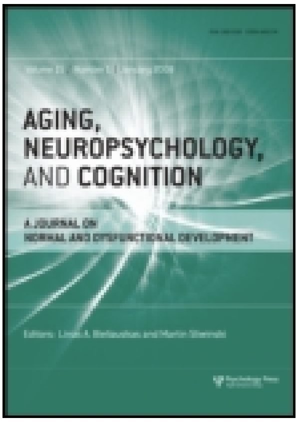

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Comparison Between Spanish Young and Elderly People Evaluated Using Rivermead Behavioural Memory Test

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ABSTRACT

The first objective of this work was to compare scores obtained in the daily memory function between young and elderly people, and to check whether there are differences between the groups for each of the profile scores obtained in the memory test. A second aim of this paper is to study the relationship between everyday memory and age, while controlling for gender and educational level. The total and profile scores obtained in the Rivermead Behavioural Memory Test were compared in a sample of 60 young and 120 elderly people from Valencia (Spain). Results showed significant differences between the two groups: those between 18 and 30 years obtained a higher average than those over 65. Once the group comparison was controlled for gender and educational level, the statistical effect of age group disappeared. The non-significant effect of group can not be explained by the introduction of gender, because both its main effect and the interaction were not statistically significant. However, educational level had a statistically significant effect which may explain the non-significant effect of group in this new analysis. The main conclusion is the need to carefully control for educational level in all studies related with everyday memory and ageing, as the differences found could be due to generational differences more than to biological deterioration.

Keywords: Memory evaluation; Everyday memory; Young people; Old age; Rivermead Behavioural Memory Test.

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INTRODUCTION

There is substantial empirical evidence showing that as we get older, mental processes are less efficient. In the framework of deterioration, the clearest symptoms of cognitive dysfunction appear in memory (Casanova-Sotolongo, Casanova-Carrillo, & Casanova-Carrillo, 2004), especially in relation to recent events, in the delay in the memorisation speed and inability to learn new things and recall information. Therefore, memory tests could be used as indicators of mild cognitive impairment, and/or pre-clinic conditions useful in the diagnosis of dementia (Luis, Loewenstein, Acevedo, Barker, & Duara, 2003; Petersen et al., 1999).

However, according to Calero et al. (2008), not all dimensions of memory are equally affected by age; some dimensions are clearly affected and others remain almost unaltered by ageing. Most researchers have used standardised tests of memory abilities, but few research studies have focussed on understanding the relationship between age and everyday memory. Klatzky (1991) conceptualized everyday memory as the recall of common events produced during a normal day, which may be translated into subjective memory complaints.

The Rivermead Behavioral Memory Test (RBMT), developed by Wilson, Cockburn, Baddeley, and Hiorns (1989), is one of the most widely used instruments to measure everyday memory, and most authors agree that it has high levels of reliability, validity, and specifically it is an ecologically valid measure of everyday memory. It was created with the aim of complementing traditional procedures of memory evaluation that are not useful in designing treatment programs, with a high level of validity, and sensitive to changes across time (Pérez-García, Godoy García, Vera Guerrero, Laserna Triguero, & Puente, 1998). The authors (Wilson et al., 1989) related the RBMT with observations of memory failures by therapists, patients and family members, and correlations were high and in the expected directions. Similar results concerning reliability and validity were obtained by Van der Feen, Van Balen, and Eling (1988) in the adaptation and standardization of the RBMT in a Dutch version. The RBMT has also been used in a number of clinical studies. Schwartz and McMillan (1989) used the RBMT as an objective measure of memory in a study where they compared subjective and objective measures of memory. Geffen, Encel, and Forrester (1991) used the RBMT to study deficits in everyday memory with patients who have been in a coma or suffered from post-traumatic amnesia. The results showed a high correlation between severity of the deficit evaluated with the RBMT, and the duration of both the coma and the post-traumatic amnesia. Beardsall and Huppert (1991) studied the utility of this measure of memory for early differential diagnosis of Alzheimer-type dementia. In sum, there is evidence of the validity of the RBMT to test for everyday memory status. Furthermore, in Spanish context, Alonso and Prieto (2004) stated that this test overcomes some problems of standardised memory tests, because it points out at the frequency and severity of specific memory problems of interest in everyday life. The RBMT test has also been validated in population of elderly people in different countries (e.g., Fraser, Glass, & Leathem, 1999; Kuçukdeveci, Kutlay, Elhan, & Tennant, 2008), including Spain (Alonso & Prieto, 2004).

