

Spanish Version of the Prospective and Retrospective Memory Questionnaire (PRMQ-S)

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The concept of prospective memory is relatively recent. Thus, it is necessary to have instruments to assess it, in interaction with retrospective memory. The Prospective and Retrospective Memory Questionnaire (PRMQ; Smith et al., 2000) is an instrument that has been effectively used for assessment in several languages. Nevertheless, there is still no Spanish adaptation. The aim of this study was to translate the PRMQ and obtain information about its psychometric properties. A back translation process was applied to the PRMQ. The resulting PRMQ-S was self-administered to 520 subjects after applying the pilot test. Confirmatory factor analysis (CFA) was used to test competing models of its latent structure. Internal consistency was evaluated using Cronbach's alpha. The results showed an adequate internal consistency of the total scale and the Prospective and Retrospective scales were: .89, .84 and .76, respectively. The factor structure was compared with the original study. Our results suggested a disagreement with the tripartite model defended by the authors of the PRMQ. Since there is a high correlation between two factors in the bi-factor model, and the tripartite model showed non-significant loadings to the two specific factors, we recommend that the PRMQ-S be used as one general memory score. We demonstrated adequate psychometric properties of the PRMQ-S if it is used as unique measurement of memory failures. These results are relevant due to the need for a short and accurate instrument in our language that explores memory failures, which has a major impact on the activities of daily living.

Keywords: memory, PRMQ-S, prospective memory, retrospective memory.

El concepto de memoria prospectiva es relativamente reciente. Por lo que es necesario contar con instrumentos para evaluarla en interacción con la memoria retrospectiva. El Cuestionario de Memoria Prospectiva y retrospectiva (PRMQ; Smith et al., 2000) es un instrumento que ha sido eficientemente utilizado para evaluarlas, en varios idiomas. Sin embargo, no se detectó versión alguna en español de dicho cuestionario. El propósito de este estudio fue traducir el PRMQ y obtener información sobre sus propiedades psicométricas. Un proceso de traducción inversa fue aplicado al PRMQ, el resultante PRMQ-S se aplicó a 520 personas, después de una prueba piloto. Para los análisis se utilizó el Análisis Factorial Confirmatorio y el Alfa de Cronbach. Los resultados reflejaron adecuada consistencia interna de la escala completa y de las subescalas de memoria prospectiva y retrospectiva: .89, .84 y .76, respectivamente. La estructura factorial fue comparada con el estudio original. Nuestros resultados sugieren un desacuerdo con el modelo tripartito defendido por los autores del PRMQ. La fuerte correlación entre los dos factores en el modelo bifactorial y el modelo tripartito, que muestra pesos factoriales no significativos, dan la pauta para recomendar que el PRMQ-S sea utilizado como un puntaje general de memoria. Nuestros resultados demuestran adecuadas propiedades psicométricas al ser utilizado como una medida única de fallos en la memoria. Estos resultados son relevantes debido a la necesidad de un instrumento breve en español que evalúe los fallos en la memoria que afectan el desempeño en las actividades cotidianas.

Palabras clave: memoria, PRMQ-S, memoria prospectiva, memoria retrospectiva.

Remembering what to do and when to do something is a crucial task in daily life. These abilities are involved in activities as simple as remembering to buy milk or take medications and which medicine to take. Memory of intentions has been studied since 1971 by Loftus E., but it was not until 1996 that prospective memory was investigated in detail. In 2000, there were more than 100 articles published about this topic. It was in that year that the First International Conference on Prospective Memory was held in response to the growth of research in this field (Ellis & Kvavilashvili, 2000).

While retrospective memory is a system that involves the recovery of information related to events in the past that can be evoked with or without environmental cues, prospective memory is the ability of “remembering to remember.” It is the aptitude to remember the intention of doing something with or without environmental clues. These two types of memory are not separated since they share subsystems. Livner, Laukka, Karlsson, and Bäckman (2009) compared the performance in prospective and retrospective tasks of an Alzheimer Disease group, a Vascular Dementia group, and a Control group. They assessed prospective and retrospective memory with actual tasks in free and cued recall. Their results indicated similar impairment of both types of episodic memory, which led to the conclusion that alterations in different structures may result in similar functional impairment.

