Detective Criteria Of Visual Perception As A Psychometric Tool For Early Detection Of Disorders For Children Aged 5-6 Years Old (A.K.O.A 5-6)

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Abstract: **The purpose of this study is the construction, validity, reliability, and weighting of a psychometric tool aiming at the early detection of visual perception disorders of children aged 5-6 years, to identify children at risk. Eight subscales were developed, which are: 1) Visual-Motor Coordination 2) Copying Shapes 3) Visual Memory 4) Visual Enclosure 5) Distinguishing Shapes-Letters 6) Distinguishing Similarities 7) Perception of Position in Space 8) Distinguishing Colors. The performance at each sub scale is individual, and the average achievement time is about 20 minutes. During the grading, an overall performance score is extracted, while each sub-scale is scored separately, so that general cognition ability measurements are obtained, and sub-scale is scored separately. In this way general cognitive ability measurements are obtained, also by sub-scales. The weighting sample of the psychometric tool consisted of 900 students from the region of Attica and Thessaly. Moreover, two pre-research phases were preceded. According to the statistical processing, the scale not only presents high reliability but also validity of conceptual construction and content.**

Keywords—Visual perception, Early Detection, Preschool Age.

Introduction

Much research has been conducted on the Developmental period of preschool age which interest the scientifical fields of pedagogy, psychology, and Special Education, given its importance for the smooth integration of the child in the school environment (American psychiatric Association, 2000). In the field of Preschool Education, teachers and special educators face individual and intra-individual differences of children, related to cognitive developmental disfunctions which undoubtedly affect their learning performance.

Many scientific studies highlight the need for early detection and particularly learning difficulties related to cognitive functions, showing a series of problems that are not only addressed lead to learning difficulties but also to emotional and behavioral problems (Koutras, 2014)

Nowadays, it is crystal clear that students' learning difficulties and differences in perceptions are no longer part of their awkward behavior but result from various factors. This fact brings to the surface the need of support in the school context (Jung, H., Woo, Y.J., Kang JW., Choi, Y.W & Kim, K.Mi., 2014).

Consequently, the timely and valid detection of learning difficulties as well as visual perception disorders, which are directly related to the possible indication of Special Learning Disabilities, becomes important. (World Health Organization, 2001)

Purpose of the research

The purpose of this study is the construction and weighting of a psychometric tool which aims at the early detection of Visual Perception Disorders, which is a crucial process for the smooth integration of the child in the learning process.

In particular, the objectives of this tool, which we named the Detective Criterion of Visual Perception (AKOA 5-6) are the following:

1. The detection of psychomotor behaviors in children aged 5-6 years that would be considered as signs of visual perception disorders.

2. The correlation of visual perception disorders with possible learning difficulties.

3. The enrichment of visual perception of preschool children material and the educators' and Specialist's training on the relevant material.

CONTENTS OF THE SCALE

THEORETICAL APPROACH

The first step in constructing a test, is that the researcher determines its content (Vamvoukas, 2006). To structure the content of the test, we studied the Greek and international literature as well as researched psychometric tools that refer to the cognitive field of visual perception (Stalikas 2012).

The theoretical background of this study is based on a series of research papers on the context of visual perception disorders (Kurtz, 2006) and on modern theories of visual perception. Specifically, emphasis was placed not only on

the neurobiological model of Perception, but also on the models of distributed information processing, according to which the processing of information and the representation of knowledge takes place simultaneously at many different levels, so as knowledge is distributed in a very large number of processing units located in many areas of the brain. (Koliadis, 2002)

A basic principle of the model is that the structural features of an object or a word are interconnected in the same way that neurons in the human brain are connected. Learning is the result of changing and modifying the power of compositions between a large set of units and therefore no rules are produced as in other typical cognitive models of representation, probably because the quality of human behavior hardly obeys rules and laws (Soslo, 1995)

Then according to the abovementioned theory, we constructed the theoretical structure of our scale in the form of an elaborate framework which includes main concepts and terms related to visual perception. Considering the purpose of our scale, the structure of the content, the specific content of each field of knowledge, the age of our sample as well as the literature review of international tests, we constructed a framework of many tests of progressive difficulty, in the form of images, oral answer and execution of cognitive work. (Hammil, Pearson, Voress, 2014)

Our main goals were the originality of the questions to be understand by the children aged 5-6. Moreover, the proportion of questions for each goal was also considered to have representative measurements for each field of knowledge.

TOOL WEIGHTING PROCEDURE

The main weighting of the psychometric tool was preceded by two pre-research periods, during which a series of tests were selected after pilot implementations and thorough analysis. In the first pilot implementation, a sample of 85 subjects was utilized and the validity of the criterion was checked with the simultaneous administration of the Bender scale, which evaluates the visual-motor maturity of children (Bender, 1938)

The findings of the pilot implementation showed that the Bender scale has a higher relevance to the sub-scales of pattern copying and visual-motor coordination. Based on the results obtained from the first pilot test, we aimed to increase the degree of difficulty in the sub-scales that showed the lowest index but also to modify the grading method in certain subscales, in order to increase the overall reliability of the test. All 8 sub-tests of the test showed the Cronbach alpha index score at 81.02 (Alexopoulos, 1998)

Therefore, the items with the best psychometric properties formed the scale of the Detective Criterion of Visual Perception (A. K.O.A. 5-6) (Koutras, 2012). Furthermore, we repeated the administration to a part of the sample, to check the predictive validity of the tool. The re-allocation showed us that the weighted scale has a high reliability index as well as validity of conceptual construction and content.

