

# Visospace Skill, Hearing Discrimination, and Academic Performance in a Group of Students of the Second Cycle of the Primary Level in the Dominican Republic

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**Abstract:** The present study addressed the determination of the relationship between visuospatial ability, auditory discrimination and academic performance in a group of students of the second cycle of the Primary Level, in an Educational Center in the Dominican Republic. The general objective was to determine if there is a relationship between visuospatial ability, auditory discrimination, and academic performance in a group of students. The methodology was framed in using the descriptive, correlational and non-experimental design, where the variables will not be manipulated. The PAF Auditory Discrimination Test (Valles, 1990) was used to assess auditory discrimination. The Copy and Reproduction test of the Rey Complex Figure (Test del Rey 1942) was used to assess visuospatial skills and to determine academic performance the averages of each subject were compiled, extracting from them a general average.

The results showed that: between visuospatial skills and auditory discrimination, there is no correlation, both in the Copy FCR and Memory FCR. Between auditory discrimination and academic performance of 4th, 5th. and 6th. In primary school grades, there is no statistically significant correlation between visuospatial skills and academic performance; there is no linear association in students who are in grades 4, 5, and 6, and finally that between Visospace Skill (Copy FCR) and Academic Performance there is no significant relationship, in conclusion it can be stated that: there is a statistically significant, positive, direct and moderate linear association between Visospace Skills (Memory FCR) and ( FCR Copia) in 4th, 5th. and 6th. primary level grades. Which shows that if the subjects do have visual support they could do a better job.

**Key words:** visuospatial skills, auditory discrimination, academic performance

## 1. Introduction

Primary education is one of the educational levels in Latin America fundamental for the education of the individual, in this training process the child develops his skills and competencies, which therefore allow him to have a good academic performance in his classes. For this, his abilities must be evidenced in all its manifestations, especially visuospatial and auditory discrimination.

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It will allow to acquire the basic and vital processes, such as: manipulating, analyzing, moving, writing, reading, differentiating, observing, listening and being able to express oneself.

Visuospatial skills are related to the way the world around us is perceived, influencing how things are seen, and the teacher must enhance these skills (Armstrong, Rivas, Gardner & Brizuela, 1999). This ability must be stimulated throughout the child's school journey as this generates a lot of meaningful learning, which is the goal of every teacher.

For the learning process to occur efficiently, it is necessary for the child to present good discrimination to auditory stimuli. In turn, these stimuli are responsible for good language acquisition. The environment where the student develops will play a preponderant role in how her visual skills are enhanced, they will allow her to be located in time and space. Another important factor is the recognition of sounds or auditory stimuli. Alvis-Gómez and Pulzara-Tiara (2013) highlight the importance of the environment or context, the space where all the movements made by the individual are carried out, allowing them to organize their perceptions and act together with all their skills: kinetic, tactile, visual and auditory.

Academic performance, on the other hand, must be sustained by the development of activities that enhance abilities, which can make the child show all their skills when carrying out cognitive tasks.

Academic performance adopts qualitative and quantitative values that allow showing the knowledge, skills and attitudes of a student in school (Edel, 2003). All these conceptions must be taken into account by the teacher when assessing the learning of their students. In this sense, this project proposes to look for the existing relationship between the variables to be studied, in a heterogeneous group that interacts in the same school context, which are stimulated in the same generalized way by their teacher.

The design of this study was framed in the descriptive and correlational type because it was found out if there was a correlation between the established variables, not experimental since none of the variables were manipulated, at the same time it was possible to determine or predict whether they had a direct impact or not with the academic performance of the students.

The school population consisted of two hundred and twenty (220) students, one hundred and twenty-five (125) males and ninety-five (95) females, these are characterized by being respectful, supportive and a minority a bit rowdy with their classmates.

The sample made up of 30 students between the ages of 10 and 12, of whom 21 are male and 9 are female, and they are in the 4th, 5th and 6th grade of the second cycle of Primary Level. Most of them come from dysfunctional families with limited economic resources, as a result of this they sometimes attend class with a torn uniform, with shoes and tennis shoes in poor condition, and with a broken backpack or with some holes. They are motivated by the ball, playing the pilgrimage and making chichiguas, they live in communities near the school, (the poorest sector of the Municipal District of Las Palomas).

The variables to be measured are visuospatial skills, auditory discrimination and academic performance of 30 students of the second cycle of the Primary Level. The instruments used were: PAF auditory discrimination test (Valles, 1995), the Copy and Reproduction Test of a Rey Complex figure (Rey, 1942). In addition to the results of their grades in their learning reports for each student for the current school year.

