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Age differences in cognitive performance: A study of cultural differences in Historical Context

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Ethnicity and cultural experience can affect neuropsychological performance, but they are rarely assessed in historical context. Attention measures are considered strongly biologically determined and therefore potentially culture-fair. In this study, we assessed the cross-cultural equivalence of Spanish and English versions of the Trail Making Test (TMT; Reitan, 1958, *Perceptual and Motor Skills*, *8*, 271–276) and the Brief Test of Attention (BTA; Schretlen *et al.*, 1996, *The Clinical Neuropsychologist*, *10*, 80–89) in two large samples of Americans (N = 203) and Spaniards (N = 213), divided into younger and older subgroups. The older Spaniards lived under Franco's political regime (1936–1975), whereas the Americans never experienced such repression. Overall, TMT performance was culture-sensitive, whereas BTA performance was not. However, when both groups were stratified by age, cultural differences in TMT performance were restricted to older participants, suggesting that historical experience across generations might have contributed to the observed differences in cognitive performance. Even such basic cognitive processes as attention, working memory, and resource sharing might be shaped to some degree by historical experiences that contribute to cultural differences.

Neurocognitive tests aim to measure underlying brain functioning (Reitan, 1958, 1966). However, other factors can affect cognitive performance, including a person's ethnicity and cultural background (Brickman, Cabo, & Manly, 2006; Evans, Miller, Byrd, & Heaton, 2000; Heaton, Taylor, & Manly, 2003). Ethnicity is a somewhat narrower construct that refers to a person's shared nationality and language (Betancourt & López, 1993). Culture is a broader construct that is thought to encompass the sum of 'learned influences on behaviour that occur during the socialization process' and are 'transmitted… from one

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generation to another' (p. 377; Betancourt & López, 1993; Gasquoine, 1999; Helms, 1992). By definition, cultural influences occur in historical context. This may be especially true for groups of people exposed to adverse political events or social conditions related to their minority status, ethnicity, or a repressive political regime (Phinney, 1996; Roberts, Sanders, & Wass, 2008). However, very few studies of how historical events might shape cognitive styles and schemata have been reported.

Given the interwoven nature of culture and history, the cultural effects on cognitive performance might differ by age. For example, Park, Nisbett, & Hedden (1999) argued that differences in cognitive performances between ethnic groups might diminish with increasing age due to the 'levelling effects of neurobiologically based functional decline on basic processes, such as cognitive resource measures', referred to as cultural convergence (p. 75; Park & Gutchess, 2006; Park *et al*. 1999). Conversely, it also is possible that ageing could amplify the effects of cultural differences on cognitive performance due to longer duration of exposure to a certain cultural or historical environment (Park *et al.*, 1999). A third possibility is that age cohort differences in the effects of cultural background on cognitive performance reflect the historical context of both. That is, the historical timing of changes in life expectancy, literacy rates, and defining events, such as wars or natural disasters, also differs across cultures. Thus, elucidating cultural differences in cognitive performance as a function of age cohort could help disentangle the effects of ethnicity and cultural experience on cognitive functioning. Such investigations also are important because advances in technology and globalization often are embraced more readily by younger than older persons, which might contribute to age differences in the effects of culture on how people process information (Inda & Rosaldo, 2002).

It is important to assess the equivalence of neuropsychological procedures in different ethnic groups (Ardila, 1995; Lucas *et al.*, 2005; Manly, 2005; Ramirez, Fujihara, & van Goozen, 2001; Van de Vijver & Tanzer, 1997). Culture-bias in neuropsychological assessments can lead to over- or under-diagnosing cognitive impairment in specific groups (Weiner, 2008; Whitfield, 2002; Whitfield *et al.*, 2000). Cross-cultural discrepancies may result from differences in 'test-wiseness', attitudes towards testing, and the importance people attach to working quickly or responding accurately (Helms, 1992; Steele & Aronson, 1995). On the other hand, using ethnic-specific norms for culture-sensitive tests has certain caveats and disadvantages. Lower performances on neurocognitive tests in a specific ethnic group can be clinically significant. For example, poor nutrition might contribute to cerebrovascular disease or neurodevelopmental deficits that occur more frequently in one ethnic group than another. In this case, there is always the possibility that the ethnic-specific norms could obscure clinically significant phenomena (Brandt, 2007). Regardless of whether one adopts culture-specific norms, it is important to make cross-cultural comparisons to estimate the magnitude of such differences.

