Personality and Individual Differences 59 (2014) 107–111

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Gender differences in imagery

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ARTICLE INFO

Article history:
Received 5 August 2013
Received in revised form 20 November 2013
Accepted 2 December 2013
Available online 15 December 2013

Keywords:
Gender differences
Imagery
Sex differences
Tests
Questionnaires

ABSTRACT

The influence of gender on several measures of mental imagery was assessed using performance tests and imagery questionnaires. A group of 202 female and male university undergraduates were administered three performance tests, and three imagery questionnaires. The performance tests were the Measure of the Ability to Form Spatial Mental Imagery (MASMI), the Spatial Scale of the Primary Mental Abilities (PMA), the Mental Rotation Test (MRT), and the Measure of the Ability to Rotate Mental Images (MARMI). The questionnaires were: The Object-Spatial Imagery and Verbal Questionnaire (OSIVQ), the Vividness of Visual Imagery Questionnaire-2 (VVIQ-2), and the Betts' Questionnaire Upon Mental Imagery (Betts' QMI). Men obtained higher scores than women on the performance tests. No significant gender differences were observed on the imagery questionnaires. Women obtained higher scores than men on the Object scale of the Object-Spatial Imagery and Verbal Questionnaire. The results are discussed and new lines of research are proposed.

1. Introduction

Numerous studies have assessed gender differences in mental imaging ability (see Richardson, 1994, for a review), but the findings remain inconsistent primarily due to the wide array of types of imagery (Campos, 1998a; Horowitz, 1983; Richardson, 1977), and the disparity between tests that are intended to measure the same mental imaging ability yet fail to show correlations from one test to another (Campos, 1998b, 2009, 2012). Thus, any reference concerning gender differences and imaging ability must take into account the type of imagery and the measurement instrument used (Campos, Pérez-Fabello, & Gómez-Juncal, 2004).

The most extensively used instruments for assessing an individual's imagery ability are imagery questionnaires, and performance tests. The most widely used questionnaire is the Vividness of Visual Imagery Questionnaire (VVIQ; Marks, 1973; McKelvie, 1995). No correlations or nonsignificant correlations have been found between imagery questionnaires and performance tests (Burton & Fogarty, 2003; Campos, 2009, 2012; Ernest, 1977).

Ernest (1983) used three measures of spatial-imagery: the Space Relations (Bennett, Seashore, & Wesman, 1947), the Minnesota Paper Form Board (Likert & Quasha, 1941), and Flags (Thurstone & Jeffrey, 1956), and three self-assessments of imagery: the Betts' Questionnaire Upon Mental Imagery (Sheehan, 1967), the Test of Visual Imagery Control (Richardson, 1969), and the Individual Differences Questionnaire (Paivio, 1971). Correlations between performance tests and questionnaires ranged between .00 and −.14. Correlations between performance tests ranged from .51 $p < .001$ to .66 $p < .001$, and correlations between questionnaires ranged from .28 $p < .001$ to .83 $p < .001$. Burton and Fogarty (2003) correlated the Card Rotation Test (Ekstrom, French, Harman, & Dermen, 1976), the Cube Comparison Test (Ekstrom et al., 1976), and the Spatial Relations Test (Thurstone & Thurstone, 1962/2002) with the Vividness of Visual Imagery Questionnaire (VVIQ, Marks, 1973), and the Betts' Questionnaire Upon Mental Imagery (Sheehan, 1967), and found that correlations ranged from .12 to .17. Correlations between performance tests ranged from .58 $p < .01$ to .77 $p < .01$, and correlations between imagery questionnaires ranged from .32 $p < .01$ to .57 $p < .01$. Blazhenkova and Kozhevnikov (2009) obtained a correlation of −.03 between the Mental Rotation Test (Vandenber & Kuse, 1978) and the Vividness of Visual Imagery Questionnaire (Marks, 1973). Similar results were reported by Campos (2009, 2012) and Dean and Morris (2003) for correlations between performance tests and imagery questionnaires, correlations between performance tests, and correlations between questionnaires.