To evaluate auditory discrimination, the PAF Auditory Discrimination Test (Valles, 1990) was used. This test determines the student's abilities to recognize phonemes and be able to express them orally. Which is made up of 28 items contained by syllables, words and pseudo words. For the evaluation of the PAF test, the auditory discrimination item was used. The independent variables to be evaluated in the PAF Auditory Discrimination Test:

PAF hits.

To assess visuospatial skills, the King's Complex Figure Copy and Reproduction Test (King's Test) from ("REY TEST", 2017) was used. The student must copy the given figure where his visuospatial ability will be measured.

Table 1 Scale to Assess Academic Performance

Numerical Ranges	Valuation
0-69	Insufficient
70-79	Okay
80-89	Very good
90-100	Excellent

Initially, permission has been requested with the directors of the center where the internship is being carried out, they must request permission from the families responsible for each student, and then proceed to sign the informed consent. The instruments used were: PAF Auditory Discrimination Test (Valles, 1990) and the Copy and Reproduction Test of the Rey Complex figure (King's Test) of ("REY TEST", 2017), to determine academic performance. the final grades of the subjects taken by the students.

To begin the evaluation, the PAF Auditory Discrimination Test was applied, it was carried out individually, in a controlled environment and without interruptions for its better application, annotations were taken of the responses as they occurred, specifically of their correct answers, doubts and repetitions.

Afterwards, we proceeded to the application of the Copy and Reproduction Test of the King's Complex figure (King's Test) of ("REY TEST", 2017) which consisted of copying and then reproducing a complex geometric drawing, it is aimed at subjects with suspected memory deficiency and for the assessment of visuospatial ability. It was applied individually with a variable time, this test can be applied in children from 4 years old and in adults.

It consisted essentially of first copying and later reproducing, from memory, a figure with a complex structure. He was presented with a blank sheet for the reproduction of the drawing, the time was timed and observing which figure he made first, then the total time in which he finished reproducing the figure was taken.

For academic performance, the final grades of each student were collected in all the subjects taken, observing the indicators achieved during the school year.

For the analysis of the collected data, descriptive statistics were used, which served to make descriptions about the behavior of the variables studied, which was supported with the SPSS statistical program and other works supported by the excell program, which allowed to find out if the variables: visuospatial skills, auditory discrimination and performance, through Pearson's correlation are related. Likewise, it facilitated the summarized presentation of the data in tables, as shown below.

Visuospatial ability is the ability to accurately perceive the visual and spatial world, this allows to elaborate mental presentations of objects, transform perceptions, recreate aspects of the visual experience and perceive directions in both concrete and abstract space. The development of this ability also allows the existing relationship between what is seen, where I perceive it, and where I can transfer it to; all this allows the child to integrate various elements to her capacity for a better abstraction, Cruz, Fernández, and Cordón (2017).

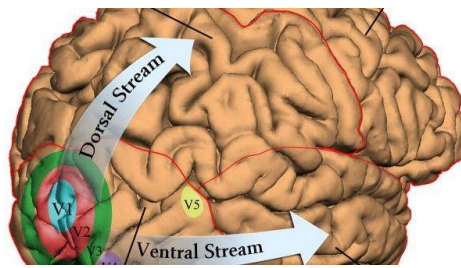
It is necessary to understand the process that occurs in the development of visuospatial skills, it is evident that this issue does not occur, if the visual system is not working well or if it presents some difficulty, therefore a

great work is exerted in the identification of what we see and especially where we place it, all this happens in order to have better processed the information regarding the color, size and position of the object that has to be seen or is being looked at.

People use this ability for visual or spatial processing, whether it be positioning themselves in the gun place, reading maps, perceiving, and to make sense of letters and numbers from the moment of acquisition and development. Everything that the child sees, touches or tries to touch, allows him to know the texture of the touched object and develops the ocular-manual visual system, improving his fine motor skills and developing his visuospatial ability since he is making mental representations that allow spatial cognition (Villamil, 2016).

Throughout this process the child understands or is understanding what he perceives, the distances that surround him, the size and the color. Trying to have some control of everything he observes, a control that develops from the moment of birth until his entire life and especially every time he makes a movement with his eyes. Visual stimuli allow in working memory to make meaningful and effective representations of learning (Manso & Ballesteros, 2003).

Although reading is a complex process, a good movement of the child's eyes will make the reading process less difficult. This movement is called saccadic movement, which are the jumps that the child executes at the time of the reading process. A good saccadic movement will allow the child to have better perceptions of the things that he sees and observes.



