in the remaining 664 participants (Table 1).

Confirmatory factor analysis

Results on the fit indices for the competing confirmatory factor analytic models of the PRMQ in the Brazilian population can be found in Table 2. The best model (4a; Figure 1) was the same one that has been shown in previous studies; that is, it represents variants on the hypothesis that the present version of the PRMQ has a tripartite structure, parameterised so that all 16 items were indicators of a common factor (representing general self-rated memory). In addition the eight prospective items were also indicators of a factor reflecting the variance specific to prospective memory, and the eight retrospective items were indicators of a specific retrospective memory factor, constrained to be orthogonal to each other and to the common factor.

Having established a best-fitting model of the latent structure of the PRMQ, the tripartite 4a model (general episodic memory failure, and scores on a prospective and retrospective subscale), we then computed reliability estimates (Cronbach α) for the three scales. The result yielded acceptable internal consistency of 0.89 (general memory), 0.85 (prospective memory), and 0.77 (retrospective memory).

Demographic effects in the PRMQ (see Table 1)

Considering that the best-fitting model of the latent structure of the PRMQ pointed to the occurrence of two separate factors for prospective and retrospective memory, and one general episodic memory factor, we used a GLM to explore effects of memory (prospective versus retrospective, obtained by calculating the mean ratings of all eight prospective and retrospective items, respectively), gender, age (as a continuous variable, varying from 20 to 80 years of age), years of schooling, and economic background ratings (continuous variables).

TABLE 1
Demographic characteristics of the present sample ($n=664$)

Gender	Schooling (years)	Economic status	Age (years)					Total	
			20–29	30–39	40–49	50–59	60–69		70–79
Females	0–4	A				1			1
		B		1	2	4	5	1	13
		C	1	4	7	8	6	5	31
		D+E		3	2	4	2	1	12
	5–8	A				1		1	2
		B	1	4	2	3		2	12
		C	7	10	16	9	5	1	48
	9–11	D+E	1	4	1	1	2		9
		A			2	1	1		4
		B	10	4	7	6	1	1	29
	≥12	C	15	18	6	6			45
		D+E	3	2	4	2			11
		A	4	6	12	6	2	1	31
	–	B	16	11	25	6	5	3	66
C		11	5	7	3			26	
D				1				1	
Females total			69	72	94*	61	29	16	341
Males	0–4	B				2	1	2	5
		C		5	2	1	2	1	11
		D+E	1	5	3	1		3	13
	5–8	A				1	1		2
		B	1	2	6	1	1	2	13
		C	7	17	9	4	3	1	41
	9–11	D+E	3	1	3	3			10
		A			1		1		2
		B	19	8	13	6	1		47
	≥12	C	18	13	8	2	1		42
		D+E	3	1	2				6
		A	6	8	10	13	7	1	45
	–	B	20	20	12	7	5	1	65
		C	10	5	3				18
D+E		1	1					2	
Males total			89	87*	72	41	23	11	323
Overall total			158	159	166	101	53	27	664

*One participant added, who did not provide information on schooling. Economic status determined following guidelines of the Brazilian Association of Market Research (Associação Brasileira de Empresas de Pesquisas – (ABEP, 2003) ABEP). Approximate mean yearly family income in US\$: class A (>30,000), B (17,000–10,000), C (5500), D (2500), E (1250).

This model yielded effects of gender, $F(1, 655) = 22.32$, $MSE = 12.68$, $p < .0001$, women having complained more of memory problems than men. In addition, there was a tendency of interaction between economic status and type of memory, $F(1, 655) = 3.46$, $MSE = 0.40$, $p = .06$. There was no effect of educational attainment, nor interaction of this factor with others (all $ps > .38$). Note that the inclusion of years of schooling and economic background limited the applicability of this model. This occurred because of substantial cohort-related income differences in

regard to educational attainment, which is to be expected in population-based samples. There was a lack of individuals, for instance, with high educational level and low income, and vice-versa. For this reason we therefore ran another model including the same factors as above, except that we excluded years of schooling, which did not yield significant effects, and substituted the continuous measure of economic status with that which stratified individuals as belonging to statuses A, B, C, and D+E, since only a few individuals belonged to status E (see above). This