As for the scales of the Betts' Questionnaire Upon Mental Imagery (Sheehan, 1967), correlations ranged from .44 $p < .001$ to 83 $p < .001$ for women, and .38 $p < .001$ to 82 $p < .001$ for men (Ernest, 1983). Correlations between the Object-Spatial Imagery and Verbal Questionnaire scales (OSIVQ; Blazhenkova & Kozhevnikov, 2009) were weak, and only one was significant. The correlation between the object imagery scale and the spatial scale was −.03, between the object imagery scale and the verbal scale .12, and between spatial and verbal scales −.18, $p < .05$ (Blazhenkova & Kozhevnikov, 2009).

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0191-8869/$ - see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.paid.2013.12.010

Few studies have assessed the correlations between tests according to gender, this study analyzed the correlations between tests in a group of women and a group of men to determine any significant differences in correlations between both genders.

The results obtained for women and men on the image rotation task were rather consistent regardless of the test that was used (Blajenkova, Kozhevnikov, & Motes, 2006; Blazhenkova & Kozhevnikov, 2010; Campos, 2012; Dean & Morris, 2003; Parsons et al., 2004; Vandenber & Kuse, 1978). Parsons et al. (2004) used 60 participants recruited from undergraduate and graduate schools who were administered the Mental Rotation Test (MRT; Vandenber & Kuse, 1978). MRT scores were significantly higher for men. Likewise, other studies using the same test have found significantly higher scores for men (Blajenkova et al., 2006; Blazhenkova & Kozhevnikov, 2010; Dean & Morris, 2003; Vandenber & Kuse, 1978), and no study found higher scores for women.

As for the Spatial Scale of the Primary Mental Abilities (PMA; Thurstone & Thurstone, 1962/2002), which is a mental imagery rotation test, significant gender differences were observed with men obtaining higher scores (Campos et al., 2004; Kail, Stevenson, & Black, 1984; Stericker & LeVesconte, 1982). A recently designed imagery rotation test is the Measure of the Ability to Rotate Mental Images (MARMI: Campos, 2012), of which only one study has been published to date (Campos, 2012) that found significant differences between women and men, with scores being higher for the latter.

Another recently published test is the Measure of the Ability to Form Spatial Mental Imagery (MASMI, Campos, 2009, 2013), which is designed to measure the ability to form spatial imagery. The two studies that used the test to measure gender differences in university undergraduates found no significant differences. In contrast, in another spatial imagery test i.e., the Paper Folding Test (PFT, Ekstrom et al., 1976), Blazhenkova and Kozhevnikov (2010) found significantly higher scores in men than women.

The Vividness of Visual Imagery Questionnaire-2 (VVIQ-2, Marks, 1995), is the latest version of the Vividness of Visual Imagery Questionnaire (VVIQ, Marks, 1973). Of the few studies that have applied the VVIQ-2, none have found gender differences, whereas the numerous studies that have applied the original version of the Vividness of Visual Imagery Questionnaire have reported contradictory results. McKelvie (1995), review of the literature revealed no significant gender difference on the VVIQ whereas Richardson (1995) review of the literature concluded women obtained slightly higher scores than men on this test.

Likewise, studies examining the differences between women and men on the Betts' Questionnaire Upon Mental Imagery (Betts' QMI, Sheehan, 1967) were inconsistent i.e., White, Ashton, and Brown (1977) found higher scores for women than for men whereas other authors (Campos & Pérez-Fabello, 2005; Sacco & Reda, 1998) found no significant differences, but no study found higher scores for men than for women (see Campos & Pérez-Fabello, 2005, for a review). Moreover, Sheehan (1967) examined gender differences in the seven sensory modalities of the Betts' QMI, and reported no significant differences in any of the modalities.