**Figure 1 Dorsal and Ventral System**

Source: <http://licjorgequiroga.com/2015/09/18/1a-via-visual-del-donde-y-del-que/>

Auditory discrimination helps the human being to be able to distinguish the sounds that are produced in the environment that surrounds him, this process is possible thanks to the fact that the human being has a hearing device, the sound is converted into neuroelectric impulses immediately enters through the auditory canal, impulses that are processed by the central nervous system. Berdicewski and Milicic (1979) found significant differences in the results of the auditory discrimination test, PAF, applied to three groups of different social and economic strata (low, medium and high), the sample consisted of 317 participants, belonging to the sector public and private educational, were of both genders and their ages ranged between 6 and 7 years. The results of this study showed that high-income children have lower scores than the low-income group.

When students have difficulties to achieve good auditory perception, they fail to develop their language skills that allow them to have a good academic performance, and the success they seek in school. Hearing problems should be observed from an early age. It is important to observe whether or not the child reacts to the everyday noises that occur in the environment in which it operates, if this does not happen they give light to typical signs that these processes do not develop normally, and that is where direct care must begin.

To be clear that hearing difficulties are well identified, the instruments and protocols with which they can be evaluated must be taken into account. A good evaluation of the phonological aspects in the acquisition of both oral

and written language allows an early intervention. Children with phonological difficulties present a series of obstacles when it comes to acquiring and developing oral language, especially and perceptual processes are diminished. Berdicewski & Milicic (1979) stated that “auditory discrimination and visual-motor coordination are two basic functions (among others) for reading-writing learning” (p. 293).

At school, teachers encounter this reality then the literacy process is diminished, which can lead to frustration not only for teachers, but also for parents and students, which is reflected in the decrease of the child's academic performance. Cañete (2006, p. 263) states that “the acquisition of oral language depends on the processing of acoustic information. It is precisely the central mechanisms that allow children to learn oral language quickly and easily.

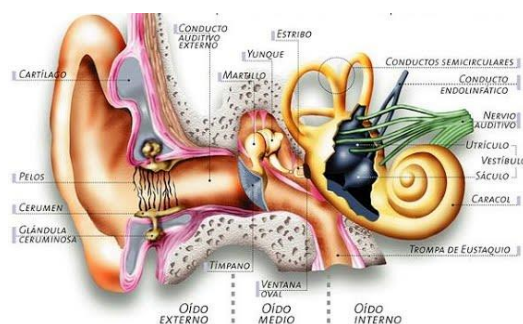
The neuropsychological processes of auditory discrimination are composed of its main organ, the auditory system, it is made up of parts that make it configured in such a way that it allows perceiving sound stimuli, the ear is the sensory organ that collects all sound information that appear in the middle, it consists of three parts: the outer ear, the middle ear and the inner ear, where each of them performs different functions and at the same time they are made up of parts that differ from one another, but that all together are like a well-harmonized orchestra.

It is important to know that hearing begins in the outer ear, where the pinna is located, which is like a parable that is responsible for collecting sound waves. There are two located on both sides of the head, which allows the correct localization of sounds. The sound is interpreted by the brain, it allows the human being to remain active even during sleep, since any sound out of the ordinary can be heard.

The cavity that is formed by the chain of ossicles forms the middle ear, which is bounded by the tympanic membrane at one end and the oval window at the other. This small cavity has a size of about two cubic centimeters in volume, which is connected to the throat through the Eustachian tube.

The inner ear is made up of an airtight cavity whose interior is flooded by a liquid called lymph. It consists of three elements: the semicircular canals, the vestibule, and the cochlea. The semicircular canals are not directly related to hearing, they have to do with balance. The vibrations from the oval window in the lobby are transformed in the cochlea.

The outer and middle ear is the conductive part, responsible for collecting and directing the sound impulse towards the inner part of the ear. In the inner ear is the sensory-perceptual zone, in charge of transforming mechanical energy into electrical energy or neural activity, and there is the area where electrical energy is analyzed along the auditory pathway by different processors such as the cochlear nucleus. bulb, superior olive complex, inferior colliculus, medial geniculate body and cortex (Martínez & Jiménez, 2017).