Prospective memory includes remembering the intention of doing something while retrospective memory implies remembering the content of that activity. For example, we can completely forget the intention of giving a message to a friend (prospective memory) or the content of the message (retrospective memory). Some researchers have found several characteristics in prospective memory, such as the lack of an evident sign (Einstein, McDaniel, Richardson, Guynn, & Cunfer, 1995; Maylor, 1990). They also have found two kinds of prospective memory cues or signals: environment-based signals, e.g., remembering to buy medicine when we pass in front of the drug store and time-based signals, e.g., calling a friend at noon. The time- or self-cued-based signals are more auto-initiated and less evident than environmental signals because there are no facilitating external indicators (West & Craik, 1999).

Some authors argue that prospective memory based on environmental signals happens mainly under the influence of retrospective memory, and its failures are related to that fact. Others consider codification and retrieval to be the keys to understanding failures in prospective memory (Tirapu-Ustarroz, 2005). Prospective memory implies other processes such as executive functions, like planning, disrupting ongoing activities and initiating action (Shum, Fleming, & Neulinger, 2002).

Retrospective memory includes memories of the past such as *declarative memory*, *episodic memory* and *procedural memory*. Retrospective memory involves

registering, storing, recovering and recognizing information. Failures in retrospective memory can lead to missing useful information in daily life, for instance, the place we put something or the time something was done. Information can be evoked with or without environmental cues. The last one is known as recognition. Spontaneous retrieval is possibly more auto-initiated than the environment-based one.

Since the concept of prospective memory is relatively recent, it has been necessary to create and adapt new instruments in order to assess this type of memory in its interaction with the retrospective memory, to determine their characteristics in the term of time (long and short), and also to identify if these are really available cues to promote an event or action (Smith et al., 2000) and if the cues are useful to remember. There are large instruments that measure the processes involved in prospective and retrospective memory, which include several tests (Fleming et al., 2008). One of them is the Prospective and Retrospective Memory Questionnaire (PRMQ; Smith et al., 2000) that has been used to assess prospective and retrospective memory failures or slips in daily life. The PRMQ consists of 16 questions. Half of the questions are concerned with every day topics. It has been adapted in a variety of languages, such as German, Hindi and Swedish. Since there is no Spanish adaptation yet, the purpose of this study was to translate it and to obtain information about its psychometric properties.

Method

Participants

Data were gathered from the general population. Subjects were contacted by psychology students, who asked relatives and neighbors to voluntarily answer the questionnaire. A total of 520 subjects answered. We excluded from the study people who did not answer two or more items and people with a diagnosis of Alzheimer's. The sample is described later (see Results).

Materials

The PRMQ is a questionnaire developed by Smith et al. (2000) to allow participants to rate the frequency that they commit specific memory errors. It consists of sixteen items. Eight questions ask about prospective memory failures, and eight ask about retrospective failures. Each question is answered on a five-point Likert scale.

Psychometric properties were assessed by Crawford et al. (2003). The reliabilities of the three scores: (a) the total score (the sum of ratings across all 16 items); (b) the prospective score (the sum of ratings across the 8 prospective items) and (c) the retrospective score (the sum of ratings across the 8 retrospective items) yielded

Cronbach's alphas of .89, .85 and .80, respectively, which indicated a high degree of internal consistency of the PRMQ. Also, the results of the confirmatory factor analysis provided evidence that the tripartite model offered the best fit. A Swedish version confirmed the factor structure and showed high consistency of 0.89, 0.86 and 0.78 (Rönnlund, Mäntylä, & Nilsson, 2008).

Ethics

The human data included in this manuscript fulfilled the regulations of the authors' institution. In addition, the data were obtained in accordance with the Helsinki Declaration.

Procedure

We contacted the authors of the PRMQ to request permission to translate the questionnaire. Afterward, a back translation process was used to convert the PRMQ to the Spanish language. A pilot application with a small sample was done before contacting the volunteers for the study. Two weeks later, thirty of the participants were contacted to respond to the PRMQ again with the purpose of having information to analyze the temporary stability of the questionnaire. The Spanish version was available by request from the authors and may also be downloaded at [http://www.psy.ed.ac.uk/research/hcn/PRMQ\(Mexico\).pdf](http://www.psy.ed.ac.uk/research/hcn/PRMQ(Mexico).pdf).

