

# Relationship between the Hand-Eye Laterality and the Writer Process in Children 8 Years Old

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## **Abstract**

In relation to the shortcomings in children's writing process, parents and schoolteachers usually think that they are lazy or with disabilities. However, the "defined laterality" can play its role in the learning processes with the due support in the students. An approach to this inherent condition of the human brain allows appreciating its level of participation in this process as long as the adults who support learning promote it in their first years of life.

For this reason, the current research took a sample of 30 third-grade children, with an average age of eight years, with no possible or potential dysgraphia diagnosed in them, in order to find out the relationship between homogeneous lateralization of the body and their writing process. Therefore, the aim of this study is to analyze the relationship between hand-eye laterality and the writing process in eight-year-old children.

The Neuropsychological Laterality Test [1], and the PROESC test [2] were applied to identify the correlation between the variables of hand-eye laterality and the writing process. After analyzing the data from the laterality and the PROESC tests, it is observed that there is no relation of dependence between the variables of hand-eye laterality and the children's writing process.

**Keywords:** Laterality, writing level, writing process

## **Introduction**

Within the line of research that surrounds the topic of motor skills and the processes of

reading and writing, there is an interest in an issue inherent in the work of the teacher, especially in the first grades. Many children experience difficulties with reading and writing processes, and both parents and teachers may think that they are lazy children or poor students.

However, when studying the issue of laterality, one ends up discovering that the role that it plays within the learning processes is extremely important; an approach to this condition inherent in the human brain allows us to appreciate their level of participation in these processes.

To evaluate laterality in the sample especially hand - eye, the laterality test of the neuropsychological test will be applied [1], [2].

This test assesses manual, pediatric, ocular and auditory laterality through ten simple actions for each body index. The child is asked to perform each of the activities that are detailed at the time, and is registered, as well, which side chooses to perform them.

However, the laterality of the hand is not the only one that influences writing, given the case; the experts in the subject have highlighted in the academic performance the way in which the eye is a relevant index in the learning process and main factor in the writer process; the eye is the one that perceives the images and works together with the hand for the realization of the grapheme, and when there is a crossed laterality in relation to the hand and the eye, the writing process may be affected.

This is how the choice of this topic is of vital importance in the educational field; hence, the present document approaches multiple variables that affect school performance and that in turn relate hand-eye laterality with the writing process in 8-year-old children. Undoubtedly, it is interesting to investigate to what extent a homogenous lateralization of the body indexes with the writing process has incidence without the diagnosis of a possible or potential dysgraphia in schoolchildren.

The relationship between hand-eye laterality and learning has practical implications in the area of speech therapy and with some specific difficulties of reading and writing, conceived by tradition as of linguistic origin; but in reality, these obey to faults in the visual system due to crossed laterality [3]. This subject of vital importance has attracted a lot of attention and has become the subject of recurrent study because it has been making a connection between the deficit in reading or in writing, with the laterality of schoolchildren and their hand-eye indexes.

To carry out the present investigation, a sample of 30 children aged 8 years old who are in the third grade of primary school is taken, to which a laterality test is applied in the first instance, since it is a test that explores the lateral dominance of the child from six years of age on the eye, ear, hand and feet; It is a useful tool to evaluate people with alterations in reading, spelling and writing. With the result of this test we can identify the way of relating the hand-eye laterality with the variable writer process that is the process that is decided to explore.

Then the PROESC test is applied [4], [5], a manual for the evaluation of writing processes; this instrument allows to evaluate calligraphy, spelling and composition in the children of the sample, in such a way that the writing variable is better appreciated.

The application of the mentioned tests facilitates the correlation between the selected variables that in this case are hand-eye laterality and writing. With the data obtained with the application of the collection instruments, an interesting discussion is reached between the referents of the research and the variables defined.

In this way, we present in these pages, a research compendium composed of its theoretical framework, its methodological framework, the results and their respective analysis, in the light of the referents and following the selected design. The document culminates with the proposal, without ignoring the respective conclusions, defining future lines and exposing the corresponding bibliographic references.