TABLE 2
Summary of fit indices

MODELS	SAMPLE	Chi-square	df	RMSEA	SRMR	CFI
1. Unitary model	Brazilian	485.97	104	0.081	0.054	0.880
	British	407.20	104	0.073	0.057	0.89
	Swedish	360.70	104	0.062	0.048	0.910
2a. Two factors, uncorrelated (Ret/Prosp)	Brazilian	824.30	104	0.094	0.209	0.757
	British	732.40	104	0.105	0.268	0.78
	Swedish	—	—	—	—	—
2b. Two factors, uncorrelated (Long/Short)	Brazilian	969.7	104	0.103	0.223	0.729
	British	971.6	104	0.123	0.288	0.70
	Swedish	—	—	—	—	—
2c. Two factors, uncorrelated (Env./Self)	Brazilian	1124.5	104	0.110	0.234	0.650
	British	979.1	104	0.124	0.290	0.69
	Swedish	—	—	—	—	—
3a. Two factors, correlated (Ret/Prosp)	Brazilian	400.16	103	0.069	0.047	0.907
	British	336.1	103	0.064	0.053	0.920
	Swedish	316.9	103	0.062	0.045	0.920
3b. Two factors, correlated (Long/Short)	Brazilian	456.1	103	0.078	0.054	0.889
	British	406.5	103	0.073	0.057	0.89
	Swedish	—	—	—	—	—
3c. Two factors, correlated (Env./Self)	Brazilian	485.9	103	0.081	0.054	0.880
	British	406.6	103	0.073	0.057	0.890
	Swedish	—	—	—	—	—
4a. Tripartite model (complete)	Brazilian	218.46	88	0.047	0.032	0.959
	British	245.40	88	0.057	0.044	0.950
	Swedish	220.20	88	0.053	0.035	0.950
4b. Tripartite model (Ret. removed)	Brazilian	353.1	96	0.068	0.044	0.920
	British	306.3	96	0.060	0.047	0.930
	Swedish	—	—	—	—	—
4c. Tripartite model (Prosp. removed)	Brazilian	323.8	96	0.062	0.039	0.930
	British	288.8	96	0.063	0.050	0.930
	Swedish	—	—	—	—	—

Summary of fit indices for the competing confirmatory factor analytic models of the PRMQ in the Brazilian, British (Crawford et al., 2003) and Swedish (Ronnlund et al., 2008) populations. The best model is indicated by bold lettering. Chi-square (a small value indicates a good model); RMSEA (root mean square of approximation; for a good fit, <0.06; very good fit <0.05); SRMR (standardised root mean squared residual; for a good fit <0.08); CFI (comparative fit index; for a good fit >0.95).

was undertaken in order to better understand the relation between memory types and economic status, which had near significant effects.

This second model showed effects of gender, $F(1, 653) = 21.69$, $MSE = 12.25$, $p < .0001$, memory type, $F(1, 653) = 5.56$, $MSE = 0.64$, $p < .02$, and again a tendency of interaction between memory type and economic status, $F(1, 653) = 2.28$, $MSE = 0.26$, $p < .08$. Participants reported greater problems with prospective than retrospective memory, and women complained more of general memory problems than men. As concerns the tendency of the abovementioned interaction, to further explore this effect we determined effect sizes of the comparison between prospective and retrospective scores in each economic status using Cohen's d (considering within-participants measures, see Morris & DeShon, 2002). Effect sizes were of moderate

magnitude for statuses A ($d = 0.49$) and B ($d = 0.58$), and small for status C ($d = 0.29$), and for D + E ($d = 0.05$). Effect sizes were also calculated to compare genders (between-participants measures; $d = 0.35$), and overall prospective and retrospective memory (within-participants measure; $d = 0.24$), which indicated a small effect.

In order to further understand the greater rate of memory complaints in women we then explored data on hormonal status of all female participants. They were stratified (Soules et al., 2001) into premenopausal ($N = 233$), perimenopausal ($N = 6$), early post-menopausal (first 5 years since menopause, $N = 27$), and late post-menopausal (more than 5 years after menopause) on no hormonal treatment ($N = 62$), on hormone replacement therapy ($N = 9$), and on isoflavone ($N = 2$). Because the number of individuals in perimenopause and on hormone/isoflavone replacement therapy