In this study, we recruited participants from the USA and Spain to assess the culture-fairness of two attentionally demanding cognitive tasks — the Trail Making Test (TMT; Reitan, 1958) and the Brief Test of Attention (BTA; Schretlen, Bobholz, & Brandt, 1996). Attention is a basic psychological process that is strongly biologically determined and widely thought to represent a 'hardwired' cognitive function (Baltes, 1993; Fan, Wu, Fossella, & Posner, 2001; Lin, 1998; Park *et al.*, 1999; Rueda, Rothbart, McCandliss, Saccomanno, & Posner, 2005). Therefore, one might reasonably expect attention tests to be more culture-fair than tests that depend more heavily on language or categorical knowledge (Park & Gutchess, 2006). Among tests of attention, the TMT is one of the most commonly used instruments for neuropsychological assessment (Rabin, Barr, & Burton, 2005). However, research suggests that TMT performance is susceptible to cultural differences (Fernandez & Marcopulos, 2008). In fact, in a meta-analysis of cross-cultural differences on TMT, large discrepancies were reported among most of the ten countries compared, showing that even a very basic psychological process is affected by cultural factors. However, it is possible that these differences reflect variation in attentional style, as in one's preference for speed over accuracy or vice-versa, rather than differences in the underlying organization of cognitive processes and functional brain capacity. Methodological limitations of previous studies might have affected the reported findings (Park & Gutchess, 2002; Park *et al.*, 1999). In fact, in the same meta-analysis of the TMT, demographic differences and variations in test administration/scoring procedures (e.g., whether errors were corrected during testing) likely contributed to some of the observed group differences in performance (Fernandez & Marcopulos, 2008). Furthermore, differences in acculturation, or the integration of new cultural elements that results from exposure (e.g., in immigrants) also might have confounded inferences about the sources of group differences in some studies (Choi, Nisbett, & Smith, 1997; Gasquoine, 1999; Park *et al.*, 1999).

In this study, we addressed the aforementioned limitations by restricting our samples to specific geographic regions of interest (Spaniards in Spain and Americans in the USA) to avoid acculturation effects, matching our samples on age and education, and using the same test administration procedures for all participants. We also examined whether any observed culture-related differences affect performance equally on two different tests of attention, the TMT and the BTA. The BTA was designed to limit cognitive demands (e.g., visual scanning, psychomotor speed) that complicate the interpretation of performance on many attention tests. Therefore, we hypothesized that there would be fewer cultural differences in BTA than TMT performance. We also hypothesized that advancing age would correlate with poorer performance in both groups on both tests. Finally, we speculated that cultural differences in test performance might be larger for older than younger adults as a result of age cohort differences in cultural experience. Perhaps the most obvious of these is the fact that older Spaniards lived under the repressive dictatorship of Francisco Franco from 1936 to 1975, whereas neither younger Spaniards nor Americans in either age cohort experienced such widespread cultural and political repression.

Method

Participants

Participants included 203 healthy adults from the Baltimore, Maryland metropolitan area (USA) and 213 healthy adults from the Bizkaia region of northern Spain. Both groups were recruited for studies of normal cognitive ageing via random-digit dialling, calling randomly selected telephone numbers from the telephone directory, local advertising, and posted announcements. Each participant underwent a structured psychiatric interview and gave a health history. Subjects were excluded if they were unable to give informed consent or, if they had any history of psychosis, central nervous system disorder (dementia, stroke, transient ischemic attack, traumatic brain injury with >1 h loss of consciousness), active systemic illness (e.g., cancer, heart disease) or current alcohol/drug abuse or dependence. Of note, neurological and psychiatric screening and exclusion criteria and the definition of 'normal' did not differ among the American and Spanish samples. Participants were treated according to the Declaration of Helsinki ethical guidelines and each person gave written informed consent to participate. For the American sample, the Johns Hopkins School of Medicine and the Hartford Hospital Institutional Review Boards[†] approved all the studies from which subjects were drawn. For the Spanish sample, no institutional review was required, as the research did not involve invasive procedures.

Procedures

Two measures of attention and resource sharing were administered, the TMT (Reitan, 1958) and the BTA (Schretlen *et al.*, 1996). The convergent validity of the two measures was demonstrated in a recent study in elderly adults (Brandt *et al.*, 2009). Of 18 executive cognition measures, these two measures shared considerable variance and loaded on the same factor which was labelled working memory and resource sharing (Brandt *et al.*, 2009).