**Figure 2 Auditory System**

Source: <https://sites.google.com/site/lasondasyelsonido/el-oido-humano/partes-del-oido>

The academic performance of a child is one of the most important dimensions in the school process, that is why when evaluating in search of improvements it is necessary to be cautious, use the best instruments because the type of instrument used, the way in which is evaluated, the content of that evaluation and the writing of that content, greatly affects the student, many times the low performance of a student is attributed to other aspects and the importance of starting from previous knowledge, of using a good methodology during teaching and to review content and writing when evaluating; which causes that there is no validity or reliability in the results obtained, the teachers when they develop tests mostly integrate content that they have not developed in their classes, which allows students to obtain grades that do not allow them to obtain expected results.

Aguilar-Morales (2011, p. 8) states that "a common problem that exists when using any of the means of evaluation is that there are no reliable instruments that ensure the obtaining of objective measures of student learning".

For reasons like the above, it is that the student reflects low performance, and it is then that low performance is attributed to low intellectual capacity. Portolés and Hernández (2015) state that "academic performance is accepted as a multidimensional, broad and relative concept based on the various objectives and expected results in educational action" (p. 165).

Sometimes an adequate performance is not obtained, even having good intellectual capacity and optimal aptitudes to carry out cognitive processes. This makes it clear that intellectual capacities do not always allow obtaining a desired performance at some point in teaching (Jiménez, 2000).

Academic performance is a worrying issue for the entire educational community, due to its relevance and complexity it has become a vital issue for teachers, for research processes, and for psychology professionals since it is a subject that allows them the elaboration of intervention projects. All the difficulties presented in the performance of the students have a direct impact on the following levels of studies for which they are studying.

Educational institutions have a great challenge and a great responsibility in terms of academic performance, since many of them yearn for a successful performance for all children, which shows in another aspect the quality teaching that they promote (Hoyos, 2011).

For many, the reflection of having a good performance is a reflection of a good performance, of having a promotion in the following studies and possibly even deserving of scholarships, (Angarita Arboleda & Cabrera Doku, 2010), (Chain Revuelta, Cruz Ramírez, Martínez Morales, & Jácome Ávila, 2003).

Many students face situations in the classroom that end up generating an unpleasant environment, it prevents them from showing their cognitive abilities, their thinking skills, and being able to communicate, aspects that are easy for some teachers, to describe them as a dedicated student and good performance.

Some negative factors directly affect the motivation of students to achieve a good performance, among them is the rigidity of the teacher, an inadequate educational structure and poor quality of teaching work, inadequate programming, little attention to the difficulties presented by their students and a poor adaptation of the contents to the needs of the group. What for many students means that starting their studies is equivalent to feeling different emotions that for many are positive and for others, it would be completely negative (López & Polo, 1992).

The effort that students dedicate to achieve mastery of those taught by their teacher in most cases is not enough, since there is a load of disinterest in the classes, especially if they are loaded with monotony, little activation of the previous knowledge and, above all, not taking into account the context where students come from, diminishing the skills and abilities that many of them possess, which are expected to be developed within a competency Curriculum. Edel Navarro (2003) expresses that "effort does not guarantee success, and ability begins

to gain greater importance”. Students who are better oriented in their studies ensure school success. Edel Navarro (2003), cite from Covington (1984), which presents three types of students:

“Those oriented to mastery: they are subjects who are successful in school, are considered capable, have high achievement motivation and show confidence in themselves. Those who accept failure: are defeatists with a deteriorated self-image and manifest a learned feeling of hopelessness and there are those who avoid failure: they are those who lack a firm sense of aptitude and self-esteem and put little effort into their performance; To ‘protect’ their image against possible failure, they resort to strategies such as minimal participation in the classroom, delay in completing a task and even cheating on exams”.

An influencing factor to be successful in studies is motivation and disposition, these two concepts inspire the student to want to perform in their performance, to dedicate time to studies, homework and to create safe study habits. Beteta (2008) expresses that “the habits are created by repetition and accumulation of acts, because the more we study and we do it more regularly in the same place and at the same time, the habit of studying can take root”.

What in the end is always wanted is that students can develop the competencies and skills that allow them to achieve later success, not only in that school year but also in the following grades and levels that they will have to take year after year, greatly allowing as students are autonomous and can combine their study habits with the strategies they use to learn.

The school context where the student develops is delimited by various events and other subjects, each student organizes and orders their perceptions, their movements, what they touch, observe and listen to. García (2012) in the findings of his study found results that indicate that there is no direct relationship between binocular ability and academic performance expressed in the school grades of the group that studied, although his results showed a relationship between visual symptoms, visual asthenopia and the influence on your grades. Which led her to conclude that the relationship between visual function and performance is not direct. She also states that it is important that schools perform at least visual examinations to detect and treat difficulties.

