

CROSS-CULTURAL STUDY WITH BENDER TEST - GRADUAL SCORING SYSTEM

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ABSTRACT

The objective of the study is to compare performance on the Bender Visual Motor Gestalt test - system of Gradual punctuation (B-SPG) in a group of Peruvian children in connection with the data provided by the Brazilian manual of the test. In this research 82 Peruvian children were involved, both sexes, with ages between 8 and 10 years ($M = 9.21$, $DT = 0.83$). The children came from the districts of Pueblo Libre (43.9%) and Rimac (51.2%) in the province of Lima, as well as from metropolitan Lima (4.9%). The B-SPG was collectively applied in the children's schools. The average points earned by the Peruvian children in the B-SPG were significantly higher than those obtained by Brazilian children in each one of the ages studied. It emphasizes the importance of investigating evidence of validity and reliability, so that, the test can be used appropriately in Peru, considering the peculiarities of the development of children in the country.

Keywords: Cross-Cultural study, psychological assessment, psychological test

Introduction

The Visual Motor Gestalt test was created by Bender in 1938; its provisions were based on the Gestalt psychology, specifically, in the laws of perceptual organization. The author used as reference 30 drawings made by Max Wertheimer in 1923, from which they selected nine figures deemed appropriate to assess the gestalt function. Unlike Wertheimer, who requested patients to describe the figures, Bender included in the instruction that the drawings are taken as models to be copied as well as possible (Colorni, 1994; Santucci & Galifret-Granjon, 1968; Tosi, 1990).

The premise of the test is that the visual motor behavior is a skill, so that the perception of stimuli and the response to them includes neuro-cerebral performance, as well as emotional factors. In this way, the evaluation of the visual motor maturity could be obtained by the use of different patterns of complexity and Organization principles (Koppitz, 1963). Bender (1955) applied the test in a sample of 800 children of ages from 3 to 11 years old and drew up a table with the typical responses in each age. The results revealed that at 11 years the majority of children already copied the figures without errors.

The work of Bender, by the fact of being the first, allowed that many other studies were conducted. The author has not developed an objective evaluation system of drawings, given that she just used them for clinical purposes. For this reason, various researchers performed other proposals for correction and interpretation of drawings, some of them being subject of quantification (Bender, 1955).

Developmental Bender Test Scoring System was the proposal elaborated by Koppitz (1963), which became world renowned. The system is intended to assess the neurological maturity in children, in order to aid in the diagnosis of cerebral lesions. According to the author, the assessment of the visual motor ability would be relevant, as intellectual development would be obtained through sensorimotor experiences in the early years of life. Within this perspective, the right visual motor development would be a prerequisite for the development of academic skills, being that a low visual motor performance could be related to learning disabilities.

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Considering the evolutionary condition associated with the learning of the visual motor gestalt functions, Koppitz (1963, 1975) sought to distinguish, in the distortions in the drawings, the ones which were linked to the perceptive maturity and the ones which were linked to emotional factors. The author supported herself in the concepts established by Bender (1955), i.e. proper visual motor behavior is a skill. Her correction system includes 30 items, which are divided among the categories «*form distortion*» (not respecting the structural aspects of drawing, being that the points, lines, the straight lines, curves and angles are drawn without precision), «*integration*» (loss of configuration, either by error to join parts, by omission, by increasing or replacing the elements, i.e., loss of position or modification of the structural aspects of the figure), «*rotation*» (modification of the orientation of the drawing relative to the stimulus, being considered that this category is present when there is an alteration of 45° or more in the axis of the figure) and «*perseverance*» (increase in the number of elements drawn in comparison with the presented figure). Alterations in each of these categories are scored, thus a high score indicates a poor performance, while a low score is considered to be a good performance.

In relation to the use of the instrument, the Bender test was identified as one of the five psychological instruments most commonly used in the United States between 1940 and 1970 (Dana, Field & Bolton, 1983; Lubin, Wallis & Paine, 1971; Lubin, Larsen & Matarazzo, 1984). In addition, in the research carry out by Noronha et al. (2002) about the use of the Test in Brazil in the 1990s, the Bender test appeared as one of the most commonly used, which was also recently highlighted by Silva and Nunes (2007).