To analyze psychometric properties, Cronbach's alpha was used to measure internal consistency. According to the original study (Smith et al., 2000), we estimated the split-half reliability using the Spearman-Brown formula and comparing both questions within each category. Also, we used Pearson correlations to measure test-retest reliability and to analyze the correlation with age. To analyze the factor structure, we used exploratory factor analysis and confirmatory factor analysis. The last one was performed using AMOS. The maximum likelihood method was applied in each analysis. This method is strongly recommended (Rodríguez-Ayán and Ruiz, 2008). Even in cases where there is no multivariate normality, Rodríguez-Ayán and Ruiz (2008) found that the maximum likelihood method was a good method to use when Mardia's coefficient did not surpass 70 points. Due to Mardia was 36.78 within this data, it was not necessary to transform the data.

Parameter estimations, including factor loadings, were tested for statistical significance ($\alpha = .05$, two-tailed). The following criteria were used as indices of an acceptable model fit: (1) Goodness of Fit (GFI) > .90; (2) Adjusted Goodness of Fit Index (AGFI) > .90; (3) Root Mean Square Error of Approximation (RMSEA) < .05; (4) Comparative Fit Index (CFI) > .90 and (5) $X^2/df < 3$ (Kline, 2005).

Similar to Rönnlund et al. (2008), we replicated three of the five models performed by Crawford et al. (2003). Model 1 is a single factor model. Model 2 is a model represented by two correlated factors. Model 3 is a tripartite

model where all 16 items are indicators of a common factor. Additionally, 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. This is the model accepted by authors of the PRMQ.

Results

The subjects were 520 people who were distributed as follow 58.3% were males and 41.7% females. The mean age of the participants was 39.32 years ($SD = 12.7$). The age range was 14-84 years old. Regarding civil status, 64.8% were married, 29.8% were single, and 5.4% were in cohabitation or divorced.

The mean PRMQ-S score was 32.1 ($SD = 9.36$), and the median was 31.0. According to the Kolmogorov-Smirnov test, the data were not normally distributed ($Z_{K-S} = 0.085$; $p = .001$). Central tendency measurements for PRMQ-S subscales were as follows: the prospective memory mean was 17.2 ($SD = 5.4$), and the median was 17.0; the retrospective memory mean was 14.8 ($SD = 4.5$), and the median was 14.0.

Reliability of the PRMQ-S

Internal consistency of the total scale and the Prospective and Retrospective scales were acceptable: .89, .84 and .76, respectively. Appropriate scale membership was indicated by item-total correlations for all items. The split-half reliability of the total scale was $r = .87$. The test-retest reliability of the PRMQ-S was $r = .81$, $r = .78$ for the prospective scale and $r = .80$ for the retrospective scale ($n = 30$).

Factor structure of the PRMQ-S

The studies published about the PRMQ did not carry out the exploratory factor analysis. We performed it to know how many factors recommended the rule K1 and scree plot. The KMO value (0.935) and sphericity test (2624.1; $df = 120$; $p = .001$) indicated that factor analysis of these items was suitable. Regarding the number of factors, a criterion of an eigenvalue higher than 1 suggested two factors. That accounted for 45.19% of the variance (38.14% by Factor 1) even though the scree plot (Figure 1) suggested one factor.

In a solution of two factors, five items have adequate loadings in both of them. All 16 items have high loadings in a one-factor solution.

The fit indices for all of the CFA models are presented in Table 1. Starting with Model 1, represented in Figure 1, its parameters are significantly different from zero. Chi-square was large and significant, which indicated that it is not a good fit. Nevertheless, chi-square is sensitive to sample size and thus very often indicates a less than optimal fit within larger

