

RELATIONSHIP BETWEEN REASONING COHERENCE AND
VOCABULARY IN CHILDREN

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Resumen

El trabajo que se informa tuvo como propósito principal, estudiar la *aptitud verbal* y la *coherencia de razonamiento* a través de dos pruebas para *niños*: el Test de Coherencia de Razonamiento para Niños (TCRN) de López Alonso y Ricardi (1993) y el Test Verbal Buenos Aires para Niños (TVBAN) de Cortada de Kohan y Ricardi (1999). El primero fue estudiado en adultos, adolescentes y niños (López Alonso, 1988; Ricardi, 1989, 1993a, 1993b) y el segundo, en adultos y adolescentes por Cortada de Kohan (1997, 1998). En dichos estudios se encontraron correlaciones significativas del TCRN con pruebas adaptadas, de las utilizadas por Jean Piaget, para establecer los estadios evolutivos del pensamiento en niños, sordos y oyentes, entre 6 y 15 años. Los resultados obtenidos indicaron una importante *correlación* con los distintos estadios evolutivos del pensamiento y con las pruebas que los evalúan. En otros trabajos, administrando el mismo test para niños, se

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encontró un factor propio de incoherencia de *razonamiento*, de signo opuesto a la mayoría de los rendimientos intelectivos diferenciales, como rendimiento escolar. Para cumplir con el objetivo propuesto, se administraron estas pruebas a 245 niños de escolaridad primaria (de segundo a séptimo grado), de 7 a 12 años de edad, de escuelas de nivel socio-económico medio de la ciudad de Buenos Aires (Argentina). Los resultados arrojaron una correlación de .497, significativa al $p \leq .01$, y se observó que existen importantes diferencias en la variable edad, no así en la variable sexo.

Palabras clave: Tests - niños - correlación - coherencia de razonamiento - aptitud verbal.

Abstract

In this research we studied the relationship between two tests for children. One of them, is a Test of Reasoning Coherence, and the other is a Test of Vocabulary in Spanish. Both tests have been studied in adults, and adolescents (Cortada de Kohan, 1997, 1998; López Alonso, 1988; Ricardi, 1989, 1993a, 1993b; Ricardi, & López Alonso, 1993). We adapted both instruments for children and administered them to a sample of 245 primary school children between 7, and 12 years old. The correlation between the test of coherence and the verbal test is .497 is a value significative to $p \leq .01$. We did not find significant differences between sexes but, we did find an increasing mean value along the ages.

Key words: Tests - children - correlation - reasoning coherence - verbal ability.

Introduction

This is a research to find out the relationship between two tests for children. One of them is the Test of Reasoning Coherence and the other is the Test of Vocabulary in Spanish. Both tests have been studied in adults, and adolescents (Cortada de Kohan, 1997, 1998; López Alonso, 1988; Ricardi, 1995; Ricardi, & Cortada de Kohan, 1999).

Here we adapted both instruments for children and administered them to a sample of 245 primary school boys and girls between 7 and 12 years old. The two schools where we administered the tests belong to the city of Buenos Aires (Argentine) and were schools of middle socioeconomic level.

Many studies have been done to analyze the relationship between language and thought. Some authors consider there is between the two concepts an intimate union, but others see them as totally independent constructs.

Noam Chomsky (1986) for instance considers that under the superficial structure of a language there is a deep structure of rules that allow for the generation of all grammatically correct propositions. Some of these rules are specific for a language but there are also common basic rules for all the languages. So it is possible to think in a general grammar narrowly akin to the mental structure of the human nature and its biological sources. He thinks that in the brain it could exist some device to the acquisition, which has the specification for the underlying linguistic rules.

Piaget's Theory (1973) constitutes an alternative to the Theory of Chomsky. To Piaget the development of the language occurs as a sub-product of the development of the other cognitive processes non linguistic. It means that it is no an independent problem. Piaget believes that the child development is a process of socialization of the child. At the beginning the child could not put apart the external world from their own perceptions.

On the other side Vygotsky (1962) emphasizes that there is a pre-linguistic sensomotor intelligences, and a pre-intellectual language, and he thinks that the highest way in which ends the thought process is the one that needs from the language. To this author the thought process developed by man has two different basis. One enters deeply in the practical behavior of the animal and another in the use of the language as a means of communication. To him, the roots of thinking have to be found not in the abstract logical operation expressed by the language but in the real animal behavior.

Vygotsky shows that the word has two aspects: (1) the attribution of the word to the object, which has an identical function in the child and in the adult, and (2) a second function, much more complex that is the signi-

fication function. This suffers deep transformations during the process of unfolding of language. In this second aspect the word is not limited to point out an object but at the same time to introduce the object in a system of relationships to analyze, and to generalize it. A word not only signals an object. It also makes a very complex analysis previously structured in the codes of the language during the process of the social history of the person. To Vygotsky a word without signification is not a word. The signification is the same word viewed from its inner side. As such, the word is an aspect of the thinking process.