The Object-Spatial Imagery and Verbal Questionnaire (OSIVQ) was designed to distinguish between Object-Spatial-Verbal cognitive styles (Blazhenkova & Kozhevnikov, 2009). The test consists of a verbal scale (individuals scoring high on this scale have verbal cognitive styles); and two mental imagery scales where "object visualizers" are characterized by their ability to process the form, shape, color, and brightness of individual objects, and "spatial visualizers" who are characterized by their ability to process spatial relations among objects, moving objects, and objects in space (Blajenkova et al., 2006). Blazhenkova and Kozhevnikov (2009) found that men obtained higher spatial scores than women whereas women obtained higher object imagery scores than men, but no significant differences in terms of gender were found on verbal scores. Similar gender differences have been reported in children (Blazhenkova, Becker, & Kozhevnikov, 2011). Other studies using only the object imagery scale, and spatial scale found men obtained higher spatial scale scores than women whereas women obtained higher object imagery scores than men (Blajenkova et al., 2006; Blazhenkova & Kozhevnikov, 2010).

Previous studies have shown that each test casts different results, which is why when the mental imagery of men and women is compared, different results are obtained depending to some extent on the type of test that was used.

Thus, the aim of this study was to obtain correlations among the tests, when they were scored by men and women i.e., the imagery vividness questionnaires, and the spatial and image rotation tests, and also to assess gender differences in each of the measures of imagery, and among the different correlations.

2. Method

2.1. Participants

A total of 202 university undergraduates at the faculty of psychology (113 women and 89 men), mean age 19.96 years (SD = 2.05), mean age of women 19.67 years (SD = 1.58), and mean age of men 20.24 (SD = 2.4) years, participated in the study.

2.2. Instruments and procedure

The following tests were administered: the Measure of the Ability to Form Spatial Mental Imagery (MASMI, Campos, 2009, 2013), the Object-Spatial Imagery and Verbal Questionnaire (OSIVQ; Blazhenkova & Kozhevnikov, 2009), the Spatial Scale of the Primary Mental Abilities (PMA; Thurstone & Thurstone, 1962/2002), the Mental Rotation Test (MRT; Vandenber & Kuse, 1978), the Measure of the Ability to Rotate Mental Images (MARMI: Campos, 2012), the Vividness of Visual Imagery Questionnaire-2 (VVIQ-2,), and the Betts' Questionnaire Upon Mental Imagery (Betts' QMI, Sheehan, 1967).

The Spanish Version (Campos & Pérez-Fabello, 2009) of Marks, 1995 the Vividness of Visual Imagery Questionnaire-2 (VVIQ-2,) consists of 32 items referring to different situations that the participant must visualize, and score the images on a 5-point scale where 1 indicated no imagery, and 5 indicated a perfectly clear image as vivid as normal vision. The test has no time limit for completion. Campos and Pérez-Fabello (2009) obtained a Cronbach alpha of .94.

The Measure of the Ability to Form Spatial Mental Imagery (MASMI, Campos, 2009, 2013) consists of an unfolded cube that the participants had to mentally reassemble before replying to 23 questions related to the cube. Each question had four responses, two correct and two incorrect responses. The test score total was calculated by adding the correct responses and subtracting the wrong responses. The participants were allowed a maximum 10-min period to complete the test. The internal consistency of the MASMI, as measured by Cronbach alpha was .93 (Campos, 2009).

The Object-Spatial Imagery and Verbal Questionnaire (OSIVQ; Blazhenkova & Kozhevnikov, 2009), is a questionnaire containing 45 items, distributed into three scales: the object scale, the spatial scale, and the verbal scale, with 15 items for each scale. The items for the object and verbal scales were taken from the Object-Spatial Imagery Questionnaire (OSIQ, Blajenkova et al., 2006). Each item was scored on a 5-point scale where 5 indicated "you absolutely agree that the statement describes you", and 1 indicated "you totally disagree with the statement". Cronbach's alphas obtained by Campos and Pérez-Fabello (2011) were .72, .77, and .81 for the verbal, object imagery, and spatial imagery scales, respectively.