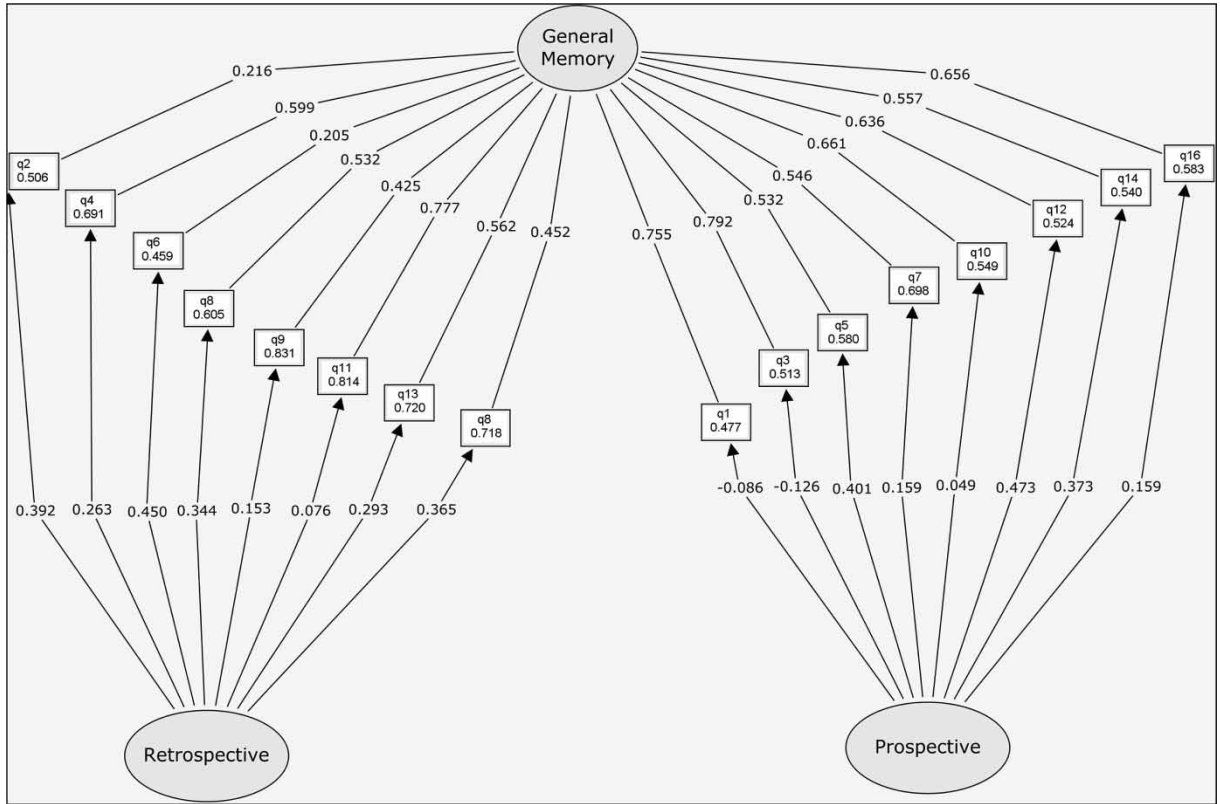


Figure 1. Graphic representation of the three-factor model of the latent structure of the PRMQ in the Brazilian population; “q” followed by a number refers to the question number used in Crawford et al. (2003).

was small, we excluded these females, as well as those who did not have reliable data on their menstrual cycle ($N=3$), and conducted another analysis using a GLM to investigate the nature of memory complaints in women with hormonal status (pre-menopausal, early and late post-menopausal) and memory (prospective vs retrospective) as factors. We found an effect of hormonal status, $F(1, 319) = 3.75$, $MSE = 2.26$, $p < .03$, and of memory type, $F(1, 319) = 15.95$, $MSE = 2.02$, $p < .0001$, but no interaction. Again, retrospective complaints were smaller than prospective ones, and women in the first years of menopause showed larger complaints than both pre-menopause and late post-menopause women (Scheffé test $ps < .05$; see Figure 1). Medium effect sizes were found comparing early post-menopause with pre-menopause ($d=0.51$) and late post-menopause women ($d=0.65$), while the effect size was small when comparing pre-menopause and late-menopause woman ($d=0.14$) (Figure 2, Table 3).

To determine whether responses to the PRMQ by women in early post-menopause explained the greater rate of complaints of women in comparison

to men, we then carried out a third GLM to compare responses to the PRMQ between genders, excluding women in early post-menopause, as well as those in perimenopause and those who were on hormonal treatment, due to the small number of these females (see above). Apart from gender, memory type, age, and economic status were also included as factors. This analysis yielded

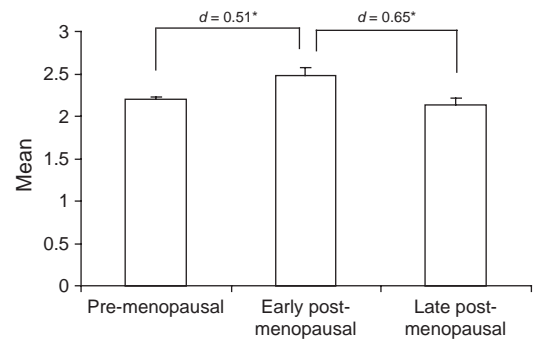


Figure 2. Mean ($\pm SE$) of responses in the PRMQ in women according to reproductive status: *early post-menopausal women ($n=27$) had a higher rate of complaints than pre-menopausal ($n=233$) and late post-menopausal ($n=62$) women ($p < .05$); effect sizes (d) of these significant effects were of moderate magnitude.