In broad terms, this document is considered a decisive step to understand in a more integrated manner, aspects related to eye-hand laterality in eight-year-old children, as well as its effect on the writing process.

## **Methodological Framework**

This chapter presents the methodology and procedures that are used to investigate the relationship between hand-eye laterality, and learning to write in 8-year-old children, who are in their third grade of primary school. The hypotheses and the chosen research design are exposed; the study variables, the description of the population, the type of sampling and the illustration of the sample. In addition, the measurement instruments used to collect the data, and the procedure defined for the collection thereof.

### *i.DESING*

An Exploratory Descriptive design is used to carry out this study. In [6]-[7], indicate that descriptive investigations measure, evaluate or collect data on certain aspects, dimensions or components of the phenomenon to be studied. Four characteristics are

established that base a quantitative investigation, with which the enumeration and the measurement are reached; always try to accept the measurement, but subject to psychometric criteria of reliability and validity; for this, we turn to the use of statistics.

Finally, we seek to reproduce numerically the relationships that occur between situations and phenomena [7], recognizing the contributions of the Chi square test, which is the most common form of hypothesis testing, highlighting the statistics the opportunity to give the qualitative value to the variables brought to the investigation.

It is then, an exploratory design, to the extent that it reaches to determine a trend; it approaches the identification of potential relationships between variables and establishes the basis for the development of more rigorous subsequent investigations. This type of cut is accepted when a more flexible methodology is required than the one chosen in descriptive or explanatory studies [7].

#### *ii. HYPOTHESIS*

The study hypotheses are the following:

H1: The laterality and writer level variables are independent.

H2: The laterality and writer level variables are not independent.

#### *iii. STUDY VARIABLE*

For this investigation, the following are taken as variables:

- Dependent variable: Student's writing level
- Independent variable: Laterality eye-hand

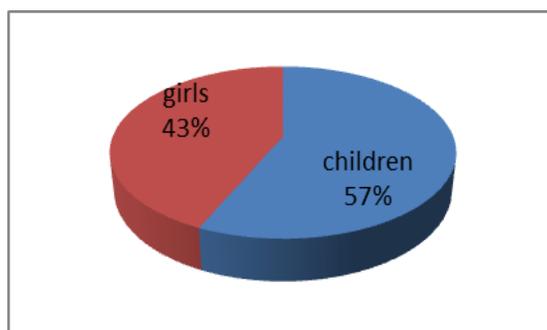
#### *iv. DESCRIPTION OF THE POPULATION*

The institution to which the sample belongs is the CRECER CIT Foundation, which is a private entity, located in the commune of the city of Neiva. The CRECER CIT Foundation has a population of 97 students that cater for children aged 6 to 12 years old in the grades 1-5.

#### *v. TYPE OF SAMPLING AND DESCRIPTION OF THE SAMPLE.*

The type of sampling that is used is the Casual or Incidental Sampling, this consists of a process in which the researcher directly and intentionally selects the subjects of the population [8]. In this case the sample is taken for availability of access to the school group.

For the present study, the sample was 30 participants; with an average age of 8.7 years (Standard Deviation = 0.9 years); in this case, the population of the sample is in the third grade of primary school, of which 17 are male and 13 are female (Figure 3). Schoolchildren of this level of study were selected, because in Colombia a first group of grades is closed, at this level, trusting that, at that height, the children have reached the basic competences foreseen in the initial writer process; In addition, "the evaluation of their written performance would allow defining more efficient management guidelines to strengthen this school learning in new generations" [9]



**Figure 1: Percentage population sample**

*vi. MEASUREMENT TOOLS*

For the collection of information on the hand-eye laterality variable, the Laterality Test of the Neuropsychological Test adapted by [1], [10] was used as an instrument. The team of the Institute of Neuropsychology and Education of the Villanueva University Center of Madrid proposes this test; its viability is guaranteed in the school population from four years of age. The test consists of evaluating the lateral dominance of children when performing various actions, evaluating the use of two indices: hand and eye; the test includes two more indices (ear and foot), but for the present study it is exempted from its application.

