

A COMPARISON OF NON-VERBAL CREATIVITY BETWEEN LITHUANIAN AND MEXICAN ADOLESCENTS

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Abstract. Background. The purpose of this work was to explore non-verbal creativity (free from language influences) between Mexican and Lithuanian adolescents. **Methods.** This is a cross comparative study of 354 high school students (average age 17.2 years) from Lithuania and Mexico who were asked to complete four tasks from the 2 non-verbal sections of the Multifactorial assessment of creativity test, EMUC (*Evaluación Multifactorial de la Creatividad*, Sánchez, García, Valdes, 2009). The first section explored visual-spatial creativity associated with vocational choices such as architecture and graphic design. The second explored inventive associated with realistic vocational choices such as engineering and practical handcraft. **Results.** No significant differences were noticed in the procedures of administering, interpreting and using test results in these two countries. In general, Lithuanians show more fluidity and flexibility, whereas Mexicans show more originality. Results indicated a poor relationship between high creative potential and vocational choices that demand creativity (i.e. design, music, etc.). Consistent gender differences were observed depending upon the type of creativity assessed. Women showed higher creativity on visual-spatial tasks, while men in originality for inventive tasks. **Conclusions.** Results underline the difficulties in assessing and comparing creative products from different cultures. They underline the importance of context specific criteria to judge creativity in an ipsative fashion. Furthermore, overall results suggest that visual-spatial tasks in this age range should focus on originality and elaboration, whereas the ingenuity task should focus on flexibility and fluidity.

Keywords. EMUC, visual-spatial creativity, inventive creativity, culture.

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INTRODUCTION

Testing creativity has been considered difficult due to the lack of reliable instruments and the inherent difficulty to test divergent thinking and originality. Creativity testing has various and solid challenges regarding validity issues. Hardship in measuring creativity lies in the fact that measurement theory is usually based on comparing a given observation against a norm, whereas when estimating a degree of creativity, one seeks to establish the deviation from the norm or even the existence of something that has no norms (originality). Indeed, creativity testing has been associated with divergent thinking that requires the test taker to use imagination and explore solutions in many different directions, sometimes with no single right answer. Thus, efforts to develop a creativity quotient similar to the intelligence quotient (IQ) have been unsuccessful since they depend on many more contextual factors than intelligence (Ferrando, Prieto, & Sánchez, 2005).

Historically, the most systematic assessment of creativity in elementary school children has been conducted by Torrance and his associates who have developed and administered the Torrance Test of Creative Thinking (TTCT, 1960) which included routines on divergent thinking and problem-solving skills that were assessed in four dimensions:

1. Fluency: the total number of interpretable, meaningful, and relevant ideas generated in response to the stimulus;
2. Flexibility: the number of different categories of relevant responses;
3. Originality: the statistical rarity of the responses;
4. Elaboration: the amount of detail in the responses.

The third edition of the TTCT in 1984 eliminated the Flexibility scale from the figural test but added Resistance to Premature Closure and Abstractness of Titles. Torrance called the new scoring procedure Streamlined Scoring. Evaluating creativity then involved five norm-referenced measures: fluency, originality, abstractness of titles, elaboration, and resistance to premature closure, and 13 criterion-referenced measures which included emotional expressiveness, story-telling articulateness, movement or actions, expressiveness of titles, syntheses of incomplete figures, synthesis of lines, of circles, unusual visualization, extending or breaking boundaries, humor, richness of imagery, colorfulness of imagery, and fantasy. Torrance (1980) grouped the different subtests of the Minnesota Tests of Creative Thinking (MTCT) into three categories:

(1) verbal tasks using verbal stimuli, (2) verbal tasks using non-verbal stimuli, and (3) non-verbal tasks. Despite the fact that Torrance Test of Creative Thinking (TTCT) is probably the most commonly used in cross-cultural studies (Lubart, 1990), other tests claim to be valid also, for example, the Creativity Achievement Questionnaire which is a self-report that explores creative achievement across 10 domains. Nonetheless, despite many efforts to assess creativity around the globe, there is still skepticism in the academic community on whether standardized tests can be used to measure creativity (Carson, Peterson, Higgins, 2005).

Difficulties in judging creative products have lead researchers to use personality traits as indicators of creative potential. For example, independence of judgment, self-confidence, attraction to complexity, aesthetic orientation and risk-taking have been associated to creativity. In this perspective, a meta-analysis by Feist (1999) showed that creative people tend to be open to new experiences, unconventional, self-confident, self-accepting, driven, ambitious, dominant, hostile and impulsive.