TABLE 3

Scores (mean \pm SD) on retrospective and prospective items according to gender and economic status

Gender	Economic status	Memory type	Mean	SD
Women	A (N=38)	Retrospective	2.12	0.62
		Prospective	2.24	0.54
	B (N=121)	Retrospective	2.11	0.62
		Prospective	2.29	0.55
	C (N=151)	Retrospective	2.10	0.61
		Prospective	2.26	0.54
D+E (N=32)	Retrospective	2.41	0.61	
	Prospective	2.45	0.53	
Men	A (N=49)	Retrospective	1.96	0.62
		Prospective	2.18	0.55
	B (N=129)	Retrospective	1.96	0.61
		Prospective	2.15	0.54
	C (N=111)	Retrospective	1.89	0.62
		Prospective	1.98	0.55
D+E (N=31)	Retrospective	2.02	0.62	
	Prospective	2.01	0.45	

Economic status determined following guidelines of the Brazilian Association of Market Research (ABEP, 2003). Approximate mean yearly family income in US\$: class A (>30,000), B (17,000–10,000), C (5500), D (2500), E (1250).

gender, $F(1,606) = 14.16$, $MSE = 7.95$, $p < .0002$, and memory type, $F(1, 606) = 5.96$, $MSE = 0.66$, $p < .02$, effects; again men reported a lower overall rate of memory complaints. Also, scores of prospective memory complaints were higher. Therefore women in early post-menopause were not responsible for the higher memory complaints of females.

DISCUSSION

The main objective of the present study was to examine the factorial structure of the PRMQ in a population-based sample representative of most ages throughout adulthood after excluding potential confounders that could influence metamemory reports. Our data concerning the confirmatory factor analysis and reliability statistics were in close agreement with previous studies in both British (Crawford et al., 2003) and Swedish (Ronnlund et al., 2008) populations, despite the fact that these studies used different methods in the selection of their samples and did not exclude confounders that could influence memory performance. The best fit had slightly superior indices than the previously cited works and occurred for the tripartite model, indicating the existence of a general episodic memory factor and two

orthogonal prospective and retrospective factors. This confirms the usefulness and adequacy of this questionnaire in evaluating prospective and retrospective metamemory, even in a third-world country in which the population differs in schooling and economic characteristics in comparison to European societies.

The dissociation between prospective and retrospective memory complaints confirms results of studies examining performance on objective prospective and retrospective measures (Kvavilashvili et al., 2009; Uttil, 2008). The formulation of the questions of the PRMQ may explain why the short- versus long-term memory, as well as the self- versus environmentally cued factors, did not reach acceptable fit indices in the past and present studies. Most of the short-term items in the PRMQ refer to difficulties in remembering things after “a few minutes”, while other involve possibly shorter time frames (“Do you mislay something, that you have *just* put down, like a magazine or glasses”). According to present memory models, episodic information that has left consciousness for more than a few seconds would actually refer to data stored in long-term memory (Squire, 1986). Different domains of prospective memory have also been proposed (Graf & Uttil, 2001; Uttil, 2008). When the prospective memory task dominates conscious awareness, tests can be considered vigilance prospective tasks, while they are characterised as prospective memory proper when intentions are out of consciousness. Most questions of the PRMQ seem to lie somewhere in between, so results may be blurred and not reflect separable factors. Also, it must be kept in mind that the distinction between self- and environmentally cued memories seems to be more important for characterising different types of prospective memory than of retrospective memory (see Uttil, 2008).

Our second aim was to investigate demographic effects of the PRMQ. In this respect our data showed effects that were somewhat different from those previously reported. As concerns age, self-reports in the PRMQ obtained here were not affected by this factor, corroborating findings of Crawford et al. (2003) and Mantyla (2003), as well as results of studies that used different metamemory instruments (Levy-Cushman & Abeles, 1998; Mendes et al., 2008; Wang et al., 2000). This is in line with the idea that memory complaints of elderly people do not appear basically different from those of younger participants (Derouesne et al., 1999). This is in sharp contrast to a large body of data showing that objective prospective

and retrospective episodic memory decline with age (e.g., Zeintl, Kliegel, & Hofer, 2007). However, it must be borne in mind that the present sample included very few individuals aged over 70 (who represent a small portion of the population of São Paulo), an age after which prospective memory seems to decline (Kvavilashvili et al., 2009). In effect, Ronnlund et al. (2008), who investigated memory complaints using the PRMQ with an older population, found that higher age was associated with slight decrements in self-reported prospective memory failures. Ronnlund et al. (2008) and Mendes et al. (2008) discuss a series of potential reasons for the finding of a relative absence of age differences on the PRMQ such as: the fact that older persons judge the frequency of failures against that of people of their age; changes in lifestyle in the elderly may lead to fewer prospective target events; use of external aids such as diaries that may compensate for some of the memory losses. Furthermore, concerns about memory (Zelinski & Gilewski, 2004) and/or beliefs regarding theories of memory and aging (Smith, Petersen, Ivnik, Malec, & Tangalos, 1996) have also been found to influence people's ratings of their memory's efficiency.