There are a number of studies that relate memory to age. In a large sample study (N = 2495) of adult volunteers aged 18–90 years, West, Crook, and Barron (1992) found that age was consistently the most significant predictor of memory performance. In the same line Jonker, Geerlings, and Schmand (2000) found that the prevalence of memory complaints, defined as everyday memory problems, was positively associated with age. In a Spanish-speaking context, a large study by Ostrosky-Solis, Jaime, and Ardila (1998) also found an age-related decline in memory abilities. All test scores declined across ages between 4.1 and 76.6%. The RBMT was used in this study, and a high correlation of this test with other standardised measures of memory was found, thus supporting the idea that everyday memory also declines with age. Alonso and Prieto (2004) found a correlation of –.24 with age in a Spanish sample of elderly subjects.

The aforementioned results suggest a memory decline associated with age. However, most authors recognise that this decline may be mediated or moderated by third variables. Even some of the aforementioned studies showed associations of memory with other variables. For example, West et al. (1992) employed a number of variables to study mediational effects on the age-memory association. Gender and vocabulary also were strongly associated with memory. Jonker et al. (2000) found a strong negative association between educational level and everyday memory problems, as well as a worse performance by women. Schmand et al. (1997) state that cross-sectional and longitudinal results showed that, in less educated people, memory decline is faster and it sets in at an earlier age. In Spain, Alonso and Prieto (2004) also found a positive association between memory scores and educational level (r = .33). Ostrosky-Solis et al. (1998) also included educational level as a confounding factor, and they controlled their study for its effect, thus recognising its relevant role on the age-related decline of memory. With respect to gender differences, a meta-analysis of 25 studies supported gender differences favoring women in verbal episodic memory tasks and verbal fluency, and men in spatial, primary working/working memory, and tests of reasoning (Meinz & Salthouse, 1998). A recent study (Maitland, Intrieri, Schaie, & Willis, 2000) showed gender differences in latent means of verbal recall between men and women: women outperformed men.

Given that there are relatively few studies on everyday memory that compare young and elderly normal populations, especially in Spanish or

Spanish-speaking contexts, the aim of this study using Spanish samples is two-fold. A first aim is to compare young and elderly populations in everyday memory (RBMT). Specifically, it is hypothesised *(hypothesis a)* that young people would have a better performance in everyday memory as measured by RBMT. A second aim is to perform the group comparison while controlling for gender and educational level, as potential confounding variables of the aforementioned relationship. It is hypothesised *(hypothesis b)* that the inclusion of gender and educational level may explain the average difference between age groups expected by hypothesis a.

SUBJECTS AND METHODS

Participants

The study group comprised a total of 180 people from the Autonomous Region of Valencia (Spain), divided into two groups: from 18 to 30 years old, and over 65 years old. These were convenience samples and were not equated by any variables. There were differences in SES and cultural backgrounds. In particular educational level was higher in the youngest group. The former group included 60 people, with an average age of 19.85 years old, and a *SD* of 2.9 years, in which 68.3% were women, and 94.4% had secondary or further education. It was recruited trough University students willing to participate and/or recruited other people within that age range to participate. The second group was formed by 120 people above 65 years old, who were not living in nursing homes and had no signs of cognitive deterioration. This convenience sample was recruited through an Spanish civil association of elderly people (UdP), the largest association of elderly people in Spain. The average age for this group was 72.1 and the *SD* was 5.5 years, of which 83.3% were female, and 6.7% had secondary or further education. With respect to the marital status, 65.8% were married and 32.5% were widowed, the remaining 1.7% corresponded to other categories.

Data collection was performed directly on an individual basis between September 2007 and January 2008, after receiving informed consent from the participants in the study. All the tests were performed by two interviewers. All the interviews were performed at the University offices. Tests were exactly the same for young and elderly participants, but the elderly participants needed more time to both understand the instructions and perform the tests. This may be due, in part, to the fact that elderly participants seem to have more difficulties in concentrating on relevant information, which results in irrelevant information being kept in the working memory (Hasher & Zacks, 1988). The study was accepted by the Ethics Committee of the University of Valencia.

Material

For data collection, a questionnaire concerning several sociodemographic parameters was used, as well as various standardized tools; in particular, the second edition of the Rivermead Behavioural Memory Test, Version A (Wilson, Cockburn, & Baddeley, 2003), which has been applied to both groups. For the group of those over 65 years old, the Mini Cognitive Exam (Lobo, Saz, & Marcos, 2002) was also used, in order to rule out potential cognitive disorders, and the Goldberg General Health Questionnaire (Goldberg, 1978) in its 12-item version (González-Romá et al., 1991). This group was also asked whether they had any type of visual or auditory impairment, to rule out those people with physical disabilities, which might affect the results.