Each subtest evaluates the use of each of these selected indices, and consists of 10 activities that are recorded separately. The researcher records on a record sheet, the child's preference side in relation to the performance of each of the actions [11]. If the child has used the hand or the right eye, a D is written; if, on the contrary, he uses the hand or prefers to use the left eye, one is registered. A final assessment is established, depending on the number of times he has used the right side, or the left side. More than 6 actions with dominance established on the left side, then defines that it is a Right dominance; if the case is, on the contrary, a Left dominance is registered; this is called homogenous laterality (left or right handed).

Below that threshold, an undefined laterality is considered. If the student has preference with one side for an index (hand or eye), and on the other hand, with the other index observed, cross-laterality is considered.

Regarding the writing variable, the chosen instrument is the PROESC test [4], [5] which aims to detect difficulties in the evaluation of constituent aspects of the writing process, from the planning of ideas, to other less complex aspects, such as writing syllables. This Test is divided into six subtests: Dictation of syllables, Dictation of words, Dictation of pseudo words, Dictation of sentences, writing of a story, writing of an essay.

The following aspects are evaluated: the domain of orthographic rules, accentuation rules and phoneme / grapheme conversion, the use of capitals and punctuation marks, the knowledge of arbitrary spelling, and the planning of narrative texts and expository. Its application for this study is decided to be individual, with a duration between 50 and 60 minutes; PROESC is designed to be used with subjects between 8 and 15 years of age. The assessments to define the difficulties in the writer process and assess the results of the test, are determined in results tables.

The data obtained with the application of the PROESC test, define the evaluations according to the categories. The valuations and their counting are shown below in the results chapter.

#### *vii. PROCESS*

Before participating in the present investigation, each of the thirty students witnessed the management authorization (informed consent) of the material applied for purely academic purposes, and in which the respect for full anonymity is declared. This format was supported by the signature of his guardian or tutor, and the signature of the research teacher.

Then, he began the application of the instrument called eye-hand laterality test. This applies during the five working days of the school week; with the approval of the group's teacher, each child was called, while the rest of the group continued their normal academic journey. This allowed the test activities to be carried out individually and the student was away from the rest of the group, which prevents the rest of the students are conditioned to the test. The selected place for the application of the test, is the computer room, guarantee of a pleasant and silent environment to prove the execution of the actions; the necessary materials were foreseen. They were allocated, for each student, 5 minutes.

For the PROESC test, which has been considered the second instrument, and that its application was joined to what was thrown by the instrument called laterality test, a block of class was allocated, in the area of Spanish Language, with the presence of

the teacher of the course. In this space ten minutes were allocated to socialize the test, and 55 minutes to solve it. In the middle of the test, an active pause was made of simple body stretching exercises (5 minutes).

#### viii. ANALYSIS OF DATA

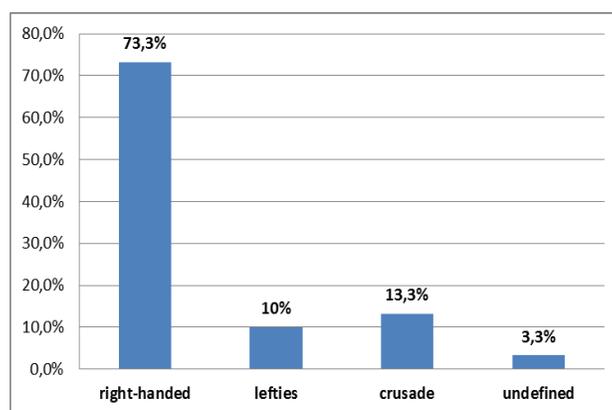
To obtain the descriptive and correlational analysis presenting the data through tables and figures that show the absolute frequencies and the relative frequencies, we went to the Microsoft Excel program. Through a contingency table, the number of students registered when crossing the variables analyzed was indicated.