As concerns economic characteristics, we found that the difference in complaints between prospective and retrospective scores tended to differ according to people's family income. Those of the higher economic status responded to the PRMQ in the same way as Europeans—that is, they complained more of prospective than retrospective memory slips (medium effect sizes)—whereas there was almost no difference between prospective and retrospective complaints in individuals with lower family income. This factor was not explored in previous investigations of the PRMQ and other memory questionnaires, and therefore we have no data to compare our results with. This is also true for a previous PRMQ study conducted in Brazil (Benites & Gomes, 2007) that contains data that are difficult to compare to our and other PRMQ studies because it involved exploratory, instead of confirmatory, factor analyses. Reasons for this difference between people from different economic backgrounds may stem from the fact that individuals with a lower family income in São Paulo are more likely to be rural-to-urban migrants (see Kim, Stewart, Shin, Choi, & Yoon, 2003) and to reside in peri-urban regions (Birley & Lock, 1998), factors that have been found to be linked to cognitive alterations. Whatever the reasons for these economic effects,

they have important implications for the use of the PRMQ in third-world countries and must be further investigated, especially as economic status affected memory complaints while educational attainment was unable to show any effects, as has been previously reported with other memory questionnaires (Crook et al., 1992; Levy-Cushman & Abeles, 1998; Mendes et al., 2008; Wang et al., 2000; Zelinski & Gilewski, 2004).

In the present sample, women reported more general memory failures than men, corroborating findings of studies with other metamemory instruments (Crook et al., 1992; Jonker et al., 2000), but contrasting with results of Mendes et al. (2008), who found no gender effects, and Crawford et al. (2003), who used the PRMQ and showed that females claimed to have slightly fewer retrospective memory problems than males. This discrepancy between studies may have arisen from differences in sample size—considering that the effect size of this result in our and Crawford et al.'s (2003) study was of small magnitude—and/or sample selection. Crawford et al.'s (2003) sample included a much smaller number of males than females and the sample was much older (mean around 60 years of age) than that used here. Thus, few women around the age of 50, or in the first years after menopause, would have been included. This group of females claimed to have more memory failures in the present study in comparison with women before menopause and in late post-menopause (see also Hachul, Bittencourt, Soares, Bacara, & Tufik, 2009).

This perceived worsening of memory in early post-menopause could also explain why women under 50 have been reported to have more memory problems than men in the same age group, a gender difference that was not observed in older individuals (Derouesne et al., 1999). The variation in self-reported memory failures between women depending on their hormonal status was of medium magnitude (Cohen *d* values) when comparing early post-menopause with both pre- and late post-menopause women, and therefore may have more clinical implications.

However, the increase in memory functioning complaints in the first years after menopause did not seem to be responsible for the gender differences reported here, because the gender effects were still apparent when women in this phase of their reproductive life were excluded from the analysis. Therefore, in practical terms, general minor gender effects in the PRMQ do not seem

to be clinically important (Crawford et al., 2003), unless reproductive status of females is of interest.

Metamemory problems in women have been related to affective problems, especially in menopause transition (Freeman, Sammel, & Lin, 2009), but depression at the time of the study could not explain our results since individuals with indications of dysphoria and depression were excluded from the present sample. However, these perceived memory problems could explain why middle-aged women use more prospective memory aids than men (Long, Cameron, Harju, Lutz, & Means, 1999), which may be a means of trying to correct for their metamemory problems.

That women rate their episodic memory, of both the retrospective and prospective types, lower than that of men is surprising considering that many studies have shown that females outperform males in objective episodic memory measures (see Andreano & Cahill, 2009), at least of the retrospective type. Gender effects throughout adulthood in objective prospective memory tasks have been under-studied, but there is evidence that elderly females are better than males in these tests (Huppert, Johnson, & Nickson, 2000). It thus remains to be determined what leads to the metamemory gender effects found here. A possible explanation is that the larger memory complaints by women could be associated with the fact that they are known to have more general subjective complaints than men (e.g., Ihlebaek, Eriksen, & Ursin, 2002). An alternative reason could be that females and males differ in memory styles, which leads to differences in memory complaints (see Schulster, 1995). Also, women tend to assume more childcare and household duties, which are often combined with employment outside the home. This could lead to larger dissatisfaction with memory performance either because the presence of more domestic responsibilities is related to a higher degree of general health symptoms (see Musshausser, Bader, Wildt, & Hochleitner, 2006), or because multitasking taxes memory more heavily.

In sum, the PRMQ seems to be a valuable tool for assessing reports of prospective and retrospective memory failures in countries that vary in social characteristics. Economic status, however, tended to influence results, those with a higher family income having reported larger rates of prospective than retrospective problems, an effect not found in those with lower income. Therefore this variable must be controlled when people of various incomes are evaluated. Females also

complained more of general memory problems, especially those in the first years of menopause, but age and education did not influence results, although they may do so in samples with larger numbers of individuals over 60 years of age. However, it should be kept in mind that because the participation of individuals with cognitive problems in the present study was minimised by excluding conditions that interfere with cognition, our data might not generalise to populations with cognitive impairment.