Beyond this individual approach based on personality, creativity has also been the focus of various cross-cultural studies. As Lubart (1990) claimed, creativity must be understood beyond personal variables including cultural and environmental variables. According to this author, culture interacting with personality regulates the general level of creativity. In this perspective, Ramos and Puccio (2014) compared Western and Eastern cultures and found that both cultures have implicit belief that creativity is thinking out of the box, something new, innovative, unusual and different, however, Americans link creativity with arts more frequently than Singaporeans. Zhou, Shen, Wang, Neber & Johji (2013) also observed that creativity is depicted as divergent thinking and linked with novelty in Germany and China, but German teachers think creativity is less likely to be expressed in mathematics, whereas Chinese teachers dispute the potential to exhibit creativity in literature. Hence, the perception of creativity is influenced by cultural factors.

Creativity and intelligence

There has been debate in the psychological literature whether intelligence (as measured by IQ) and creativity are part of the same mental process (the conjoint hypothesis) or represent distinct mental processes (the disjoint hypothesis). Evidence from correlational studies since the 1950s has not settled this issue to the satisfaction for most scholars.

While some researchers believe that creativity is the outcome of the same cognitive processes as intelligence (Feist & Barron, 2003), others believe that creativity is, in fact, a mental process that has to do more with emotions, intuition, or spirituality (Janescic, 2001; Corry, Mallet, Lewis, & Abdel-Khalek, 2013). Actually, Einstein's statements regarding creativity and intelligence have left this issue open to debate for many years: "The true sign of intelligence is not knowledge but imagination" and "creativity is intelligence having fun."

The *threshold hypothesis* proposed by Torrance posits that a high degree of intelligence appears to be a necessary but not sufficient condition for high creativity (Torrance, 1988). That is, while there is a positive correlation between creativity and intelligence, this correlation disappears for IQs above a threshold of around 120. Such a model has found acceptance by many researchers, although it has not gone unchallenged.

Neurobiology of Creativity

An emphasis on biological factors related to creativity has been noted in recent years. Heilman, Nadeau, & Beversdof (2003) assert that highly creative people who excel at creative innovation tend to differ from others in three functions based in the frontal lobe: they have a high level of specialized knowledge, they are capable of divergent thinking, and they are able to modulate neurotransmitters such as norepinephrine. Thus, the frontal lobe appears to be the part of the cortex that is most important for creativity. Flaherty (2005) suggested that the creative drive results from an interaction of the frontal lobes, the temporal lobes, and dopamine from the limbic system. She asserted that whereas the frontal lobes can be seen as responsible for producing ideas, the temporal lobes are known for their editing and evaluation. Thus, abnormalities in the frontal lobe (such as depression or anxiety) generally decrease creativity, while abnormalities in the temporal lobe often increase it. High activity in the temporal lobe typically inhibits activity in the frontal lobe, and vice versa. High dopamine levels increase general arousal and goal directed behaviors and reduce latent inhibition, and all three effects increase the drive to generate ideas (Cromie, 2007). This new neurobiological evidence further supports the notion that creative potential is a construct rather inconsistent in time and context dependent in nature.

Gender and creativity

Although Hyde & Linn (1998) claimed that there are basically no gender differences in verbal creativity, Runco, Cramond, & Pagnani (2010) argued that men are identified as more creative because of their higher social recognition and coincided that there are no gender differences in the creative potential. Gough (1992) also reported no significant differences between men and women.

Baer and Kaufman (2008) meta-analysis of gender differences in creativity also argued in favor of a lack of consistent gender differences in overall creativity test scores, creative achievements, and self-reported creativity. They argued that the debate on gender differences is a difficult arena in which to conduct a research, with few significant differences in creativity test scores and accomplishments of boys and girls, and in case they are found, they tend to favor girls. As a result, it is difficult to show how innate gender differences in creativity could possibly explain later differences in creative accomplishment. Nonetheless, gender differences should lead investigators to explore environmental and cultural influences that explain the observed differences in the creative achievement of men and women in many fields. For example, Henderson (2003) recognized women that worked in multinational firms and had the same publications and conference presentations as men. These women depicted their experiences in family, school, community and higher education as crucial to enhance their ability to invent.

In many cases, especially in research on divergent-thinking, there are significant numbers of studies in which one sex score higher, but these findings are generally counter-balanced by studies showing the opposite.