Luria (1980) also assesses that the language has an essential place in the organization of the cognitive process. He states that, the existence of language and its structures of grammar and logic allow the man to extract conclusions upon the basis of logical reasoning, without having to proceed each time to his sensorial experience. Many authors accept that verbal ability is the more significative aspect of the cognitive process, and in almost all the tests which try to measure this construct the verbal factor has an important place.

Methodology

Instruments

Verbal Test Buenos Aires for Children

From a previous research on the relation between intelligence, and achievement (Cortada de Kohan, 1997, 1998) we become acquainted about the low verbal usage of many pupils in our primary and secondary schools. This fact, and the knowledge that there is not in our country a vocabulary test with norms, moved us to the construction of a test of this kind. It is well known that many authors consider that the verbal ability and word fluency are some of the essential processes of thought. For instance, Terman (Terman, & Merrill, 1937) sustained that the vocabulary that a child has is the best measurement of intelligence. We were interested in constructing a test similar to the English Mill Hill Vocabulary Scale, by J.C. Raven, Court, and J. Raven (1993). Hoping that our test could measure as well mental reproductive behavior which supposes memory, and reproduction of verbal material. This is said that constitutes the cultural background of knowledge. The performance of many school and academic tasks relies on verbalized ideas and the fluency of words. That is why the great Spanish writer, Camilo Cela, stated that 'the ideas live in the words'.

Procedure for the test construction

For the construction of the Spanish vocabulary test which from now on we shall call Buenos Aires Verbal Test for Children we selected a large bunch of words (around 600) from books for children that are used as textbooks in the primary schools.

We found that the percentage of words with meaning were approximately: 50% nouns, 30% verbs, and 20% adjectives and so this was the proportion of each type used in the test. We constructed then three forms of the test. One for the younger children (7, and 8 years old), other for children of 9, and 10 years old, and the other for children of 11, and 12 years old. Each form had 40 items, multiple choice type, with five alternatives one of which was the correct synonym of the selected word.

In each of the forms we organized the items from those considered very easy to the more difficult ones according to our experience and the help of a frequency words dictionary (Eton, 1960). We administered the three forms to a small group of around 30 children each form as a pilot essay. We analyzed the results, and after eliminating those items that were extremely difficult or extremely easy (even for the younger children), and we constructed the final form with 50 items, all of them of five alternatives, multiple choice synonymous type. We administered the final form to 245 children of the schools of Buenos Aires (Argentina), from a population that regarding its socio-economic level was middle class.

Reasoning Coherence Test for Children

This test in its form for children was designed by Ricardi in 1985, on the base of the Reasoning Coherence Test constructed by López Alonso (1981, 1988) for adults. It measures the internal reasoning coherence. The subject has to solve 64 logical items starting from four attributes which the child has to relate and which are shown as pairs ordered in the affirmative or negative mode. The coherence is considered here not only as a type of syllogistic ability, but also as an organizational trait of cognition which penetrates all human behavior, and activities. The technique consist in the presentation of 64 logical problems with a succession of four pairs of attributes, and their denial. They are to be related by pairs, being presented alternatively as the antecedents or consequents of each relationship. Such relations are expressed as *They are* (inclusion), *They are not* (exclusion), and *They can be* (no-inclusion and overlapping), and they are scored and

symbolized by I , \emptyset , and P respectively. Trying to make the problems more easy to understand for children, each item of the test is presented with small pictures of elements of four classes within an oval line to suggest the idea of a set.

Besides, the attributes that are denied are presented as complementary from the respective affirmative attributes. So the union of both hints at the notion of universal set. In this test the reasoning is realized by understanding more than by extension because the quantification is only implicit in the relationship of inclusion, of no inclusion or overlapping and of exclusion when the sets are interrelated.

As for the scoring, and evaluation of the test they are considered the errors of the following type:

1.- Errors relating to contradiction with the premises of relationships, where are used I , \emptyset and P .

2.- Errors of identity:

a.- Errors of identity between positive attributes (for instance the mistakes of the type *The A are A*) called *errors of positive identity*.

b.- Errors of identity between denied attributes (for instance the mistakes of the type *The no-A are no-A*) called *errors of negative identity*.

3.- Transgressions to the basic principle of no-contradiction and of the third exclude:

a.- Errors of the type *A can not be A*.

b.- Errors of the type *no A can not be A*.

4.- When some item is omitted.

5.- The total scores is the sum of all errors made by the subject.

As it can be seen a high score means that the subject has made many mistakes in the coherence of reasoning. The lower scores, instead, mean that the subject has a good coherence.

Sample

We administered both tests (the verbal, and the coherence tests), to a sample of 245 primary school boys, and girls between 7 and 12 years old.

The two schools were of middle socio-economic level from the city of Buenos Aires (Argentina).

Result

As can be seen in Table 1 the means in the Verbal Test go from 16.42 for 7 years old to 34.14, and 33.80 for the groups of 11, and 12 years old. A growing is related to age with an important difference after 10 years old. As it was expected there is a better attainment in verbal ability as age grows up.