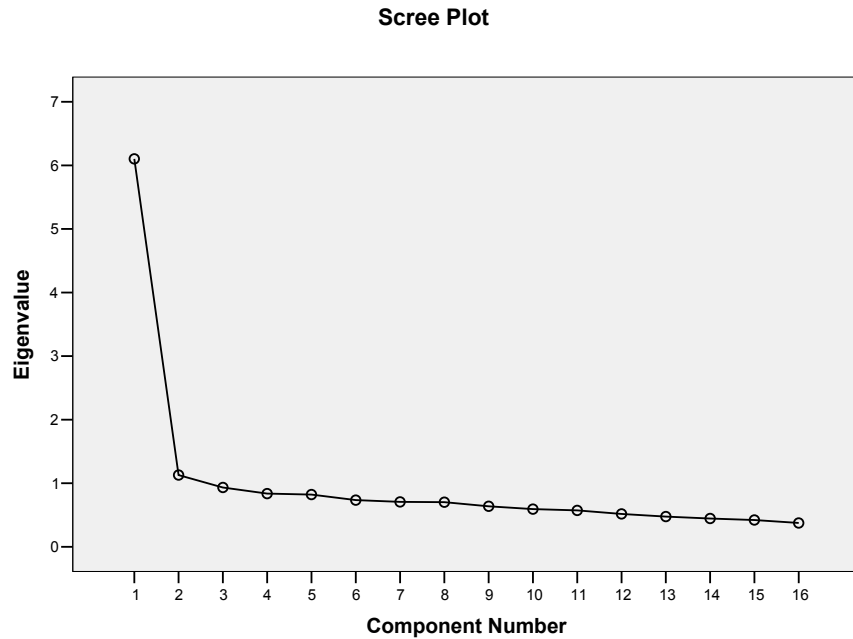


Figure 1. Scree plot of PRMQ-S.

Table 1
Fit indices for confirmatory factor analysis of the PRMQ-S

Models	X^2	df	X^2/df	GFI	AGFI	RMSEA	CFI
1. Single memory factor	272.822	104	2.623	.937	.917	.056	.933
2. Prospective and retrospective memory as correlated factors ($r = .99$)	272.463	103	2.645	.937	.917	.056	.933
3. Tripartite model	196.754	88	2.236	.954	.929	.049	.957

samples. Thus, others goodness of fit indices provide more exact information about the model fit. RMSEA should be $< .05$. This index showed values close to the criterion (.056, .056 and .049, respectively, in the three models analyzed). All of the other indices showed values within the criteria.

Model 2, is a two-correlated factor model. Its parameters are significantly different from zero, and the correlation between factors is strong ($r = .99$). The goodness of fit indices contains the same values from Model 1.

Model 3, reported as the best fit model by Crawford et al. (2003) and Rönnlund et al. (2008), shows the best goodness of fit indices; nevertheless, not all parameters are significant. The item loadings are shown in Figure 3.

Influence of age

Even though the correlation between age and the total scale ($r = .09$; $p = .038$) and age with the retrospective scale were significant ($r = .10$; $p = .018$), the Pearson coefficients were weak. The p-value was influenced by sample size (the prospective scale and age: $r = .07$; $p = .108$).

Conclusions

The aim of this study was to translate the PRMQ into Spanish and to evaluate the psychometric properties of PRMQ-S. As for central tendency measurements, they were slightly lower than those found by Crawford et al. (2003) due to sample features. The reliability estimated by Cronbach's alpha was almost the same reported by Crawford et al. (2003) and Rönnlund et al. (2008). The split-half reliability demonstrated an adequate value that was modestly higher than the one reported by Smith et al. (2000).

According to factor structure, our results suggested a disagreement with the tripartite model defended by Crawford et al. (2003), Crawford, Henry, Ward, and Blake (2006) and Rönnlund et al. (2008). We found the recommendation of a one-factor solution based on the exploratory factor analysis. Goodness of fit in the confirmatory factor analysis suggested that the model could be improved. The goodness of fit indices in model 2, which represents two correlated factors, has the same values, and correlation between the factors indicated that a one-factor model may be adequate.