In spite of these previous claims, research continues to evidence gender differences in creative productivity, and these differences represent the most significant unanswered questions about gender and creativity. It is clear that a large part of those differences are either cultural or environmental, including differences in adult expectations of girls and boys, differences in opportunities available to male and female children and adults, and differences in the kinds of experiences women and men are likely to have. There are also differences in how different kinds of creativity works, including those more typically produced by women and men, and how they are valued by different cultures. However, very few studies

published explored gender differences in creativity considering cultural background. Hence, the purpose of this work was to explore non-verbal creativity performances in youngsters, men and women, from two different cultural backgrounds. Cross-cultural studies are recognized as means to understand the links between creativity and changing modern cultures (Lubart, 1990), they reveal complexity of creativity in various cultures (Ramos, Puccio, 2014) and they provide information helpful to gain awareness and understanding of these differences (Corry, Mallett, Lewis, Abdel-Khalek, 2013).

METHODS

Type of study

This is a quantitative, exploratory study that collects information from two groups of youngsters between 16 and 19 years of age from Mexico and Lithuania. Researchers originally aimed to collect a sample of 180 participants per country from high school and college freshmen. In each country, a conventional sample of students volunteered to participate in the study. It was assumed that each group reflected their country's culture in the performance of two different non-verbal creative tasks.

Participants

Table 1 depicts demographic characteristics of participants finally included in each country sample. A total of 354 students completed the test with directions in their born language. Six students were discarded because their test was either incomplete or they did not follow directions.

Table 1. *Demographic characteristics of participants*

	Mexico	Lithuania	Total
Males	82	95	198
Females	74	103	156
Total	177	177	354
Average age, years	18.4	16.3	17.2

Instrument

The two non-verbal subscales of the three scales of the Multidimensional Scale for Creativity developed by Sánchez (2011) were used. The first subscale attempts to measure visual-spatial creativity by providing a stimulus consisting of figures that require the respondent to use in free drawing. Two performances are required, the first one timed. Criteria for scoring performance consist of frequency of objects drawn (fluency), frequency of categories (flexibility), originality and degree of complexity of drawings (elaboration).

The second subscale attempts to measure inventive creativity. As in the previous subscale, two stimuli are provided and the respondent is requested to write as many uses one can think for that object. Scoring criteria are based on and consists of frequency of objects (fluency), frequency of categories (flexibility) and originality. Sánchez, García, & Valdes (2009) provided evidence of the external validity for this test in discerning highly creative students and stated that the instrument has good psychometric properties according to content, construct and criterion validity and high reliability (Cronbach's alpha value is above 0.8) that make it usable for measuring creativity in Mexican adolescents. The test was translated to Lithuanian and administered in a standardized fashion by respecting the timing for each routine.

This tests does not provide norms to assess creativity and assumes ipsative criteria to judge performances in the routines. Both versions of the test showed acceptable psychometric properties (see Table 2).

Table 2. Reliability coefficients for each test (Cronbach's Alfa)

	Mexico	Lithuania	Total
Visual-spatial	.71	.67	198
Inventive	.74	.64	156

Scoring system to assess fluidity and flexibility consists of the frequency of ideas in the former and of the variation of ideas in the latter. Scores ranged from 0 to 10. Scoring for originality and elaboration are given in a scale from 0 to 5.

Procedures

Investigators obtained permission from school authorities, parents and students to administer the test. The instruments were administered in each country following their own rules. For instance, parental consent was not needed in Mexico. Participants were explained the purpose of this study and asked to voluntarily participate in it. Data from both countries was coded and analyzed using SPSS Statistics version 21.

RESULTS

Visual-spatial creativity

The first subscale estimated visual-spatial creativity. The mean scores of both performances were compared by gender and country. T-tests for independent samples established significant differences as shown in Tables 3 and 4.

Table 3. *Visual-spatial creativity per country*

	Fluidity		Flexibility		Originality		Elaboration	
	Mexico	Lithuania	Mexico	Lithuania	Mexico	Lithuania	Mexico	Lithuania
Draw 1	2.21	2.55	1.51	1.94	.17	.33	.17	.27
Draw 2	2.71	3.15	1.94	2.45	.29	.16	.24	.16
Average	2.46	2.85*	1.72	3.16*	.23	.24	.20	.21

Note: * $p \leq .05$

It can be observed that Lithuanian students show more Fluidity and Flexibility than Mexican students. Overall, no differences were found in Originality and Elaboration. However, cultural differences are manifested in the drawings of subjects. For example, Mexican students provided more examples and uses about living in the tropics, whereas Lithuanian students used situations related to extreme winter situations.