In addition, with the use of the Chi square test, we chose another table; this table shows the contingency status between the variables, with which it is possible to observe the possible distance or discrepancy between the frequencies observed and the expected frequencies. All this is explained below, in the results chapter.

## Results

### i. Descriptive Analysis, Variable Hand-eye Laterality

Through this analysis, it is possible to describe the result obtained with the application of the laterality test. Figure 4 shows the percentage covered by the population, according to the type of laterality observed. Table 3 shows the frequencies obtained in said test.



**Figure 2. Results obtained in the laterality test**

As can be seen in Figure 4, homogenous laterality predominates in the population; 73.3% of students show right laterality and 10% have left laterality; therefore, 83.3% of the schoolchildren observed have definite laterality. 13.4% of the sample, externalized crossed laterality, and 3.3% is without defining its laterality. The laterality that predominates in the observed degree is right-handed.

**Table 1. Frequencies laterality test**

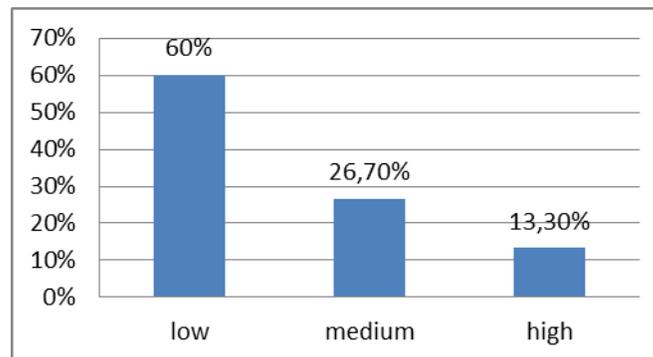
LATERALITY	f	fr
RIGHT- HANDED	22	73,3%
LEFTIES	3	10,0%
CRUZADE	4	13,3%
UNDEFINED	1	3,3%
<b>TOTAL</b>	<b>30</b>	<b>100%</b>

As has been said, Table 3 shows the absolute frequency, but it does it together with the relative frequency. The absolute frequency allows to identify the number of students of the sample that were located in each laterality; in that sense, we have that, of 30 children, 22 are right-handed, 3 are left-handed, 4 showed crossed laterality, while 1 of the students cannot be defined.

Now, as shown in Figure 5 and Table 4, 60% of the population has a low level in writing; that is, 18 of the 30 children observed, are located at the level mentioned. The remaining 40% is distributed as follows: 8 schoolchildren were assessed within the medium level (26.7%), while 4 (13.3%) reached the high level.

*ii. DESCRIPTIVE ANALYSIS, VARIABLE WRITING*

On the other hand, the results of the PROESC Test yielded the following data:

**Figure 3. levels of writing detected****Table 2. Frequencies Writing Levels**

LEVELS	f	F	fr
LOW	18	18	60,0%
MEDIUM	8	26	26,7%
HIGH	4	30	13,3%
<b>TOTAL</b>	<b>30</b>		<b>100%</b>

i. CORRELATIONAL ANALYSIS VARIABLES: LATERALITY \* WRITING

This subchapter is brought to Figure 6, correlating the observed frequency of the hand-eye type of laterality, with each of the three levels (where the 1 corresponds to the low level, 2 to the medium level, and 3 to the high level) of the writer process.