Manuscript received 31 May 2009
Manuscript accepted 26 February 2010
First published online 20 April 2010

REFERENCES

- ABEP. (2003). Associação Brasileira de Empresas de Pesquisa – www.abep.org – abep@abep.org.br *Dados com base no Levantamento Sócio Econômico, 2000, IBOPE*, 1–3.
- Andreano, J. M., & Cahill, L. (2009). Sex influences on the neurobiology of learning and memory. *Learning and Memory*, 16(4), 248–266.
- Bassett, S. S., & Folstein, M. F. (1993). Memory complaint, memory performance, and psychiatric diagnosis: A community study. *Journal of Geriatric Psychiatry and Neurology*, 6(2), 105–111.
- Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology*, 56(6), 893–897.
- Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, 4(6), 561–571.
- Benites, D., & Gomes, W. B. (2007). Tradução, adaptação e validação preliminar do Prospective and Retrospective Memory Questionnaire (PRMQ). *Psico-USF*, 12(1), 45–54.
- Birley, M. H., & Lock, K. (1998). Health and peri-urban natural resource production. *Environment and Urbanization*, 10(1), 89–106.
- Bisiacchi, P. S., Tarantino, V., & Ciccola, A. (2008). Aging and prospective memory: The role of working memory and monitoring processes. *Aging Clinical and Experimental Research*, 20(6), 569–577.
- Blazer, D. G., Hays, J. C., Fillenbaum, G. G., & Gold, D. T. (1997). Memory complaint as a predictor of cognitive decline: A comparison of African American and White elders. *Journal of Aging and Health*, 9(2), 171–184.
- Brandimonte, M., Einstein, G. O., & McDaniel, M. A. (1996). *Prospective memory: Theory and applications*. Mahwah, NJ: Lawrence Erlbaum Associates Inc.
- Broadbent, D. E., Cooper, P. F., FitzGerald, P., & Parkes, K. R. (1982). The Cognitive Failures Questionnaire (CFQ) and its correlates. *British Journal of Clinical Psychology*, 21(1), 1–16.