DESCRIPTION OF AKOA 5-6 TEST

The Detective Criterion of Visual Perception (AKOA 5-6) established eight sub-scales, which constitute cognitive fields or sectors.

It was made with the goal of being a tool for special educators and other specialists who deal with children's visual disorders or/and learning difficulties.

The Detective Criterion of Visual Perception (AKOA 5-6) can detect the visual perception disorders, which are directly related to the possible indication of the occurrence of Special Learning Disabilities. It can also be used as a diagnostic tool in combination with other psychometric tools (Koutras, 2012).

The "AKOA 5-6" test can assess the following skills which are related to each other:

Visual-Motor Coordination: the ability to interpret visual information and respond with a motor action (Asonitou K, Koutsouki, D. Charitou S, 2010)

Visual Discernment: The ability to differentiate shapes and symbols within an specific environment (Richmond & Waugh, 2009)

Long-Term Visual Memory: The ability to retain and retrieve general and specific long-term visual information (Stuart, Masterson & Dixon, 2000)

Visual Form-Background Distinction: The ability to differentiate similar stimuli (the form) from unrelated stimuli (the background) (Peterson & Gibson, 1991)

Visual-spatial relations: The ability to perceive the relative positions of objects in space (Stavros, 1982)

The 8 sub-tests which cover the areas of visual perception are the following: 1) Visual-Motor Coordination (3 tests), Visual Memory (3 tests), Visual Discernment (10 tests), Copy of Shapes (10 tests), Perception of space (8 trials), Color Distinction (5 trials), Figure-letter distinction (5 trials), Visual Enclosure (5 trials) (Koutras, 2014)

The "AKOA 5-6" test is an Individually Administered Test in the sense that it can be administered to only one person at a time. The average achievement time is 20´.

The Scoring yields a value of general performance but there is also individual performance for each sub-scale, so that we have measurements for the general level of visual perception but also for each cognitive field. Score differences between subscales provide us with important information, which can be used not only in the early detection of difficulties, but also in the design of an individual intervention program. The percentage positions and the conversion of the initial values into Z-values offer us the possibility of comparing children's performances with each other.

The Visual Perception Detection Criterion (AKOA 5-6) has a playful form which is attractive to the children. Also, it can be easily used by professionals, and it is not expensive (Stalikas, Triliva, Roussi, 2012)

QUESTIONS ANALYSIS PROCESS

The statistical procedures included the descriptive analysis of the test by calculating:

1) The frequencies of the values, the averages, and the standard deviations of the performance of the research subjects in relation to the following demographic variables (region where the students' study, nationality, gender and handwriting choice).

2) The lowest and highest performance values, the average performance and the standard deviations of the sample, each sub-scale of the test but also the total sample of the test.

3) The Percentage values of the test variables with respect to the ages of the children.

4) Conversion of the initial values in the test subtests into constant values (G values) (Paraskevopoulos, 1993)

Also, an inductive statistical analysis was conducted by using the statistical criteria T - test and One-way Anova, to investigate whether the test performance is statistically affected by a) hand preference b) the district in which the schools are located 3) gender 4) citizenship.

Moreover, we applied the Tamhanes T2 technique by the methods of multiple comparisons at the level of statistical significance p= 0.05 to determine which specific groups differ systematically from each other. We also applied the Pearson correlation coefficient to investigate whether is there a statistically significant correlation between the 8 subtests of the early visual disturbance test. (Koulakoglou, 1998). We proceeded to the factor analysis and the multiple regression analysis of the test, and we investigated the validity and reliability of the Test for Early Detection of Visual Perception Disorders.

RESULTS

Results reveled that:

1) There were no statistically significant differences in the overall test performance as far as the gender is concerned.

2) There are statistically significant differences in the performance of students in the whole test with the natives being superior to the foreigners.

3) The area in which the students attend the schools seems to statistically affect their performance in the tests of perception, position in space, color discrimination, letter pattern discrimination and visual inclusion.

4) we conclude that almost all sub-scales of the test (A.K.O.A. 5-6) are statistically significantly correlated with each other, since we examined the application of the Pearson relevance index.

5) The results of the reliability and validity test show that the Detection Criterion of Visual Perception is a reliable and valid tool, given that the total factor of Cronbach a = 0.819

6) The validity of the content was checked twice, i.e during the construction of the test and by the method of factor analysis.

7) Predictive validity was checked by reviewing a random sample of children

CONCLUSION

The outcomes of the abovementioned analysis indicated that the detection of visual perception disorders in preschool children is crucial not only for their smooth integration and inclusion into the school environment, but also it can be a powerful instrument for the proper consolidation of cognitive objects.

Moreover, this paper has introduced the Visual Perception Detection Criterion (AKOA 5-6), which is a weighted test, exclusively for the child's perceptual abilities. The AKOA 5-6 test has the potential to detect possible signs of disorders at preschool aged children and function as a useful tool in order to the professionals proceed with the design and the implementation of an appropriate intervention program for each child with learning difficulties or disorders.

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