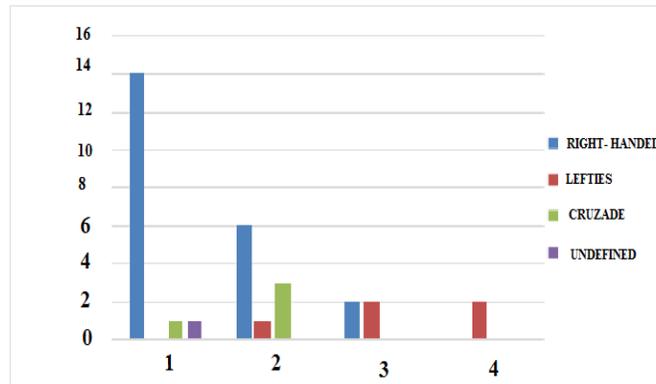


Figure 4. Variables Laterality \* Writing (Levels)

On the other hand, Figures 7 and 8 indicate the relative (recount) and absolute frequencies (percentages), allowing visual appreciation of the correlation between Hand-eye Lateral Variables and Writing Levels.

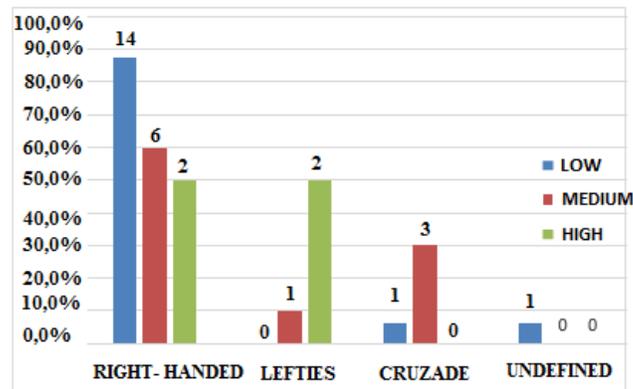


Figure 5. Correlation Frequency Variables Lterality\* Writing

Because Table 5 confirms the contingency values between the writer process and hand-eye laterality, it was decided to go to the Chi-square test to determine the dependency relationship between the variables.

**Table 3. Contingency Variables Laterality hand-eye \* Writing**

WRITING LEVEL	LATERALITY		CRUSADE	UNDEFINED	TOTAL
	RIGHT HANDED	LEFT HANDED			
LOW	14	0	1	1	16
MEDIUM	6	1	3	0	10
HIGH	2	2	0	0	4
TOTAL	22	3	4	1	30

We apply chi squared to table 6 and find the p-value between the observed and expected frequencies, and then analyze that value and accept the null or alternative hypothesis to conclude with the dependence or independence of the variables (laterality, writing).

**Table 4. Observed frequency**

LATERALITY	WRITING LEVELS			TOTAL
	LOW	MEDIUM	HIGH	
HOMOGENEA	14	7	4	25
CRUSADE UNDEFINED	2	3	0	5
TOTAL	16	10	4	30

**Table 5. Expected frequency**

LATERALITY	WRITING LEVELS			TOTAL
	LOW	MEDIUM	HIGH	
HOMOGENEA	13,33	8,33	3,33	25
CRUSADE UNDEFINED	2,67	1,67	0,67	5
TOTAL	16	10	4	30

**Table 6. Value- p**

VALUE-P	LEVEL OF SIGNIFICANCE
0,31981902	0,05

The p-value is greater than 0.05, the alternative hypothesis is rejected, therefore the variables are independent (null hypothesis): The Chi-square method in this case, was able to determine that there is no dependency relationship between the hand laterality variables eye, and Writing level.

## Conclusions

The daily life of the school leaves in the environment the feeling that the act of writing

is not strengthened as spontaneously as it is believed, nor how many people perceive it in everyday life; weaknesses in the production of written texts remains a concern for teachers of the first grades, and an unknown to linguists, psychologists and neurologists, as perceived by the Language and Culture Research Group (2008), when it says that "writing it is a complex activity that requires knowing how to use various tools to achieve the work "(p.12).

But it happens that in the same way as they disregard the real reasons for a student to present problems with the writers' processes, the teachers have little or no use of important cognitive strategies. It is much more possible that during their teaching process, teachers detach the observation of the motor development of their students, the development of security to seek to advance in writing. The father of the family, as well as the teacher, should care about the issue of laterality, in the sense of supporting the early detection of the custom that subjects have, of counting one side of the body more skillful than the other.