Considering its wide use and the need for measures which provide psychometric properties appropriate to a context or specific population in Brazil a system of correction and interpretation of the Bender test was developed, called Bender - system of Gradual Punctuation - B-SPG (Sisto, Noronha & Santos, 2005). The construction of the B-SPG took place in a historical context in which the instrument was not enabled for use, as a result of the lack of reliable studies of validity and Brazilian scales, based on the resolutions of the Federal Council of psychology, (2001, 2003). Thus, the authors began their work in order to give continuity to the validation of indicators established by Koppitz (1971).

The B-SPG uses the nine figures proposed by Bender, but with the difference that the hexagons of Figure 7 are considered and evaluated separately. The instrument evaluates the visual motor maturity just by means of the analysis of the distortion, i.e. when not respecting the structural aspects of the drawing; and the points, lines, straight lines, curves and angles are drawn without precision, as Koppitz (1963) considered it. Another innovation of the system is allowing the collective application.

Since its publication in 2005, B-SPG has been linked widely with other variables, mainly with the age of the children, as a way of verifying the effectiveness of the instrument to capture the appearance of maturity in the construct (Noronha, Santos & Sisto, 2007; Sisto, Noronha & Santos, 2004; Sisto, Santos & Noronha, 2004); with learning difficulties (Carvalho & Noronha, 2009; Suehiro & Santos, 2005); with the level of schooling (Pinto & Noronha, 2011; Suehiro & Santos, 2006); and measures that assess intelligence (Bartholomeu & Sisto, 2008; Sisto, Bartholomeu, Rueda, Santos & Noronha, 2008; Vendemiatto, Santos & Suehiro, 2008). In addition, the B-SPG was compared with other correction systems, showing that it has some advantages over others (Noronha & Mattos, 2006; Santos & Jorge, 2007).

Despite all the studies conducted with the B-SPG, it is perceived that there are few of those who have stopped to compare the performance on the test in groups with different characteristics (Noronha, Santos & Rueda, 2012). Considering this aspect, it highlights the research of Suehiro, Rueda and Silva (2007), which sought to verify possible performance differences in the B-SPG between institutionalized and non-institutionalized children. For that, the authors applied the test in 128 children, aged between 7 and 10 years, where the half was institutionalized and the other half was not. The institution was located in the State of Bahia (Brazil) and the school in which the children studied was located in the interior of the State of São Paulo in Brazil. Results showed significant difference in scores between groups, finding that not institutionalized children had less deformation in the figures. Despite that, it is important to note that the issue of different States (South-Eastern and North-Eastern region of Brazil) must be considered in the interpretation of differences, caution still being necessary

when generalizing the results, since that variable (institutionalized and non-institutionalized children) was not controlled.

Another research that analyzed groups with special characteristics was developed by Neri, Santos and Lima (2008). The authors studied and compared the performance of deaf children and listener children, for that they integrated to the Group of listeners 120 subjects aged 6 to 11 years, while the Group of deaf children integrated it 19 subjects from 9 to 11 years, presenting the diagnosis of severe or profound deafness as common property. The results were not satisfactory, since the evolutionary aspect of the sensorimotor maturity was not observed in the deaf children, as well as no significant differences between the groups were found. On that basis, the authors emphasized the need for new studies, aiming to explore the sensitivity of the B-SPG to the sample in question (not listeners).

Pacanaro, Santos and Suehiro (2008), studied 51 people with Down's syndrome, with ages between 6 and 24, of an institution of the interior of San Pablo, Brazil. The intellectual and visual motor skills of the sample were evaluated by means of the application of the BSPG and the Test of not Verbal intelligence - TONI 3 - form A. The *Pearson* correlation showed a coefficient of $r = -0.57$ ($p < 0.001$), indicating a moderate relationship among the constructs. Thus, there was a decrease of errors according to the passing of the age.