Trail Making Test (Reitan, 1958)

This well-known and widely used test assesses visual scanning, sequencing, single and dual mental tracking, and psychomotor speed. Of note, uniform test administration and scoring procedures were used across samples. The examiner pointed out mistakes whenever they occurred, and subjects were required to correct the error before continuing. Examinees were allowed a maximum of 300 s to complete part A and 600 s to complete part B of the TMT. Because TMT-B adds a set-shifting demand to the sequencing and visual scanning requirements of TMT-A, it often is thought to place greater demands on the supervisory attentional system than TMT-A. Therefore, we also subtracted completion times for TMT-A from those for TMT-B to assess executive functioning (larger differences reflect poorer executive control). Thus, the variables used for data analysis were times to complete TMT-A, TMT-B, and TMT-B minus TMT-A, as well as the number of errors committed on both.

Brief Test of Attention (Schretlen et al.*, 1996)*

The BTA is a test of auditory divided attention. It consists of two parallel forms presented via audiocassette. On Form N (Numbers), a voice reads ten lists of letters and numbers that increase in length from 4 to 18 elements, and the examinee must keep track of how many numbers (ignoring the letters) each list contains. On form L (Letters), the same 10 lists are presented, and the respondent must keep track of how many letters each list contains. The total number of correct responses was recorded for statistical analyses.

Statistical analysis

Independent-samples *t*-tests were used to examine group differences in age, years of education and test performances. Chi-squared (χ^2) test was used to examine group differences in sex. The significance level was set at $p < .05$, two-tailed for all analyses. Because multiple comparisons were performed, we applied a partial Bonferroni correction that accounts for both the number (24) of the comparisons conducted and

[†] *The names of the institutions were omitted while the manuscript was under peer review. This has now been corrected in the online version, and 'masked review' has been replaced by the institution names.*

Table 1. Demographic characteristics of the American and the Spanish samples (*means* ± *SDs*)

Characteristic	Sample	USA	Spain	*p*-value
Age (years)	Entire	43.8 (14.3)	43.5 (15.4)	.79
	Young	29.4 (5.7)	28.7 (6.5)	.44
	Old	53.6 (9.1)	54.5 (9.8)	.48
Education (years)	Entire	13.9 (2.7)	13.5 (3.6)	.21
	Young	13.8 (2.5)	15.5 (2.0)	<.001
	Old	13.9 (2.8)	12.0 (3.7)	<.001
Sex (male %)	Entire	42.4%	48.8%	.19
	Young	41.5%	49.5%	.29
	Old	43.0%	48.4%	.40

the mean correlation among outcome variables. Based on a mean Pearson $r = .34$ among the outcome variables, this yielded a partial Bonferroni-adjusted p-value of .006 (http://www.quantitativeskills.com/sisa/calculations/bonfer.htm). The effects of demographic variables on TMT and BTA performance were examined with a series of stepwise linear regression models in the Spanish and American groups separately.

Results

As shown in Table 1, the Spanish and American groups did not differ in age ($t = 1.25$, $p = .21$), years of education ($t = 0.26, p = .79$), or sex ($\chi^2 = 1.74, p = .19$). As expected, both increasing age and fewer years of education were associated with poorer performances on both measures in both groups. However, in the Americans, age and education correlated with performance on all TMT and BTA measures except TMT-A errors, for which only education predicted performance. In addition, sex contributed to BTA performance, as women outperformed men on this attention test. In the Spaniards, demographic factors that predicted cognitive performance were slightly different. While age and education both contributed to performance on some measures (BTA, BTA L,

Table 2. Summary of regression analyses: Contribution of demographic factors on the TMT and the BTA in the American sample

Variable	Factor	B	*SE* B	Standardized beta	R^2
BTA L	Education	.206	.048	.287	.091
	Age	−.022	.009	−.163	.118
BTA N	Age	−.032	.008	−.254	.076
	Education	.148	.044	.222	.125
BTA Sum	Education	.350	.080	.286	.096
	Age	−.052	.015	−.224	.142
	Sex	.952	.432	.143	.171
TMT-A sec	Age	.175	.052	.226	.061
	Education	−.873	.278	−.211	.105
TMT-A err	Education	−.025	.011	−.151	.023
TMT-B sec	Education	−6.955	1.094	−.393	.176
	Age	.884	.205	.266	.246
TMT-B err	Education	−.083	.022	−.252	.075
	Age	.013	.004	.210	.118
TMT-B minus TMT-A	Education	−.130	.027	−.323	.114