The Rivermead Behavioural Memory Test (RBMT) (Wilson et al., 2003) is designed to detect problems in memory function in situations similar to those of daily life. This test, the ecological validity of which has been demonstrated in different contexts (Kuçukdeveci et al., 2008), is used to assess changes in memory over time, in contrast to other standardised tools that rely on experimental measures. In particular, the subscales of the RBMT are designed to mirror everyday tasks, reflecting the types of situations that may cause some difficulties in daily life (Will, Clare, Shiel, & Wilson, 2000). Specifically, it consists of 12 subscales: name recall, recall of a personal belonging, recall of an appointment, picture recognition, immediate and delayed story recall, face recognition, immediate and delayed route recall, message recall, orientation and date questions. Each of these subtests of the RBMT can be marked with scores between 0 and 1 for each item (screening score) or with values ranging from 0 to 2 (standardised or profile score). Profile scoring was chosen for our analysis, as it gives more information than screening scoring, and the maximum score was therefore 24. The estimated completion time for the RBMT was on average 40 minutes for the younger group, and 70 minutes for the group of those over 65 years.

The Mini Cognitive Exam (MEC) (Beaman et al., 2004; Lobo et al., 2002) is the adapted and validated version in Spanish of the Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHungh, 1975). It is designed with the aim of providing a brief and standardised analysis of the mental state, estimating quantitatively the existence and the severity of cognitive deterioration, while not being a diagnostic aid for any specific disease. This screening tool for cognitive deterioration consists of 11 items in which 8 cognitive areas are evaluated: spatial and temporal orientation, immediate and recent memory, attention-concentration and calculation, expressive and comprehensive language, abstract thinking and visuospatial construction. The maximum score, obtained by adding the scores of each item, is 30 points. Individuals with scores lower than 23 were not included in the study, as it was possible, according to this test, that they had cognitive deficiencies. According to this cut-off criterion, seven elderly were excluded from the elderly sample.

The General Health Questionnaire (GHQ) (Goldberg, 1978) is a test designed to measure non-psychotic psychiatric disorders, and has been widely used in different contexts. The version used, consisting of 12 items (González-Romá et al., 1991), is the shortest available one and advances a two-factor model addressing the constructs of depression and anxiety. Each of the items is rated from 1 to 4, and scores can be obtained, both for the whole test and for the individual factors within it.

Data analysis

All the analysis has been performed using the SPSS 15 statistical package. Descriptive and inferential statistics were estimated, and figures were produced. Specifically, (a) a one way ANOVA was performed to test for mean differences between the age groups; (b) factorial ANOVA was used to test for age groups differences and gender and educational level effects; and (c) nonparametric tests were performed to test for differences in the Profile scores. For profile scores analyses, a Bonferroni correction was used to aid in the interpretation of the results.

RESULTS

First, a comparison between both age groups was made based on the profile scores of RBMT in order to test *hypothesis a.* Results of the *F*-test showed significant differences between the two groups (F = 98.53, p<.001, η^2 = .356): the group of those between 18 and 30 years obtained a higher average than the group of those over 65. This was a bivariate effect in which both groups were compared without controlling for other variables. However, both groups differed significantly in two important demographic variables, specifically gender (χ^2 = 5.3, p = .021) and educational level (t = 61.46, p < .001). Therefore, a new analysis was performed to statistically control for age and gender. The new analyses tested hypothesis b. Once these two variables were controlled for, the statistical effect of age group disappeared (F = 0.086, p = .770, η^2<.001). The non-significant effect of group can not be explained by the introduction of gender, because both its main effect (F = 0.100, p = .752, η^2 = .001) and the interaction sex-group (F = 0.039, p = .844, η^2<.001) were not statistically significant. On the other hand, educational level had a statistically significant effect (F = 7.78, p = .006, η^2 = .044), and this effect may explain the non-significant effect of group in this new analysis. This result is in line with hypothesis b.

In addition to this analysis, a detailed study of the 12 profile scores of the different tasks in the RBMT was conducted. As in the previous analyses,

TABLE 1. Differences between age groups for each of the items on the RBMT

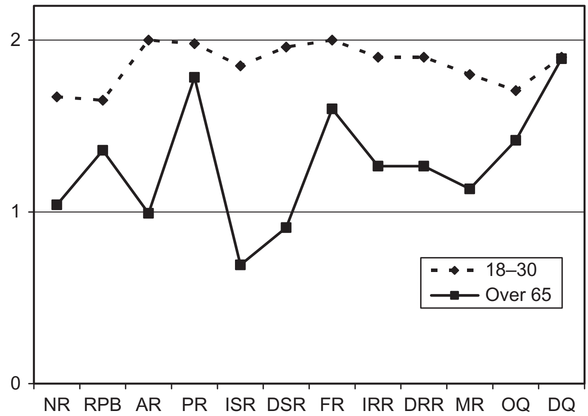
	Group effect			Group effect controlled for gender and educational level		
Task	*F*	*p*	η^2	*F*	*p*	η^2
Name recall	19.03	< .001	.097	0.650	.421	.004
Recall of a personal belonging	7.10	.008	.038	1.81	.180	.010
Recall of an appointment	71.68	< .001	.287	0.203	.653	.001
Picture recognition	9.08	.003	.049	0.261	.610	.001
Immediate story recall	104.7	< .001	.370	2.43	.121	.014
Delayed story recall	105.1	< .001	.371	0.343	.559	.002
Face recognition	24.34	< .001	.120	0.475	.491	.003
Immediate route recall	33.65	< .001	.159	5.52	.020	.031
Delayed route recall	31.43	< .001	.150	8.28	.005	.045
Message recall	28.38	< .001	.138	1.55	.214	.009
Orientation questions	9.51	.002	.051	0.745	.389	.004
Date question	0.016	.900	< .001	0.005	.942	< .001