Finally, we can mention the study of Noronha, Santos and Rueda (2012), comparing performance in the BSPG between children from different regions of Brazil. It involved 511 children aged between 6 and 10 years, from the States of Minas Gerais and Paraiba. Statistically significant differences were not found considering the State in which the child resided. Later, scores of children in these States were compared with the scales of the manual of the B-SPG, whose participants are exclusively in the State of São Paulo. The authors found statistically significant differences in the performance of 6-year-olds, being that children of Minas Gerais and Paraiba had lower performance. Comparing the males at 7 years and females at age 10 there was also a statistically significant difference, and in such cases the best performance was also observed in the normative sample (Sao Paulo).

As it can be noted, despite the large number of studies with the B-SPG, there is still a lack of research that may be considered cross-cultural in relation to performance in the test in different populations, which allows one to generate results that can be evaluated in a differentiated way. Thus, this study was exploratory, and aimed to compare performance on the B-GSP in a group of Peruvian children in relation to the regulatory performance presented by the Brazilian manual.

Method

Participants

In the research participated 82 children, of whom 52.4% were male. Data was collected in the districts of Pueblo Libre (43.9%) and Rimac (51.2%), in the province of Lima. In addition, 4.9% belonged to Metropolitan Lima. The ages were between 8 and 10 years ($M = 9.21$; $DT = 0.83$), 25.6% were eight years old, 28% nine and 46.3% ten years. In relation to the Brazilian sample, a total of 781 represented children aged 8, 9 and 10 that are part of the scales of the test of the B-SPG manual.

Instruments

- *Bender's Visual Motor Gestalt test. System of Gradual Punctuation - B-SPG (Sisto et al., 2005)*

It is made up of nine figures: A, 1, 2, 3, 4, 5, 6, 7 and 8 (in Figure 7 the two hexagons are analyzed), presented one to one to be copied by the subject on a sheet of white paper. In the playback, rubber to erase or any mechanical assistance should not be used. The figures are presented with the recommendation that children copy nine models on a single sheet of paper, in the best possible way. The application may be individual or collective.

In the B-SPG, a progressive score is attributed to each figure, which varies from zero to three points, according to the severity of the error, allowing a total of 21 points. Scores in figures A, 1, 2, 3, 4, 5, 7a, 7b and 8 may vary from 0 to 2 and in Figure 6 from 0 to 3 points. Errors correspond to the presence of deviations in each one of the figures of the test. In the case there are no deviations related to the distortion of the form the score is attributed to zero.

The system includes studies of validity and reliability; among them, the validity studies were in relation to the age of the children, noting a negative and significant correlation ($r = -0.58$; $p < 0.001$) between age and score in the B-SPG, confirming expectations in relation to the instrument, and also confirming the evidence of validity based on the relationship with other variables. This result indicates that when age increases the score obtained in the B-SPG decreases, or better, the distortions in the reproduction of figures decreased progressively with increasing age (American Educational Research Association - AERA, American Psychological Association - APA & National Council on Measurement in Education - NCME, 1999).

In what refers to the average differences between groups of ages (6-10 years) and to the possibility of discrimination between them, we used analysis of variance (ANOVA) and *Tukey's* test. The variables of age and sex (4 x 2) were considered in the ANOVA. The result said the age was a major source of variance, being the only one that was statistically significant. In relation to sex, the results were not significant, i.e., the variable showed no source of sufficient variance to produce differences that were not attributed to chance or coincidence. As regards reliability, analyses performed by Cronbach's alfa, the method by the *Rasch* model and the two halves of *Spearman-Brown* showed satisfactory rates. The reliability among evaluators, which revealed a match greater than 80% in all cases was also studied.

The scales, as well as the concerning studies to the metric properties described above, were performed on a sample comprising 1,052 children, natives of eight schools in the State of São Paulo, Brazil. Ages ranged from 6 to 10 years, with an average of 8.35 years and a standard deviation of 1.29. In relation to sex, 51.1% were males, and grades were from preschool through 4th grade of basic education.

Procedure

The data collection procedure adopted in Peru was similar to that used in Brazil, since they were collective applications and the projection of the nine figures in the test. The children were oriented to copy the figures that

were displayed on the wall in the best possible way, and the approximate time of each application was 20 minutes. The correction of the tests was performed by a Peruvian psychologist, strictly following the rules of correctness of the manual, which had previously been translated by a professional psychologist that had Spanish as a mother language and widely dominated Portuguese, besides having experience with the B-SPG.