Table 3. Summary of regression analyses: Contribution of demographic factors on the TMT and the BTA in the Spanish sample

Variable	Factor	B	*SE* B	Standardized beta	R^2
BTA L	Education	0.096	0.038	.202	.085
	Age	−0.018	0.009	−.161	.103
BTA N	Age	−0.025	0.007	−.246	.060
BTA Sum	Age	−0.037	0.014	−.202	.089
	Education	0.139	0.062	.176	.111
TMT-A sec	Age	1.097	0.099	.611	.374
TMT-A err	Education	−0.013	0.005	−.165	.027
TMT-B sec	Age	2.056	0.243	.520	.420
	Education	−4.001	1.056	−.233	.458
TMT-B err	Age	0.008	0.003	.169	.028
TMT-B minus TMT-A	Education	−0.042	0.014	−.208	.043

Table 4. Neuropsychological results for the entire sample, for the younger subgroup (<40) and for the older subgroup (≥40). *Means* (*SDs*)

Test/measure	Sample	USA	Spain	*p*-value
BTA L	Entire	8.25 (1.93)	8.39 (1.69)	.42
	Young	8.71 (0.16)	8.66 (0.16)	.82
	Old	7.85 (0.17)	8.25 (0.17)	.12
BTA N	Entire	8.23 (1.79)	8.26 (1.56)	.89
	Young	8.81 (0.15)	8.47 (0.15)	.12
	Old	7.80 (0.16)	8.16 (0.16)	.14
BTA Sum	Entire	16.48 (3.29)	16.71 (2.80)	.43
	Young	17.52 (0.27)	17.16 (0.26)	.36
	Old	15.65 (0.29)	16.49 (0.29)	.052
TMT-A sec	Entire	28.50 (11.10)	40.75 (27.63)	<.001*
	Young	26.66 (1.16)	28.71 (1.12)	.22
	Old	31.75 (2.18)	47.52 (2.18)	.001*
TMT- A err	Entire	0.18 (0.44)	0.08 (0.28)	.006*
	Young	0.12 (0.04)	0.06 (0.04)	.40
	Old	0.23 (0.03)	0.06 (0.03)	.001*
TMT-B sec	Entire	73.56 (47.59)	87.62 (60.72)	.009
	Young	61.32 (2.63)	58.51 (2.52)	.45
	Old	89.37 (5.33)	102.00 (5.33)	.10
TMT- B err	Entire	0.44 (0.88)	0.32 (0.75)	.13
	Young	0.28 (0.67)	0.13 (0.43)	.18
	Old	0.62 (0.07)	0.33 (0.07)	.01
TMT-B minus TMT-A	Entire	2.61 (1.08)	2.21 (0.72)	<.001*
	Young	2.38 (0.08)	2.15 (0.08)	.06
	Old	2.83 (0.09)	2.20 (0.09)	.001*

Note. *Asterisks denote comparisons that remain significant after adjusted Bonferroni correction.

TMT-B sec), a few correlated only with age (BTA N, TMT-A sec, TMT-B errors) or education (TMT-A errors, TMT-B minus TMT-A). Sex did not make a significant contribution to performance in the Spanish sample. The results are summarized in Tables 2 and 3.

As shown in Table 4, Americans completed both Part A (TMT-A: $t = -5.95, p < .001$) and Part B (TMT-B: $t = -4.38$, $p < .01$) of the TMT faster than Spaniards, although the difference in TMT-B completion time did not survive Bonferroni correction. In contrast, the Spaniards made fewer errors. This difference was statistically significant for errors on TMT-A ($t = -2.77$, $p < .01$), but not TMT-B ($t = 1.51$, $p = .13$). Finally, Americans showed significantly higher difference of TMT-B minus TMT-A (i.e., worse executive functioning) than the Spaniards ($t = 4.38$, $p < .001$). The American and Spanish participants did not differ significantly on either form L or form N of the BTA, and their mean scores overall were nearly identical (Americans = 16.48; Spaniards = 16.71).