Table 4. *Visual-spatial creativity differences by gender*

	Fluidity		Flexibility		Originality		Elaboration	
	Males	Females	Males	Females	Males	Females	Males	Females
Draw 1	2.28	2.50	1.61	1.87	.21	.27	.12	.30
Draw 2	2.63	3.26	2.00	2.42	.24	.19	.18	.21
Average	2.45	2.88*	1.80	2.14*	.33	.36	.15	.25*

Note: * $p \leq .05$

Note the consistent gender differences in favor of women, regardless of country in this domain: women show more Fluidity, Flexibility and Elaboration.

Inventive creativity

Participants were asked to name as many possible uses of a rope and a blanket. They had a time limit of 120 seconds per routine. Results comparing creativity according to country and gender are shown in Tables 5 and 6.

Table 5. *Inventive creativity differences by country*

	Fluidity		Flexibility		Originality	
	Mexico	Lithuania	Mexico	Lithuania	Mexico	Lithuania
Rope	6.12	6.84	4.60	6.00	.56	.15
Blanket	5.40	7.12	4.43	6.17	.53	.15
Average	5.76	6.8*	4.51	6.08*	.54*	.15

Note: * $p \leq .05$

It can be observed in the inventive subtest that in general, Lithuanian students show more Fluidity and Flexibility than Mexican students. However, Mexican students show more Originality.

In this test, gender differences were explored. Table 6 illustrates differences of inventive creativity between different genders.

Table 6. *Inventive creativity differences by gender*

	Fluidity		Flexibility		Originality	
	Males	Females	Males	Females	Males	Females
Rope	6.63	6.41	5.38	5.38	.42	.25
Blanket	6.40	6.32	5.41	5.39	.36	.28
Average	6.51*	6.36	5.39	5.38	.44*	.26

Note: * $p \leq .05$

In contrast to visual-spatial creativity, men tend to score higher in Fluidity and Originality dimensions of inventive creativity.

Participating students were asked to state their future vocational aspiration or career choice. Open responses were categorized and computed. Table 7 depicts results by country and gender.

Table 7. Vocational aspirations by country and gender

Occupation	Mexico		Lithuania		Total
	Males	Females	Males	Females	
Arts	21	14	15	21	71
Medicine (health)	5	3	15	15	38
Engineering	18	10	3	1	32
Computer science	10	5	10	0	25
Science	0	2	11	8	21
Commerce	0	3	12	5	20
Finances	3	2	7	5	17
Law	1	2	5	3	11
Education	0	7	0	3	10
Sports	1	0	3	2	6
Communication	3	1	3	1	8
Politics	0	0	1	2	3
Gastronomy	6	6	0	0	12

It can be observed that in general, Lithuanian students have greater vocational aspirations, selecting careers such as Law, Medicine and Finances. Mexican students tend to choose new vocational alternatives such as Gastronomy. Gender differences are few regarding vocational choice, except for some preference in Engineering and Computer science by males in both countries.

Vocational choices were classified by the degree of creativity demanded, for example, file keeping (low), legal work (medium) or graphical design (high). As it can be seen in Table 8, high scores in Originality and Elaboration in visual-spatial task and Originality in inventive tasks were related to vocational choices with high creative demands. Thus, these factors must be considered in vocational guidance. Fluidity or Flexibility, however, were not related to vocational desires.

Table 8. Scores by demand of creativity and vocational choice

	Indicators	Low	Medium	High
Visual-spatial	Fluidity	2.88	2.48	2.64
	Flexibility	2.09	1.82	1.99
	Originality	.12	.18	.45
	Elaboration	.16	.15	.38
Inventive	Fluidity	5.51	6.48	6.73
	Flexibility	5.51	5.32	5.23
	Originality	.26	.32	.63

DISCUSSION

Results show more consistent differences by gender than by country. These findings should revise the debate on gender differences and creativity, and they indeed challenge previous researchers claiming there are no gender differences in creative potential (Hyde & Linn, 1998; Baer & Kaufman, 2008). Perhaps, the observed patterns between men and women in relation to a given creative task lead investigators to infer more significant influences due to sex than to culture itself. Women showing more creativity in visual-spatial tasks and men in inventive tasks should suggest that the analysis of gender differences should include the type of creativity that is under the study.