Results

To analyze the results first was relative to the performance of the Peruvian children in the B-SPG, it was conducted an analysis of variance followed by *Tukey* test; the scores of Peruvian children were then compared with scores of Brazilian children according to the manual of the B-SPG. That comparison was performed in each age separately (8, 9 and 10 years), as described in the manual. Finally a comparison between the percentages of responses in each of the figures was made, age by age.

In what refers to the first result, the ANOVA showed a statistically significant difference between the ages of the children in Peru [$F(2.81) = 11.98$, $p < 0.001$]. To find out at

what age there was a difference in scores the *Tukey* test was performed, and the results are shown in Table 1.

Table 1
Groups formed by the Tukey test based on the ages function and performance in the B-SPG

AGE	N	Groups for alpha = 0.05	
		1	2
10	38	2.34	
9	23	2.90	
8	21		6.24
<i>p</i>	82	0.806	1.000

In Table 1 we can see that children of 8 years had a performance that differentiated them from children of 9 and 10 years. Despite not having a separation of three age groups, there was an inverse relationship between age and score, that is, the greater the age, minor was the performance. It is based on the data presented by the Brazilian and foreign literature on the instrument. Following the analysis, the results of Peruvian children were compared with results in the Brazilian manual. Those data are included in Table 2.

Table 2
*Comparison between Peruvian and Brazilian children using the statistic *t* of student*

Age	Group	<i>N</i>	<i>P</i>	<i>DT</i>	<i>t</i>	<i>p</i>
8 years	Peruvian sample	21	6.24	4.04	3.26	0.004
	Brazilian scales	303	9.11	3.50		
9 years	Peruvian sample	23	2.87	3.14	-6.48	< 0.001
	Brazilian scales	210	7.11	3.77		
10 years	Peruvian sample	38	2.34	2.17	-8.65	< 0.001
	Brazilian scales	268	5.39	3.09		

To compare the performance of the Peruvian and Brazilian children in each of the ages, you could verify that in all of them there was one score for the Brazilians, which in the Bender test means a worse performance. It should be noted that these differences in average were all statistically significant. Based on those findings, some considerations must be made. The first refers to the fact that corrections

were made by different psychologists, before a concordance among them was made, i.e. it is possible to think in the hypothesis that the Brazilian correction has been very rigorous, while some mistakes of distortion were considered in the Peruvian as not deserving a negative score. Anyway, that observed aspect should be better studied.

Finally, during the analysis the percentages of response in each of the figures and each of the ages of the Peruvian

and Brazilian samples were compared. The result is found in Table 3.

Table 3

Comparison of response rate in each figure of the B-SPG among Peruvian and Brazilian children

		Peruvian sample			Brazilian scales		
		Ages					
		8	9	10	8	9	10
Figure A	0	81.0	87.0	92.1	67.1	76.7	85.0
	1	14.3	13.0	7.9	30.1	20.5	14.7
	2	4.8	0	0	2.8	2.9	0.4
Figure 1	0	71.4	91.3	89.5	60.5	70.5	76.1
	1	19.0	4.3	7.9	3.3	6.7	3.4
	2	9.5	4.3	2.6	36.2	22.9	20.5
Figure 2	0	19.0	69.6	76.3	9.9	29.2	36.2
	1	66.7	21.7	18.4	56.3	54.1	51.1
	2	14.3	8.7	5.3	33.8	16.7	12.7
Figure 3	0	47.6	82.6	76.3	7.4	19.8	28.5
	1	42.9	13.0	13.2	29.8	29.0	35.6
	2	9.5	4.3	10.5	62.9	51.2	36.0
Figure 4	0	57.1	82.6	81.6	15.4	18.7	29.5
	1	38.1	17.4	15.8	62.9	67.5	63.4
	2	4.8	0	2.6	21.7	13.9	7.1
Figure 5	0	66.7	82.6	86.8	30.6	40.4	45.1
	1	14.3	13.0	10.5	59.8	51.4	54.1
	2	19.0	4.3	2.6	9.6	8.2	0.7
Figure 6	0	28.6	52.2	63.2	13.6	26.8	37.7
	1	52.4	26.1	31.6	53.6	49.7	50.7
	2	14.3	17.4	5.3	26.5	17.7	10.8
	3	4.8	4.3	0	6.3	5.8	0.7
Figure 7a	0	47.6	73.9	73.7	39.5	50.6	73.1
	1	33.3	8.7	21.1	38.2	30.1	22.4
	2	19.0	17.4	5.3	22.3	19.2	4.5
Figure 7b	0	42.9	82.6	73.7	46.3	62.7	72.8
	1	33.3	8.7	26.3	34.7	23.0	20.9
	2	23.8	8.7	0	19.0	14.4	6.3
Figure 8	0	38.1	78.3	81.6	52.8	67.6	79.8
	1	42.9	13.0	15.8	26.9	21.7	17.6
	2	19.0	8.7	2.6	20.3	10.6	2.6