We next divided each sample into younger (<40 years: 82 Americans, 91 Spaniards) and older (≥40 years: 121 Americans, 122 Spaniards) age cohorts in order to test whether the differences in performance are consistent across the age range. We chose age 40 as the cut-off, because participants aged less than 40 at the time of assessment were not exposed to socio-political conditions under Franco's dictatorship (they were all less than 5 years or born after the dictatorship ended), whereas aged 40 and older were at least old enough to attend school under the regime or were already adults (Franco's dictatorship lasted from 1936 to 1975). Because both the older and younger age cohorts differed on years of education, we used ANCOVA to control for potential effects of education. As shown in Table 4, marginal *means* (and *standard errors*) for the younger subsample did not differ significantly on either the BTA or TMT measures. When the two older cohorts were compared (also using ANCOVA to control for group differences in education), Spaniards slightly outperformed Americans on the BTA, although the difference did not survive Bonferroni correction. More strikingly, older Americans consistently completed the TMT faster than Spaniards, but also made significantly more errors. Finally, the older American cohort showed greater slowing on TMT-B relative to TMT-A than the older Spanish cohort.

Discussion

In this study, we compared patterns of performance shown by healthy American and Spanish adults on the TMT and BTA. We examined group differences overall and after stratifying both samples by age on these two tests of attention, working memory and resource sharing. Overall, the American and Spanish groups showed nearly identical BTA performance and distinctly different patterns of performance on the TMT test. Compared to Americans, the Spanish adults took more time to complete TMT, made fewer errors, and showed less of a performance decrement on TMT-B relative to TMT-A. On closer inspection, virtually all these differences were restricted to persons aged 40 and older.

Our finding of cultural differences in TMT performance is consistent with previous research (Fernandez & Marcopulos, 2008). However, while Fernandez and Marcopulos (2008) found significant differences in TMT performance across groups of persons from several western countries, Spain was not represented among them. Clearly, Spain and the USA share many features of 'Western' cultures, including styles of education, alphabet, and numeric systems. But there are important cultural/historical differences as well, and it seems likely that some of these contributed to the differences observed in this study. Interestingly, BTA performance was more culturally invariant, at least in these groups, and particularly in younger adults.

The BTA and TMT both require attention, but their task demands also differ. The TMT requires visual processing, whereas the BTA is an auditory task. Perhaps more importantly, TMT performance likely depends to some degree on a person's preference for speed versus accuracy. This preference is best understood as a cognitive style, rather than a cognitive process (Lohman & Bosma, 2002; Nietfeld & Bosma, 2003). It seems reasonable to infer that cultural differences might have greater impact on cognitive style than basic attentional processes. This could explain why we found larger group differences on the TMT than on the BTA. Thus, our findings suggest that when cultural differences are found in performance on tests of attention, they might reflect differences in cognitive style, rather than basic cognitive processes, *per se*. In this sense, variation in the apparent impact of culture on different tests of related cognitive abilities is likely to depend on varying task demands.

The TMT and BTA have good convergent validity, as they share considerable variance in healthy adults (Brandt *et al.*, 2009; Schretlen *et al.*, 1996). However, several differences in their task demands could contribute to differences in their susceptibility to culture effects. First, the TMT is a timed test, and how examinees interpret instructions to work as quickly as possible is thought to contribute to large cultural differences on such tests (Rosselli & Ardila, 2003). Second, the TMT allows for a greater range of response strategies for successful performance than the BTA. On the latter, all examinees must selectively attend to target stimuli, disregard distractors, and keep a mental count of how many targets are presented. As noted above, the TMT allows an examinee to tolerate more errors to draw lines connecting the test stimuli as quickly as possible, or slow down and avoid errors by placing a greater premium on accuracy, or assign equal importance to both speed and accuracy. In this study, compared to younger adults from both countries and to older Americans as well, older Spaniards seemed to prioritize accuracy over speed. That is, they took longer to complete the TMT, but they made fewer mistakes in the process. Indeed, older Spaniards actually made fewer errors on average than younger Americans on TMT-A. These differences in response style might contribute to 'method bias' in the TMT (Van de Vijver & Tanzer, 1997). Third, performance on the TMT-B depends on how well one has encoded the Latin alphabet sequence (Dugbartey, Townes, & Mahurin, 2000; Moll, Oliveira-Souza, Moll, Bramati, & Andreiuolo, 2002). Different linguistic experiences of English and Spanish speakers, such as opportunities for alphabetic sequence recitation (less frequent in Spain), also could influence what generally is thought to an automatic linguistic process (Steinberg, Bieliauskas, Smith, & Ivnik, 2005).

Neuroimaging data support the effects of social and culture environment on cognitive processes. It has been shown that, although the attention neural network develops under strong genetic control, it is also affected by the environmental context during development (Rueda *et al.*, 2005). In particular, the frequent use of specific cognitive strategies (cognitive styles) by people of different ethnicity may influence the recruitment and activation of neural networks (Han & Northoff, 2008).

