



Mental rotation and object-spatial-verbal cognitive stiles

Rotación mental y estilo cognitivo objetual, espacial y verbal

Alfredo Campos* y Diego Campos-Juanatey**

*Universidad de Santiago de Compostela, **Universidade da Coruña

Abstract

The aim of this study was to assess correlations between the Measure of the Ability to Rotate Mental Images (MARMI, Campos, 2012), an innovative mental imagery rotation test, and each of the three scales of the Object-Spatial Imagery and Verbal Questionnaire (OSIVQ, Blazhenkova & Kozhevnikov, 2009). Tests were administered to 203 undergraduates, and the MARMI was significantly correlated with the Spatial Imagery Scale of the OSIVQ ($r = .42$). Weak correlations were found for the MARMI with Object Imagery ($r = -.02$), and the Verbal Scales ($r = -.10$). We obtained significant differences between the mean scores of the three scales of the OSIVQ. The highest score was on the object scale, and the lowest score was on the verbal scale. The results are discussed.

Keywords: Mental rotation. Cognitive stiles. Object imagery. Spatial imagery. Verbal scale

Resumen

En esta investigación deseábamos averiguar la correlación que existía entre la Measure of the Ability to Rotate Mental Images (MARMI, Campos, 2012), un nuevo test de rotación de imágenes mentales, y cada una de las tres escalas del Object-Spatial Imagery and Verbal Questionnaire (OSIVQ, Blazhenkova & Kozhevnikov, 2009). Se aplicaron los test a un grupo de 203 estudiantes universitarios y encontramos que el MARMI correlacionó significativamente con la escala de imagen espacial del OSIVQ ($r = .42$). Fueron encontradas bajas correlaciones del MARMI con la imagen del objeto ($r = -.02$), y con la escala verbal ($r = -.10$). Obtuvimos diferencias significativas entre las medias de las tres escalas del OSIVQ. Las puntuaciones mayores se obtuvieron en la escala del objeto, y las menores puntuaciones se obtuvieron en la escala espacial. Se discuten los resultados.

Palabras clave: Rotación mental. Estilos cognitivos. Imagen del objeto. Imagen espacial. Escala verbal

Recently, Campos (2012) designed a test to measure an individual's ability to rotate mental imagery i.e., the Measure of the Ability to Rotate Mental Images (MARMI). Statistically significant correlations ($p < .01$) were found between the MARMI and tests that measure mental rotations such as the Spatial Scale of the Primary Mental Abilities (PMA; Thurstone & Thurstone, 1962/2002) ($r = .38$), or the Mental Rotation Test (MRT; Vandenberg & Kuse, 1978) ($r = .48$). Moreover, Campos (2012) found the MARMI correlated significantly ($p < .01$) with the Measure of the Ability to Form Spatial Mental Images (MASMI;

Campos, 2009, 2013) ($r = .48$), a test designed to measure spatial imagery. However, the test correlated poorly ($r = .05$), with the Vividness of Visual Imagery Questionnaire- 2 (VVIQ-2; Marks, 1995), a questionnaire for measuring image vividness.

On the whole, the correlation for the image rotation tests and imagery vividness questionnaires were weak or no association was found (Blajenkova, Kozhevnikov, & Motes, 2006; Burton & Fogarty, 2003; Campos, 1998, 2012; Campos & Pérez-Fabello, 2011b), which would indicate they measure different types of mental imagery.

Similarly, cognitive and neuropsychology studies (Kosslyn, 1994; Kosslyn & Koenig, 1992) have shown that imagery is not unitary, and at least two types of imagery have been distinguished i.e., object imagery, and spatial imagery. Object imagery refers to the form, colour, shape, and size of objects whereas spatial imagery refers to spatial relations among objects, locations of objects in space, movements of objects, and spatial transformations (Blajenkova et al., 2006).

The Object-Spatial Imagery and Verbal Questionnaire (OSIVQ), designed by Blazhenkova and Kozhevnikov (2009) has three scales: the Object scale, Spatial scale, and Verbal scale. This questionnaire was correlated to the Mental Rotation Test (MRT, Vandenberg & Kuse, 1978), Blazhenkova and Kozhevnikov (2009) found the MRT correlated $-.18$ ($p < .05$) with the OSIVQ object, $.31$ ($p < .01$) with the OSIVQ spatial, and $-.10$ with OSIVQ verbal.

There are different ways of processing information. People who study science have higher scores on spatial ability than people who study visual arts. Visual artists scored higher than scientists on tests that measure object imagery: shape, brightness, colour, and so on. People who work as painting or sculpting have special abilities on object imagery, however, the physicists, engineers and architects have higher spatial abilities than the average of population (Kozhevnikov, Blazhenkova, & Becker, 2010; Kozhevnikov, Kosslyn, & Shepard, 2005; Motes, Malach, & Kozhevnikov, 2008).