This does not happen with sex, there are no significant differences in the results of boy, and girls.

In the Test of Reasoning Coherence the results show similar tendency that in the Verbal Test. There are more logical errors in the younger ages. Children of 11 and 12 years old have a much better performance in logical reasoning that younger children. These results can be observed in Table 2. The correlation between the Verbal Test, and the Coherence Test is of .497. We remind the reader that the positive correlation comes from the type of scoring. We reversed the score of errors into the score of correct answers in the Test of Coherence (see Graph 1). In a following research we shall study the test according to the Item Response Theory and we shall find the parameters for each item, its information curve and the corresponding indexes of reliability and validity.

Conclusion

We believe that is important in this work to observe that the Verbal Test discriminates very well between the ages as can be seen in the difference between the means of successive ages. This could be seen also in the Coherence Test where the mean of 12 years old is 43.47 and the mean of 7 years is 31.69. The correlation between the tests of Coherence and the Verbal is .497 a value significative at $p \leq .01$. This seems to be showing that in the Test of Vocabulary as the child has to choose the synonym, this implies to use of an inferential process. It means that in fact in measuring vocabulary we are measuring an intellectual ability. We believe it measures what now is called, crystallized intelligence (*Gc*).

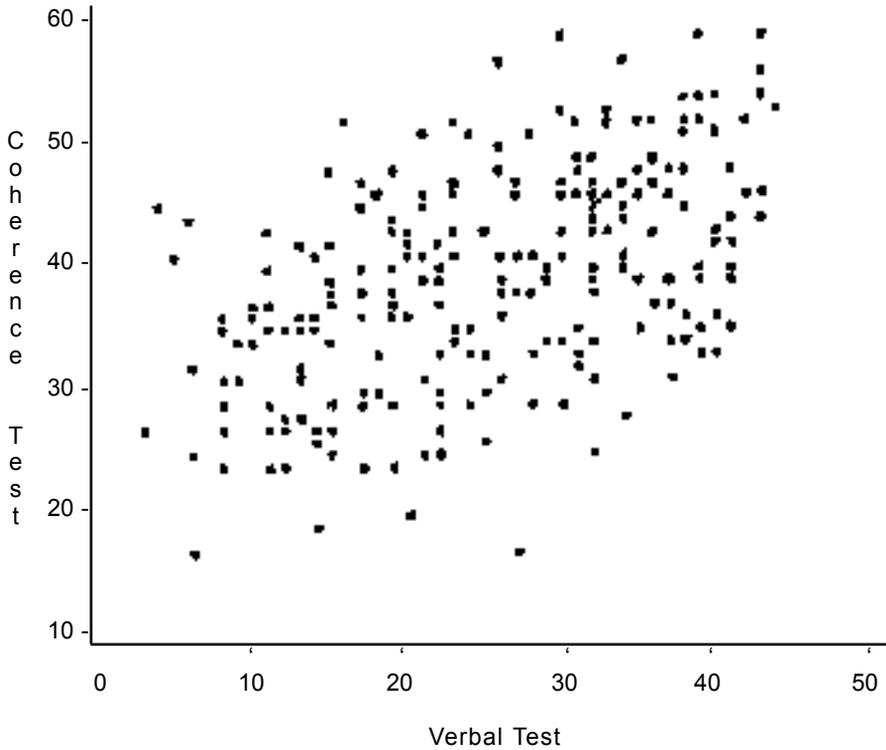
Table 1
Means and standard deviation of scores in the Verbal Test

	7 years	8 years	9 years	10 years	11 years	12 years	Total
<i>N</i>	37	35	48	36	41	48	245
<i>M</i>	16.42	18.71	22.08	29.47	34.14	33.80	26.27
<i>SD</i>	6.71	7.05	9.45	7.76	6.19	7.59	10.35

Table 2
Means, and standard deviation of different types of errors in the scores of correct answers in Test of Reasoning Coherence

Age	Relational	Id. positive	Id. negative	Contradict.	Total Error	Total Correct
7 years	<i>M</i> 24.52	.57	1.91	3.54	32.30	31.69
	<i>SD</i> 5.66	.70	1.44	2.64	8.24	
8 years	<i>M</i> 23.20	.28	1.17	2.45	28.28	35.71
	<i>SD</i> 5.38	.85	1.42	2.60	7.09	
9 years	<i>M</i> 22.50	.18	1.60	2.35	27.66	36.33
	<i>SD</i> 6.76	.57	1.71	2.42	7.39	
10 years	<i>M</i> 21.56	.11	1.55	1.58	25.77	38.22
	<i>SD</i> 6.94	.39	1.64	2.22	8.73	
11 years	<i>M</i> 18.78	.00	1.56	1.09	22.90	41.09
	<i>SD</i> 6.41	.00	1.66	1.36	7.19	
12 years	<i>M</i> 17.63	.07	1.61	.91	20.52	43.47
	<i>SD</i> 7.77	.26	1.59	1.67	7.66	

Graph 1
Dispersion of correlation between the two tests



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