Perhaps the most interesting finding of this study was that cultural differences in TMT performance varied so strikingly by age cohort. Differences in both completion time and error rates between the full American and Spanish samples disappeared when we examined only young people (<40 years of age), but remained among older participants. The finding that older adults differ in the patterns of performances, whereas younger participants do not, contrasts with the cultural convergence hypothesis (Park & Gutchess, 2006; Park *et al.*, 1999) which posits that the decreasing availability of cognitive resources, such as processing speed, working memory and attention, in older adults tends to constrain resources and strategies used to solve problems, and thereby increase the comparability of cognitive performance across ethnic groups with advancing age. However, we speculate that a powerful and specific socio-political condition that affected only the older Spanish cohort might moderate the expression of cultural convergence in this study. That is, the older Spaniards in this study (most of whom were from the Basque region) lived for decades under a brutal dictatorship in which inhibitory and prudent behaviour patterns were strongly reinforced. Under this regime, people learned to be very cautious and careful to avoid making mistakes in all manner of interactions with others due to fear of imprisonment or worse (Payne, 1987; StudyMode.com, 2009, 12). From 1936 to 1975, Spanish schools became extremely conservative institutions. Speaking Basque was forbidden, even if that was one's only language, and children were not allowed to learn Basque in school. Strict Catholic values were widely embraced, as were social norms that emphasized prudence in everyday life. Some of the oldest Spaniards in this study also survived the Spanish civil war. Altogether, these historical, socio-political events and cultural conditions might have led many Spanish participants in the older age cohort to develop a cognitive style that involves sacrificing speed in order to avoid making mistakes, as was reflected by their uniquely more cautious approach to the TMT. Younger Spaniards, on the other hand, who grew up after the Franco dictatorship ended and during the time in which media and other technological advances have facilitated mass communication, globalization, and increased sharing of cultural experiences might have developed an orientation towards speed and a tolerance of errors that is more similar to those of both younger and older Americans. While this explanation obviously is speculative, it seems to provide a plausible account for the core findings. It also introduces the idea that cultural influences and their historical context are inextricably linked to the discourse on cultural differences in clinical neuropsychology.

A limitation of this study is the fact that historical experience was not systematically assessed. The most important implication of this limitation is we cannot exclude the contribution of other factors, such as diet and nutritional status, quality of education, or rates of poverty to age cohort differences in cognitive performance. One or more of these factors could have affected cognition in specific ethnic subgroups at specific points in time (Alaimo, Olson, & Frongillo, 2001). However, if this were the case, one might expect one group (e.g., older Spaniards) to perform more poorly than the corresponding group (e.g., older Americans) on both the TMT and the BTA, or in terms of both completion times and error rates. Instead, what we found is that older Spaniards completed the TMT more slowly that older Americans, but they fewer errors, and that they performed marginally (but not significantly) better than older Americans on the BTA. In any case, we studied cultural differences from the perspective of historical experience by contrasting the cognitive styles of adults from one country that has never experienced a dictatorship with those from another country in which some citizens did and others did not experience a dictatorship. To our knowledge, this is the first study to address culture effects on cognition from a historical perspective. A final consideration is that younger adults scored closer to the ceiling of the BTA than older adults (17.3 vs 16.1 out of 20). This restriction of the range of performance by younger adults might have constrained between-group differences. However, since there is room for performance improvement, we believe that the test was sufficiently difficult to detect potential differences between the groups.

In summary, this study found that demographically matched samples of adults in Spain and the USA differed in their performance on the TMT but not on the BTA, even though both tests assess attention. However, the main difference appears to involve one's preference for speed versus accuracy, rather than a general performance decrement in one group compared to another. Most strikingly, on closer investigation, cultural differences on the TMT were restricted to older Spaniards in a manner that underscores the potential role of powerful and specific socio-political events that shaped the cultural experience of this cohort, and possibly accounts for the obtained findings. Future studies might try to replicate these findings by comparing the performance of different samples that did or did not live under similarly repressive socio-political conditions.

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Disclosure

Under an agreement with Psychological Assessment Resources, Inc., DJS is entitled to a share of royalty on sales of a test used in the study described in this article. The terms of this arrangement are being managed by The Johns Hopkins University in accordance with its conflict of interest policies. JP, EA, and NO have no conflicts of interest to report.

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