Note: According to the Bonferroni correction $p < .004$ is needed to declare a difference as statistically significant.

firstly the analyses were performed bivariately, and secondly the analyses were controlled for gender and educational level. Taking into account that testing these effects requires several different analyses of the same data set, and in order to limit type I errors, Bonferroni correction was used for data analysis. Despite Bonferroni correction, it can be seen in Table 1 that, in all cases, except in the subtest referring to dates, differences between groups were statistically significant.

In order to better visualise the bivariate differences in the 12 profile scores, the results can be plotted as shown in Figure 1. The graphical divergence corresponds to statistically significant differences. There was a systematic negative effect of age, but this effect was uncontrolled by gender or educational level. Therefore, a second level of analyses was performed, statistically controlling for gender and educational level. The multivariate analyses can be seen in Table 1. The pattern of results was quite clear: none of the bivariate effects of age remained significant when gender and educational level were controlled for. In fact, the inclusion of educational level made the effects of age disappear, as they disappeared in the overall score of the RBMT. Furthermore, according to the effect sizes (η^2) in Table 1, the pattern of effects is even clearer: there were medium to large effect sizes of age when only bivariate relations were considered, but these effects turned to almost non-existent when educational level was controlled for (see eta-squared in Table 1).

FIGURE 1. Average scores for the two age groups on each of the items of the RBMT.
NR, Name recall; RPB, Recall of a personal belonging; AR, Recall of an appointment; PR, Picture recognition; ISR, Immediate story recall; DSR, Delayed story recall; FR, Face recognition; IRR, Immediate route recall; DRR, Delayed route recall; MR, Message recall; OQ, Orientation questions; DQ, Date question.



DISCUSSION

In the bivariate results, related to the first objectives of this study, there were mean differences in the daily memory function: the elderly had lower means on the RBMT and its tasks, with higher variability. These findings were similar to those obtained in other studies, both conducted in Spain (Alonso, & Prieto, 2004; Pérez, Peregrina, Justicia, & Godoy, 1995) and abroad (Wilson et al., 1989, 2003) and these could reinforce the idea of a high prevalence of age associated memory impairment in the older population.

However, we should bear in mind that both gender and level of education were different in the two groups analysed, and this had an impact on the results. Furthermore, in other published studies the level of education in the older population was also generally lower than in the younger population. Therefore, these variables should be controlled for in this type of studies. Nevertheless, this seems to be a generational effect. Results showed that differences between the two groups turned into non-significant when educational level was controlled for. This result is also in line with some studies that recognize the importance of educational level and its relationship with memory problems (Alonso & Prieto, 2004; Jonker et al., 2000; Schmand et al., 1997). There were also gender differences between the two groups, and gender has been related to memory in several studies (e.g., Maitland et al., 2000; Meinz &

Salthouse, 1998). However, this gender effect was not found in our study and it also had no impact as a moderator of the age-everyday memory relationship.

With respect to the 12 memory tasks in the RBMT, the greatest bivariate differences between young and elderly people in the profile scoring were found in the immediate and delayed story recall tests, recall of appointments, as well as name recall. These were the lowest results in >65-year-old group. Along the same lines, other studies (Hultsch, Masson, & Small, 1991) have shown differences in story recall between young and elderly people, and exclusively with large population sizes, the greatest effects are found in appointment recall, belonging recall and the story recall tests (Montejo & Montenegro, 2006). In relation to this factor, age-related differences have been found in the recall of information during speech, with observable difficulties in comprehending and producing information (Buiza, 2001), and, among others, specific problems with the comprehension of texts (Ulatowska, Hyashi, Cannito, & Fleming, 1986). However, as with the total RBMT profile score, these differences in the 12 tasks disappeared when educational level was controlled for, pointing out that the role of educational level as a moderator of the relationship between age and everyday memory may be quite general. Again, gender plays no role in task differences in our samples.

In sum, the results of this study point out the relevant role of educational level to understand the observed everyday memory differences between age groups. However, more research on this area is needed, since the present study has some shortcomings: a better control of the socio-demographic characteristics of samples, and better sampling procedures (random sampling instead of convenience sampling) is needed. The use of other ecological measures of the everyday memory could also be interesting.

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