- Crawford, J. R., Henry, J. D., Ward, A. L., & Blake, J. (2006). The Prospective and Retrospective Memory Questionnaire (PRMQ): Latent structure, normative data and discrepancy analysis for proxy-ratings. *British Journal of Clinical Psychology, 45*(1), 83–104.
- Crawford, J. R., Smith, G., Maylor, E. A., Della Sala, S., & Logie, R. H. (2003). The Prospective and Retrospective Memory Questionnaire (PRMQ): Normative data and latent structure in a large non-clinical sample. *Memory, 11*(3), 261–275.
- Crook, T. H. III, Feher, E. P., & Larrabee, G. J. (1992). Assessment of memory complaint in age-associated memory impairment: The MAC-Q. *International Psychogeriatrics, 4*(2), 165–176.
- Cunha, J. (2001). *Manual em português das Escalas Beck*. São Paulo: Casa do Psicólogo.
- Derouesne, C., Alperovitch, A., Arvay, N., Migeon, P., Moulin, F., Vollant, M., et al. (1989). Memory complaints in the elderly: A study of 367 community-dwelling individuals from 50 to 80 years old. *Archives of Gerontology and Geriatrics Supplement, 1*, 151–163.
- Derouesne, C., Lacomblez, L., Thibault, S., & LePoncin, M. (1999). Memory complaints in young and elderly subjects. *International Journal of Geriatric Psychiatry, 14*(4), 291–301.
- Devi, G., Hahn, K., Massimi, S., & Zhivotovskaya, E. (2005). Prevalence of memory loss complaints and other symptoms associated with the menopause transition: A community survey. *Gender medicine, 2*(4), 255–264.
- Ezzati-Rice, T. M., & Curtin, L. R. (2001). Population-based surveys and their role in public health. *American Journal of Preventive Medicine, 20*(4), 15–16.
- Freeman, E. W., Sammel, M. D., & Lin, H. (2009). Temporal associations of hot flashes and depression in the transition to menopause. *Menopause, 16*(4), 1–7.
- Gorenstein, C., & Andrade, L. (1996). Validation of a Portuguese version of the Beck Depression Inventory and the State-Trait Anxiety Inventory in Brazilian subjects. *Brazilian Journal of Medical and Biological Research, 29*(4), 453–457.
- Graf, P., & Uttl, B. (2001). Prospective memory: A new focus for research. *Consciousness and Cognition, 10*(4), 437–450.
- Hachul, H., Bittencourt, L. R. A., Soares, J. M. Jr, Bacara, E. C., & Tufik, S. (2009). Sleep in post-menopausal women: Differences between early and late post-menopause. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 145*(1), 81–84.
- Hambleton, R. K., & Bollwark, J. (1991). Adapting tests for use in different cultures: Technical issues and methods. *ITC Bulletin/ Bulletin CIT: International Test Bulletin Issues, 32/33*, 3–32.
- Hartley, D. E., Elsabagh, S., & File, S. E. (2004). Gincosan (a combination of *Ginkgo biloba* and *Panax ginseng*): The effects on mood and cognition of 6 and 12 weeks' treatment in post-menopausal women. *Nutritional Neuroscience, 7*(5–6), 325–333.
- Henrique, I. F., De Micheli, D., Lacerda, R. B., Lacerda, L. A., & Formigoni, M. L. (2004). Validation of the Brazilian version of Alcohol, Smoking and Substance Involvement Screening Test (ASSIST). *Revista da Associação Médica Brasileira, 50*(2), 199–206.
- Henry, J. D., MacLeod, M. S., Phillips, L. H., & Crawford, J. R. (2004). A meta-analytic review of prospective memory and aging. *Psychology and Aging, 19*(1), 27–39.
- Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structural equation modeling: Sensitivity to underparameterised model misspecification. *Psychological Methods, 3*(4), 424–445.
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indices in covariance structural analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55.
- Humeniuk, R., Ali, R., Babor, T. F., Farrell, M., Formigoni, M. L., Jittiwutikarn, J., et al. (2008). Validation of the alcohol, smoking and substance involvement screening test (ASSIST). *Addiction, 103*(6), 1039–1047.
- Huppert, F. A., Johnson, T., & Nickson, J. (2000). High prevalence of prospective memory impairment in the elderly and in early-stage dementia: Findings from a population-based study. *Applied Cognitive Psychology, 14*(7), S63–S81.
- Ihlebaek, C., Eriksen, H. R., & Ursin, H. (2002). Prevalence of subjective health complaints (SHC) in Norway. *Scandinavian Journal of Public Health, 30*(1), 20–29.
- Jonker, C., Geerlings, M. I., & Schmand, B. (2000). Are memory complaints predictive for dementia? A review of clinical and population-based studies. *International Journal of Geriatric Psychiatry, 15*(11), 983–991.
- Jonker, C., Launer, L. J., Hooijer, C., & Lindeboom, J. (1996). Memory complaints and memory impairment in older individuals. *Journal of the American Geriatrics Society, 44*(4), 44–49.
- Kim, J.-M., Stewart, R., Shin, I.-S., Choi, S.-K., & Yoon, J.-S. (2003). Subjective memory impairment, cognitive function and depression: A community study in older Koreans. *Dementia and Geriatric Cognitive Disorders, 15*(4), 218–225.
- Kish, L. (1965). *Survey sampling*. New York: John Wiley & Sons Inc.
- Kliegel, M., & Jäger, T. (2006). Can the prospective and retrospective memory questionnaire (PRMQ) predict actual prospective memory performance? *Current Psychology: Developmental, Learning, Personality, Social, 25*(3), 182–191.
- Kvavilashvili, L., Kornbrot, D. E., Mash, V., Cockburn, J., & Milne, A. (2009). Differential effects of age on prospective and retrospective memory tasks in young, young-old, and old-old adults. *Memory, 17*(2), 180–196.
- Levy-Cushman, J., & Abeles, N. (1998). Memory complaints in the able elderly. *Clinical Gerontologist, 9*(2), 3–24.
- Loehlin, J. C. (1998). *Latent variable models*. Mahwah, NJ: Laurence Erlbaum Associates Inc.
- Long, T. E., Cameron, K. A., Harju, B. L., Lutz, J., & Means, L. W. (1999). Women and middle-aged