Academic performance in school therefore evidences the child’s learning levels, so teachers must always be vigilant to make good evaluations of their students, since they are hindering not only the development of students in school, but also the evaluation of their performance, a good evaluation allows to identify significant variables that in turn must be perfect in each child, as is the case of knowing that they have good auditory discrimination.

A perfect auditory discrimination allows the child to appropriate vital processes such as writing and reading, of course these are accompanied by other factors that are sometimes not taken into account, such as the grip of the pencil, poor language development and poor sensory stimulation.

## **2. Summing Up**

The relationships or not of each of the variables studied. Regarding the existence of a relationship between auditory discrimination and visuospatial ability in the copy of the figure, no correlation was found, which makes this hypothesis or those that relate it to each other to be discarded.

Between the visuospatial ability in memory copy of the figure and the academic performance of the students of 4th, 5th. and 6th. primary level grades, there is no linear association,  $p = 0.934$ , a margin of error almost 100% and the value of the coefficient ( $r$ ) = 0.01. A similar study found a significant correlation between visuospatial ability and academic performance but in mathematics, both in FCR Copia and FCR Memoria (Navascués-Irigoyen,

2015).

In the Auditory Discrimination Test (PAF), the maximum value is 24 correct answers and the lowest is 13, when the highest score is 28 correct answers. Where they obtained an average of 19 hits. Regarding the relationship of the Auditory Discrimination variables and the Academic Performance of the subjects, they show the non-association between them, with a  $p$ -value = 0.580 and a coefficient of 0.105, from the analyzed data it can be affirmed that they do not have significance in those involved. A similar study attempted to find similarities between auditory discrimination and academic performance in English, finding no relationship between them (Navascués-Irigoyen, 2015).

Regarding academic performance, its general average was 83.4, classifying it within the assessment of very good (Macizo, Bajo, & Soriano, 2006), stated that the study of academic performance is a difficult variable to study, since it is a multifactorial process, especially since working memory and cognition play an important role.

However, no association was found between Visuospatial Ability (FCR Copia) and academic performance in 4th, 5th grade students. and 6th. primary level grades since the margin of error between these variables is high and exceeds 5%. Finally, a statistically significant, positive, direct and low linear association was found between FCR Copia and FCR Memoria in 4th, 5th grade students. and 6th. primary level grades. What explains the results obtained, in the visuospatial ability test its highest score was in copying rather than in memory, which allows us to affirm that if they have visual support, they can do a better job and could influence their having a academic performance that allows them to pass the subjects and the grade they are studying.

Regarding the development of the intervention proposal, it is focused on enhancing the three variables, since between them there is no evidence of any relationship that expresses a negative or positive impact on one or the other.

In general, and after discussing the main findings of this research, they are presented as conclusions:

Between visuospatial skills and auditory discrimination, there is no correlation, both in the FCR Copia with a high margin of error and  $p = 0.915$  and  $r = 0.020$ .

- Regarding the PAF Hits and Visuospatial Ability (HRR Memory), in this case,  $p = 0.695$  and  $r = -0.075$ , which shows the non-significant relationship between the variables.

- Between hearing discrimination and academic performance of 4th, 5th grade students. and 6th. Primary level grades have no significance among the people involved, showing a  $p$ -value = 0.580 and a coefficient  $r$  of 0.105.

- There is no linear association between visuospatial skills and academic performance in students who are in 4th, 5th and 6th grades, with a  $p$  value greater than 5% (0.350 margin of error between these variables) and  $r = 0.177$ .

- It was found that there is a statistically significant, positive, direct and low linear association between Visuospatial Skills (FCR Memoria) and (FCR Copy) in 4th, 5th grade students. and 6th. primary level grades, with values ( $p = 0.036$  and  $r = 0.384$ ).

- And finally that between Visuospatial Ability (FCR Copia) and Academic Performance there is no linear and significant relationship whatsoever, giving values of  $p = 0.934$ , a margin of error of almost 100% and the value of the coefficient ( $r$ ) = 0.016.

In conclusion, it is determined that between visuospatial skills and auditory discrimination and academic performance, there is no evidence of any correlation. Except for a moderate relationship between the variables of Visuospatial Ability studied in the King's Complex Figure Test (King's Test) of ("REY TEST", 2017), in its



components (FCR Memoria) and (FCR Copia). Which shows that if the subjects did have visual support they could do a better job.

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We hope in the future to be able to make the improvement plan that we leave as an intervention proposal a reality.

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