Table 3 shows that in figures, 1, 2, 3, 4, 6 and 7a, the highest score was always attributed to Brazilian children, while Peruvian children had one greater distortion in score, just in figures A, 5 and 7b at the age of eight; and, in figures 5 and 8 at the age of ten. In this way, the information in table

3 further reinforces the fact that differences between children in the two countries seem to have been quite pointed, being important to continue studies to verify whether these differences are real or they may have occurred by any bias.

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Discussion

This study was proposed with the aim of comparing the performance of Peruvian children in the B-SPG with normative performance presented by the Brazilian manual of the test (Sisto et al., 2005). It is necessary to mention that before making such a comparison, the performance of Peruvian children was compared by means of the analysis of variance depending on the age, verifying that there was a decrease in scores when it increased the age of the children. The obtained result was expected, as the Bender is a test that scores errors. Comparing this result with the Brazilian manual it was perceived that barely two age groups were differentiated, happening to children 9 and 10 years differed from children of 8 years old. The Brazilian manual shows that the score of five ages comprising the instrument (6 to 10 years) were differentiated one from the others.

The results of the study are in accordance with the results obtained by Brazilian researches which were carried out with the B-SPG correction system. On that, we can mention the work of Noronha et al. (2007), which identified the aspect related to the maturity of the B-SPG. The study of Bartholomeu and Sisto (2008), that analyzing the relationship between the Visual motor maturity and intelligence identified that with increasing age there is a decrease in errors; as well as the investigation of Noronha et al. (2012) that compared children from different Brazilian States and also noted that perspective of development.

By comparing the performance of Peruvian children with Brazilian children it was verified that there were statistically significant differences in the three studied ages, it just so happened that in all cases the Peruvian sample presented a lower score, which indicates better performance. On the basis of this result some possibilities were intended, the most obvious and perhaps will be set as a limitation of the study refers to the fact that the corrections of the protocols were made by people with varying degrees of knowledge of the instrument. In another measure, in the case that the results portray really substantial differences in the performances of the children who participated in the study, it is required a deep check of the suitability of the criteria of correction for Peru, as a way of guaranteeing that the metric properties of the B-SPG are preserved.

In addition, other two relevant elements should be highlighted, which are the lack of studies of validity with Peruvian samples for the instrument and the constitution of these samples. Establishing rules of an instrument is something that should occur when the empirical studies already showed that there is validity to proposed interpretations (AERA, APA & NCME, 1999). Thus, this study that was exploratory did not have claim to determine the rules, but compare the Brazilian studies with other samples. Besides that, the samples used were formed by convenience, which may also have collaborated with the findings of this research.

Considering what was said by Dana et al. (1983), Lubin et al. (1971), Lubin et al. (1984), Noronha et al. (2002) and Silva and Nunes (2007), the Bender is presented as one of the instruments most known and used worldwide, it seems obvious the importance of cross-cultural studies in Latin America. It is through these studies that similarities in the assessment of some important aspects of human development concerning psychological science may be observed, as well as there will also be an approximation of the Latin American peoples.

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