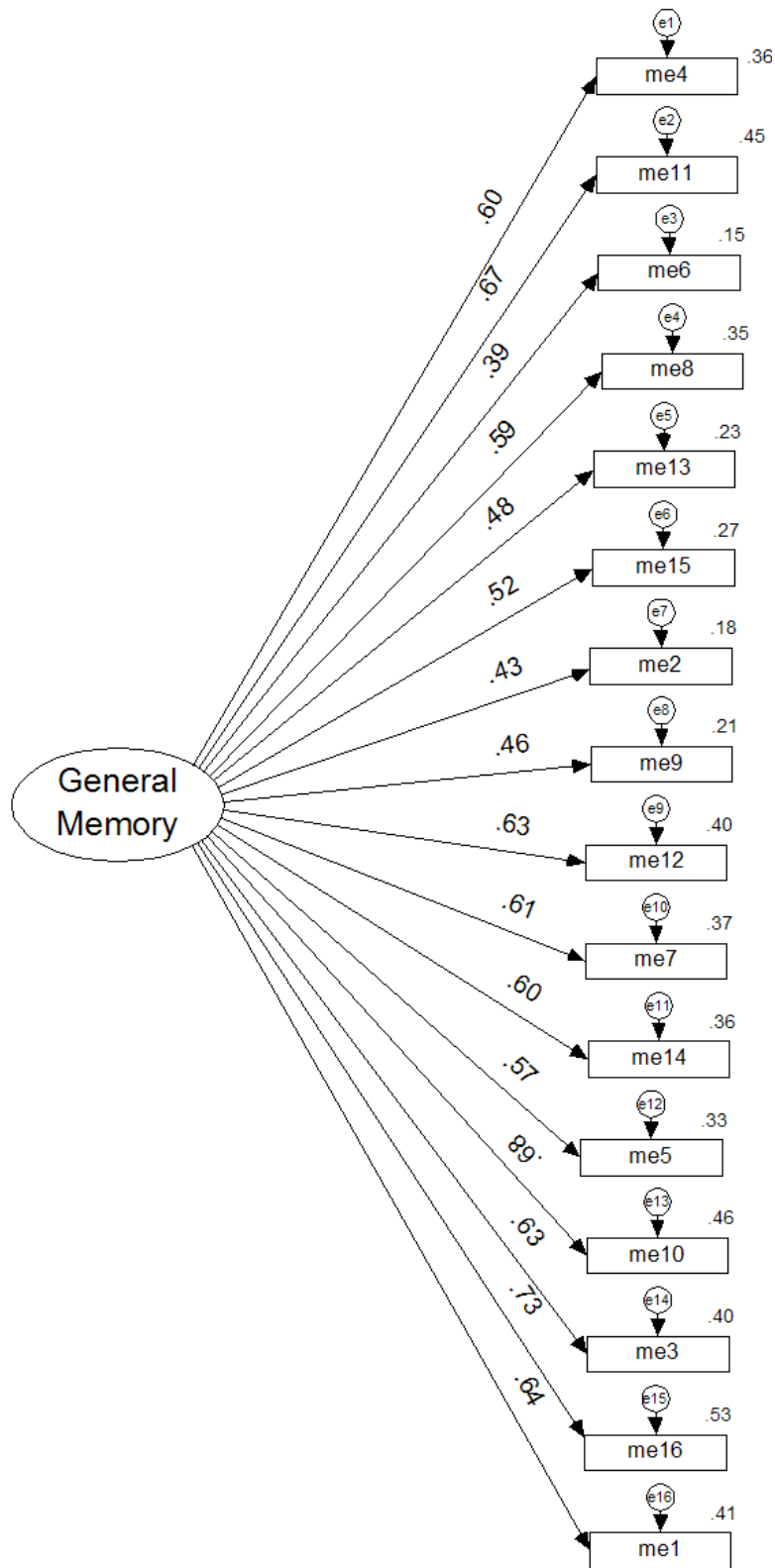


Figure 2. Graphical representation of Model 1.