Regarding cultural differences, obvious themes were identified. For example, the drawings appeared to be based on demographics, i.e. snow landscapes drawn by Lithuanian students vs. beach landscapes – by Mexican students. Unlike Zhou et al. (2013) and Ramos & Puccio (2014), no major cultural differences in creativity were found. Maybe, the fact that both groups had roughly the same school level cancelled cultural effects.

It can be noted that test adaptation in Lithuania was uncomplicated since only directions for the test and the demographic questions required translation. The focus of the measurements was non-verbal tasks. This follows Sánchez-Escobedo & Hollingworth (2011) guidelines:

During the translation and/or adaption of any test, it is important to make sure that the test is more understandable to the test takers, the directions are easy to comprehend, and the items are ordered on an appropriate scale of difficulty (p. 26).

Lessons learned and Recommendations

Testing for creativity remains a challenge for investigators seeking to develop instruments that could be useful for schools when screening students with high creative potential so they could receive, for example, additional instruction or vocational guidance to make the most of this potential. Furthermore, comparative studies, such as this one, elicit many more questions than those that guided the study. For instance, is gender a more compelling influence in different creative tasks than culture? This question remains unanswered and should trigger more research projects that include not only the usual dependent variables of gender and nationality but that consistently include a third element of analysis: the type of creative task under scrutiny.

The process of administering, scoring and interpreting results from these two very different countries demonstrates once again the conceptual, methodological and practical difficulties in assessing creativity.

Maybe, efforts to develop standardized tests that objectively attempt to identify the degree of creativity in students should be replaced by more innovative approaches. Researchers should focus on procedures more qualitative in nature, able to identify a student with creative potential that it is worth to be cultivated in school.

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NEVERBALINIO LIETUVOS IR MEKSIKOS PAAUGLIŲ KŪRYBIŠKUMO Palyginimas

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Santrauka. Tyrimo tikslas. Šio darbo tikslas – įvertinti skirtingose kultūrose (Lietuvoje ir Meksikoje) gyvenančių paauglių neverbalinio kūrybiškumo skirtumus. **Metodas.** Tarpkultūriniam tyrime dalyvavo 354 Lietuvos ir Meksikos gimnazijų mokiniai (amžiaus vidurkis – 17,2 m.), kurie atliko keturias Multifaktoriaus kūrybiškumo įvertinimo testo EMUC (*Evaluación Multifactorial de la Creatividad*, Sánchez, García, Valdes, 2009) užduotis, skirtas neverbaliniam kūrybiškumui įvertinti. Iš dviejų užduočių sudarytos pirmosios skalės paskirtis – įvertinti vizualinį-erdvinį kūrybiškumą, siejamą su tokiais profesiniais pasirinkimais kaip architektūra, grafikos dizainas ir pan. Antrosios, kurią sudaro taip pat dvi užduotys, paskirtis – įvertinti išradingumą, siejamą su tokiais profesiniais pasirinkimais kaip inžinerija ar amatai. **Rezultatai.** Rezultatai nepatvirtino prielaidos, kad kūrybingesni Meksikos ir Lietuvos paaugliai rinksis kūrybiškumo reikalaujančias profesijas (pvz., dizainerio, muziko ir pan.). Analizuojant testo administravimą, interpretavimą ir rezultatų panaudojimą skirtumų tarp lietuvių ir meksikiečių nebuvo rasta, tačiau pastebėta, kad pirmieji pasižymi aukštesniu mąstymo laisvumu bei lankstumu, o antrieji – originalumu. Analizuojant skirtingų tipų kūrybiškumą patvirtinti lyčių skirtumai: merginos geriau atlieka vaizdines-erdvines, o vaikinai išradingumo užduotis. **Išvados.** Rezultatai atskleidžia sunkumus, kylančius vertinant kūrybiškumą ir lyginant kūrybiškumo rezultatus, o tai skatina kūrybiškumą vertinti ipsatyviai. Be to, apibendrinti rezultatai rodo, kad vertinant vizualines-erdvines užduotis turėtų būti labiau akcentuojamas kūrybinio mąstymo originalumas ir detalumas, o išradingumą – lankstumas bei laisvumas.

Pagrindiniai žodžiai: daugiafaktorinis kūrybiškumo įvertinimas (EMUC), vizualinis-erdvinis kūrybiškumas, išradingumas, kultūra.

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