It is forgotten that just as the teacher strives to learn to teach writing, and reaches to see discursive progress in his students when he performs a constant reflection on the productive act, it could happen with the motor functions; this, accepting that "some research has mentioned that children who have difficulties in the first two years of learning and are not corrected, will continue to present them throughout their training" according to [9].

Students who are prepared to learn math, learn to read, but also to learn to write, usually do not have clear what is written; Sometimes, neither adults nor adults have it; traditional textual production practices in the school, remain detached from the psychological and mental aspects of minors, as well as the sociocultural environments of the environment; it happens that writing is not meaningful or contextualized; the teachers and specialists who join the school institutions must feed the analysis of what the writer process is, relating it to the psychological and mental aspects of the children.

In these terms, in the elementary school classrooms of a developing country like Colombia, especially, there is a real need to accept what [3] said about it: "Writing is not a spontaneous skill like talking is" [6]. The writer does not write the running texts, but builds them with work and craft: he reflects on the communication situation, points out ideas, makes outlines, drafts drafts, reviews proofs. Hence, research such as that of [12] on the one hand, and that of [13], on the other [9], insist that "writing is not a simple transcription of oral language , since it is a tool that implies the coordination and use of diverse motor, communicative and linguistic abilities "(p.114).

The present study, however, discards the relationship of dependence between the variables hand-eye laterality, and writing level, in 8-year-old children. But, just as laterality is linked to brain processes, the child in his first written production exercises, while striving to raise his communicative act, or perform operations (if it is

with mathematics), reread, correct and reformulate what is. In this way, he is also developing his cognitive process in a great way. That is, correct or revise, are actions that are part of the process of construction of texts, of writing, along with looking for ideas, organize and improve them.

Returning to the general objective "to analyze the relationship that exists between hand-eye laterality, and learning to write in 8-year-old children" and after analyzing the results obtained, it is concluded that children of eight years and that present homogeneous laterality, may be coinciding in the scriptural failures, with those who present heterogeneous laterality. For this reason it can be affirmed that already in the eight years of age, the difficulties in writing, do not depend directly on the laterality of the students; faults can be related to other types of factors.

Although it is true, the first stage of writing, when spontaneity was its characteristic, and where random lines and drawings mixed, children define their laterality with the help of those around them; there they tended to linearity, and little by little they wrote doodles similar to letters, beginning to understand that they are related to what they hear and also pronounce. These children of eight years, despite their marked difficulties, as could be perceived with the application of the PROESC Test [4], [5], may already be in a second stage, in which the reproduction of texts in themselves, will mark the uniformity of their codes, tend to repeat the words and letters, and there is an effort to understand the meaning of the written, to say it with [14].

Institutions such as the CRECER CIT Foundation, from which the sample has been taken, show in this research, what Pérez (2015) states: "detecting difficulties, re-educating students and preventing them are fundamental functions of the school" (p. 7). On the other hand, during the process of teaching and learning to write, as well as reading, the student must meet certain requirements for it to achieve its purpose, among which are motor skills and laterality; Therefore, this document attempts to address the cognitive processes that result in the writing skills of school children aged 8 years, trying to show that their laterality must be strengthened from two or three years ago.

After the study of the referents, it can be concluded that it is not so much the relationship of the writer process with the circumstance that the child is right-handed, left-handed or heterogeneous; it can be left as a hypothetical situation, that the dependence would rather be based on the fact that the child wishing to be left-handed, for example, is prevented; or wanting to explore both hands when writing, do not allow it; It can be assumed that his brain is not going to start writing, with barriers or prejudices on the part of his parents or teachers.

Of course, it is not ruled out that in some cases it may be necessary visuo-motor reeducation or laterality, establishing specific guidelines for greater knowledge and mastery of spatio-temporal coordinates with respect to the body itself, or assume a specific intervention in the writing disorder.

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