As the Measure of the Ability to Rotate Mental Images (MARMI, Campos, 2012) is a new test, we must know how the test correlates with other test, so the aim of this study was to assess the correlations between the Measure of the Ability to Rotate Mental Images (MARMI) and each of the three scales of the Object-Spatial Imagery and Verbal Questionnaire (OSIVQ), in order to gauge the efficacy of the MARMI. We also assessed differences in the types of mental imagery (cognitive styles: object imagery, spatial imagery, or verbal processing) usually used by psychology students.

Method

Participants

A total of 203 undergraduates, students of psychology (155 women and 48 men; mean age 19.80, $SD = 1.35$, age range 19 to 27 years) volunteered to participate in the study.

Materials

The Measure of the Ability to Rotate Mental Images (MARMI) consists of 23 items that measure the ability to rotate mental imagery. The test consists of an unfolded cube that participants have to mentally reassemble and rotate prior to responding to the items on the questionnaire. Each item has four options, two true and two false. Total scores were obtained by adding the correct options and subtracting the false ones. Test completion was limited to

10 minutes. Campos (2012) obtained a Cronbach α of .90.

The Object-Spatial Imagery and Verbal Questionnaire (OSIVQ) is a questionnaire consisting of 45 items, 15 for each of the three scales: the object, spatial, and verbal imagery scales. Each item is scored on a 5-point Likert type scale where 5 indicated “absolutely agree that the statement describe you”, and 1 indicated “total disagreement with the statement.” The questionnaire has no completion time limit, and Campos and Pérez-Fabello (2011a) obtained Cronbach alphas of .77, .81, and .72 for the Object imagery, Spatial imagery, and Verbal scales, respectively.

Procedure

In groups of approximately 20, participants were administered the Measure of the Ability to Rotate Mental Images (MARMI; Campos, 2012), and the Spanish version (Campos & Pérez-Fabello, 2011a) of the Object-Spatial Imagery and Verbal Questionnaire (OSIVQ; Blazhenkova & Kozhevnikov, 2009). The order of test administration was juxtaposed. All of the undergraduates participated voluntarily in the study and were assured their data would remain anonymous and confidential.

Results

The MARMI significantly correlated with Spatial Scale of the OSIVQ ($r = .42$, $p < .01$), however, did not correlate significantly with the Object Scale ($r = -.02$, $p > .05$), or with the Spatial Scale ($r = -.10$, $p > .05$).

In order to determine significant differences between scales, a Repeated Measures Analysis of Variance (ANOVA) was performed, and we obtained significant differences between the mean scores of the three scales of the OSIVQ, $F(1, 190) = 269.66$, $p < .001$, $\eta^2p = .59$, power = 1. The results of the Least Significant Difference test showed significant differences ($p < .001$) between the Object Scale ($M = 3.69$, $SD = .50$) and the Spatial Scale ($M = 2.39$, $SD = .60$), between Object Scale and the Verbal Scale ($M = 2.85$, $SD = .48$), and between Spatial Scale and Verbal Scale.

Discussion

The Measure of the Ability to Rotate Mental Images (MARMI) significantly correlated (.42) with Spatial Scale of the OSIVQ (Table 1), regardless of the spatial imagery was measured by a questionnaire, and mental rotation was measured by a performance test. High correlations have also been found between spatial imagery and imagery rotation (Blazhenkova & Kozhevnikov, 2009; Burton, & Fogarty, 2003; Campos, 2009). A weak negative correlation was observed for the MARMI with the Object Scale, and the Verbal Scale, a result that corroborated the findings of previous studies that have correlated image rotation tests with image questionnaires, and verbal scales (Blajenkova et al., 2006; Burton & Fogarty, 2003; Campos, 1998, 2012; Campos & Pérez-Fabello, 2011b). The verbal

scale and image scale were constructed as opposed (see Paivio, 1971, for a review), and imagery rotation and verbal scale are also opposed. Moreover, the results support the findings of other studies indicating that mental imagery is not unitary Kosslyn (1994), and Kosslyn and Koenig (1992).

We found that psychology students had higher scores on Object Scale than other scales, confirming studies of Kozhevnikov et al. (2010); Kozhevnikov et al. (2005), and Motes et al. (2008). Further research is required to assess the MARMI in samples of different age cohorts, and to correlate the MARMI with other measures of imagery. Also, further studies are required to assess the image commonly used by individuals of different age and professions

Table 1
Means and Standard Deviations, and Correlations of the MARMI with Scales of the OSIVQ

	Object Scale	Spatial Scale	Verbal Scale	M	SD
MARMI	-.02	.42*	-.10	9.73	9.14
M	3.69	2.39	2.85		
SD	.50	.60	.48		

* $p < .01$

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