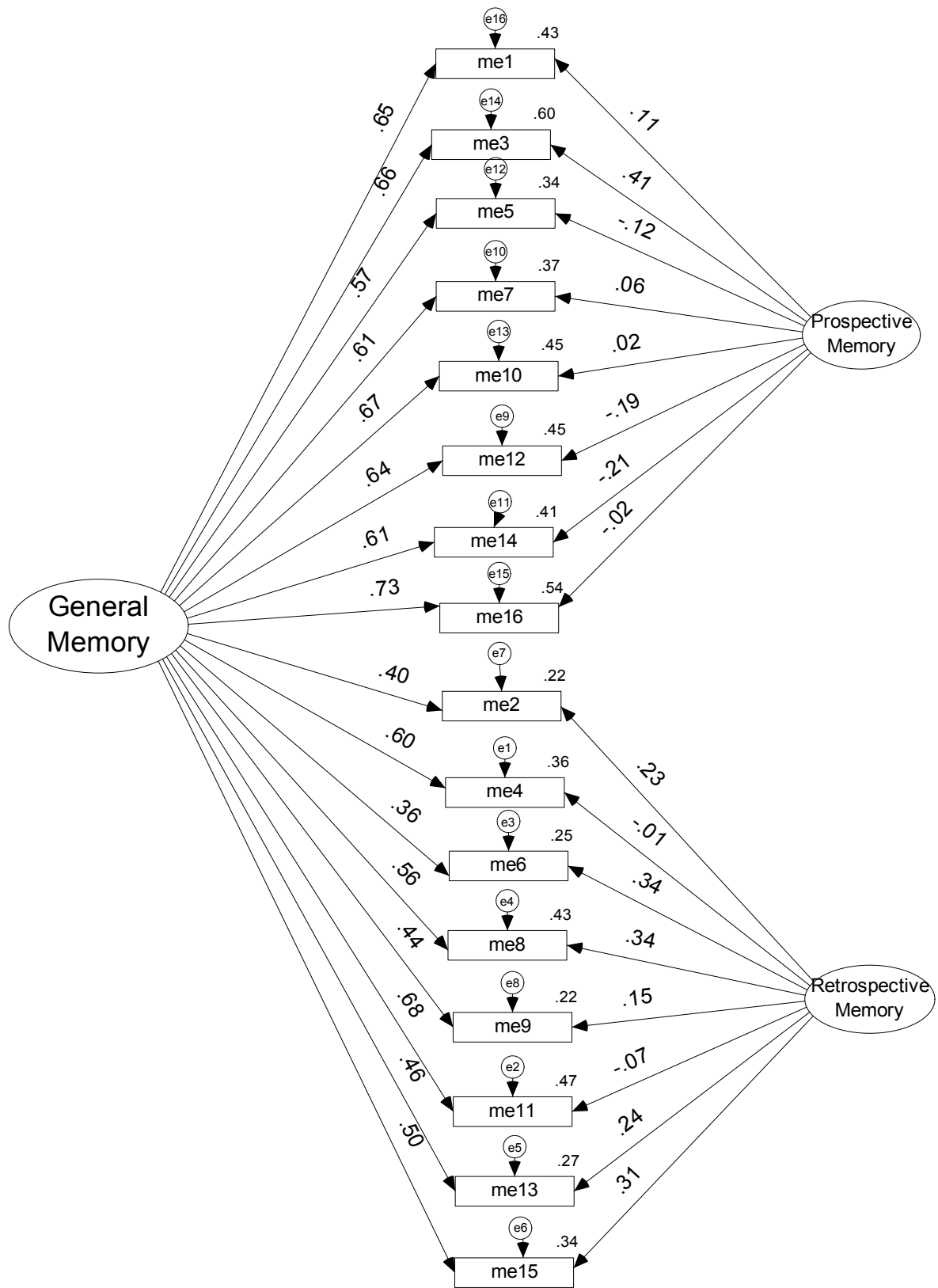


Figure 3. Graphical representation of Model 3 (tripartite model of the PRMQ-S).

Goodness of fit is better in the tripartite model than in a single-factor model. However, in the tripartite model, not all the parameters are significant, and its item loadings are higher on the general factor than on specific prospective or retrospective memory factors. Crawford et al. (2006) reported similar findings about the item loadings. Their results and ours suggest that the tripartite model is not the best factor structure for scale. As we mentioned before, prospective and retrospective memory are two types of memory but share subsystems. Thus, they are not separated. This was reflected in the high correlation between the two factors (Model 2).

As a part of our analyses, we evaluated the correlation between age and the PRMQ-S subscales. Crawford et al. (2003) failed to detect a significant correlation between age and scores on the PRMQ. Rönnlund et al. (2008) indicated that this was an intriguing finding, considering the substantial evidence about these correlations. Therefore, they found significant correlations between two of the PRMQ scales (total score and prospective score) and age. We also found a significant correlation between them, even though the Pearson's coefficient was weak and the p-value was influenced by sample size. Nevertheless, it is necessary to perform research that evaluates age groups.

We demonstrated adequate psychometric properties of the PRMQ-S. Our results suggest that using a single score of PRMQ-S would be the best option to use in a research. Nevertheless, using PRMQ-S as a way to obtain data of memory failures in a clinic environment, the scale could give much more information than a single score. It provides specific information about the failures reported by patients to be the most important in their own lives. This is relevant due to the need for a short and accurate instrument in our language that explores memory failures with a major impact on activities of daily living. For further research, it would be interesting to use a representative sample to obtain normative data about the PRMQ-S. Also, we suggest evaluating with combined assessments that include PRMQ-S and other actual measures, such as those used by Livner et al. (2009).

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