- individuals report using more prospective memory aids. *Psychological Reports*, 85, 1139–1153.
- Mantyla, T. (2003). Assessing absentmindedness: Prospective memory complaint and impairment in middle-aged adults. *Memory & Cognition*, 31(1), 15–25.
- Martin, T., McDaniel, M. A., Guynn, M. J., Houck, J. M., Woodruff, C. C., Bish, J. P., et al. (2007). Brain regions and their dynamics in prospective memory retrieval: A MEG study. *International Journal of Psychophysiology*, 64(3), 247–258.
- Maylor, E. A. (1993). Aging and forgetting in prospective and retrospective memory tasks. *Psychology and Aging*, 8(3), 420–428.
- McDaniel, M. A., & Einstein, G. O. (2007). *Prospective memory: An overview and synthesis of an emerging field*. Los Angeles: Sage Publications.
- Mendes, T., Gino, S., Ribeiro, F., Guerreiro, M., de Sousa, G., Ritchie, K., et al. (2008). Memory complaints in healthy young and elderly adults: Reliability of memory reporting. *Aging & Mental Health*, 12(2), 177–182.
- Morris, S. B., & DeShon, R. P. (2002). Combining effect size estimates in meta-analysis with repeated measures and independent-groups designs. *Psychological Methods*, 7(1), 105–125.
- Musshauer, D., Bader, A., Wildt, B., & Hochleitner, M. (2006). The impact of sociodemographic factors vs. gender roles on female hospital worker's health: Do we need to shift emphasis? *Journal of Occupational Health*, 48(5), 383–391.
- Nusrat, N., Nishat, Z., Gulfaheen, H., Aftab, M., & Asia, N. (2008). Knowledge, attitude and experience of menopause. *Journal of Ayub Medical College Abbottabad*, 20(1), 56–59.
- Reese, C. M., & Cherry, K. E. (2006). Effects of age and ability on self-reported memory functioning and knowledge of memory aging. *Journal of Genetic Psychology*, 167(2), 221–240.
- Riedel-Heller, S. G., Matschinger, H., Schork, A., & Angermeyer, M. C. (1999). Do memory complaints indicate the presence of cognitive impairment? Results of a field study. *European Archives of Psychiatry and Clinical Neuroscience*, 249(4), 197–204.
- Rodgers, J., Buchanan, T., Scholey, A. B., Heffernan, T. M., Ling, J., & Parrott, A. (2001). Differential effects of ecstasy and cannabis on self-reports of memory ability: A web-based study. *Human Psychopharmacology: Clinical and Experimental*, 16(8), 619–625.
- Ronnlund, M., Mantyla, T., & Nilsson, L. G. (2008). The Prospective and Retrospective Memory Questionnaire (PRMQ): Factorial structure, relations to global subjective memory ratings, and Swedish norms. *Scandinavian Journal of Psychology*, 49(2), 11–18.
- Santos-Silva, R., Tufik, S., Conway, S. G., Taddei, J. A., & Bittencourt, L. R. A. (2009). Sao Paulo Epidemiologic Sleep Study: Rationale, design, sampling, and procedures. *Sleep Medicine*, 10(6), 679–682.
- Sehulster, J. R. (1995). Memory styles and related abilities in presentation of self. *American Journal of Psychology*, 108(2), 67–88.
- Singer, J. J., Falchi, M., Macgregor, A. J., Cherkas, L. F., & Spector, T. D. (2006). Genome-wide scan for prospective memory suggests linkage to chromosome 12q22. *Behavior Genetics*, 36(1), 18–28.
- Smith, G., Della Sala, S., Logie, R. H., & Maylor, E. A. (2000). Prospective and retrospective memory in normal ageing and dementia: A questionnaire study. *Memory*, 8(5), 311–321.
- Smith, G. E., Petersen, R. C., Ivnik, R. J., Malec, J. F., & Tangalos, E. G. (1996). Subjective memory complaints, psychological distress, and longitudinal change in objective memory performance. *Psychology and Aging*, 11(2), 272–279.
- Soules, M. R., Sherman, S., Parrott, E., Rebar, R., Santoro, N., Utian, W., et al. (2001). Stages of Reproductive Aging Workshop (STRAW). *Journal of Women's Health and Gender-Based Medicine*, 10(9), 843–848.
- Squire, L. R. (1986). Mechanisms of memory. *Science*, 232(4758), 1612–1619.
- Treves, T. A., Verchovsky, R., Klimovitzky, S., & Korczyn, A. D. (2005). Incidence of dementia in patients with subjective memory complaints. *International Psychogeriatric*, 17(2), 265–273.
- Troyer, A. K., & Rich, J. B. (2002). Psychometric properties of a new metamemory questionnaire for older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 57(1), 19–27.
- Tsai, D. H., Green, R. C., Benke, K. S., Silliman, R. A., & Farrer, L. A. (2006). Predictors of subjective memory complaint in cognitively normal relatives of patients with Alzheimer's disease. *The Journal of Neuropsychiatry and Clinical Neurosciences*, 18(3), 384–388.
- Uttl, B. (2008). Transparent meta-analysis of prospective memory and aging. *PLoS ONE*, 3(2), e1568.
- Vestberg, S., Passant, U., Risberg, J., & Elfgrén, C. (2007). Personality characteristics and affective status related to cognitive test performance and gender in patients with memory complaints. *Journal of the International Neuropsychological Society*, 13(6), 911–919.
- Wang, P. N., Wang, S. J., Fuh, J. L., Teng, E. L., Liu, C. Y., Lin, C. H., et al. (2000). Subjective memory complaint in relation to cognitive performance and depression: A longitudinal study of a rural Chinese population. *Journal of the American Geriatrics Society*, 48(3), 295–299.
- WHO. (1996). Research on the menopause in the 1990s. Report of a WHO Scientific Group. *World Health Organization Technical Report Series*, 866, 1–107.
- Zeintl, M., Kliegel, M., & Hofer, S. M. (2007). The role of processing resources in age-related prospective and retrospective memory within old age. *Psychology and Aging*, 22(4), 826–834.
- Zelinski, E. M., & Gilewski, M. J. (2004). A 10-item Rasch modeled memory self-efficacy scale. *Aging & Mental Health*, 8(4), 293–306.