

# Investigating the Relation of Literacy Skills to Elementary Musical ones in Greek Children with Various Types of Learning Disabilities.

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## Introduction

In the past few years, increasing interest has been expressed in the etiology and neurobiological factors of language and literacy difficulties experienced by children and a great research effort has been devoted to establish explicit classification criteria and effective identification procedures for individuals with learning disabilities. Recent research (Douglas & Willatts, 1994; Overy et al., 2003, Tiffin-Richards et al., 2004) has provided growing evidence that specific problem areas for children with various types of learning disabilities (LD), especially dyslexia, could be screened through an examination of music-related timing and sequencing behavior.

The aim of the present work is to investigate the relation between standardized nationally-normed measures of IQ and literacy skills, and sub-skills underlying basic musical tasks in primary school children diagnosed as LD's. A clinical sample of 14 children who have received adequate primary education in literacy skills were investigated. Strong relationships between various literacy-related sub skills and musical timing skills are discussed as an attempt to provide new evidence about the value of music tests as a reliable non-literacy-based screening tool for learning disabilities.

## Participants

During that initial phase of our work, a sample of 14 children (9 boys, 5 girls) aged between 7-12 years, was recruited sequentially from the outpatient clinic of the Lab of Developmental Pediatrics, Hippocrates Hospital of Thessaloniki, Greece. They had all received a clinical diagnosis of learning disabilities or dyslexia either by a child psychiatrist or a developmental pediatrician. Two of the children had the comorbid diagnoses of attention-deficit/hyperactivity disorder (ADHD). Moreover, all parents were interviewed so as a detailed developmental and medical history was completed for each child. A summary of the number of children that participated to this study per combination of GRADE LEVEL and DIAGNOSIS, together with the corresponding mean age are illustrated in Fig. 1. It is important to note the difficulty of obtaining fewer cases of children at the lower grades of elementary school, due to the absence of a systematic screening procedures for literacy and learning-related deficits in the first elementary levels in the Greek educational system.

## Materials

All participated children were tested individually with the use of the following tests:

a) The adapted and standardized Greek edition of the Wechsler Intelligence Scale for Children-Third Edition (WISC-III). This is an excellent instrument for assessing students' intelligence, but it is also used to assess patterns in children's cognitive abilities and some subscales has been also associated with LD (Swartz, C. L., Gfeller, J. D., Hughes, H. M., & Searight, H. R. & Kaufman, 1979). In its Greek version, WISC-III is consisted of a Verbal Scale that includes 5 subscales (Information, Similarities, Arithmetic, Vocabulary, Comprehension, Digit Span) and a Performance Scale that includes 5 subscales (Picture Completion, Coding, Picture Arrangement, Block Design, Object Assembly).

b) The "AthenaTest" (Paraskevopoulos et al., 1999), a standardized Greek vocabulary and cognitive ability screening test that is administered individually. This psychoeducational scale is one of the most widely accepted, standardized batteries for diagnosis of LD in Greece, and is consisted of fourteen (14) sub-tests (verbal analogies, figure copying, vocabulary, memory for digits, memory for pictures, memory for shapes, sentence completion, word completion, grapheme discrimination, phoneme discrimination, phoneme blending, audio-visual synchronization, right-left orientation, lateralization).

c) Additional, brief reading, writing and orthography-spelling informal tests were administered to each child.

d) A revised short version of the Musical Aptitude Tests (Overy et al., 2003).

A short description of each test is given below:

**Song rhythm:** The child tapped the rhythm of Happy Birthday on the computer keyboard along with the song as it was played back.

**Rhythm copying:** A short rhythm was presented over loudspeakers, and the children copied it on the keyboard. This was repeated at increasing levels of difficulty (14 tests items).

**Rhythm discrimination:** Pairs of rhythms were presented over loudspeakers, and the children responded whether they were the same or different. This was repeated at increasing levels of difficulty (14 tests items).

**Melody discrimination:** Pairs of short melodies were presented, and the children reported whether they were same or different. This was repeated at increasing levels of difficulty (14 tests items).

All tests and interviews were administered by a psychologist, a doctor and a musician.

## Procedure

The study took place at the Lab of Developmental Pediatrics, Hippocrates Hospital of Thessaloniki, Greece. All tests were administered during two sessions on different days. Each session lasted between 60 and 90 minutes. In the beginning of the first session parents were informed by a psychologist and a doctor in detail about the whole study and the specific procedure. Then, children remained in the test room and parents were completed a detailed developmental and medical history of their child, as long as they waited outside the room. The first test given in every child by a psychologist, was the extended form of the greek version of WISC-III. During the last 10 minutes of this session the child was also assessed in reading, writing and orthography/spelling. In the second session, every child was assessed with the psychoeducational scale "AthenaTest", by a psychologist and/or a doctor. During the second session the music tests were also administered by a musician through a computer-based assessment. This was performed by the use of a custom-made software and its duration was about 20 minutes.

FIG. 1

GRADE	GRADE	age	DIAGNOSIS				Group Total	
			LEARNING DISABILITIES		DYSLEXIA		Count	MEAN AGE
			Count	Mean	Count	Mean		
	GRADE 2	age			1	7,33	1	7,33
	GRADE 3	age	1	8,58	3	8,33	4	8,40
	GRADE 4	age			2	9,08	2	9,08
	GRADE 5	age	3	10,39	2	10,21	5	10,32
	GRADE 6	age	1	12,00	1	11,50	2	11,75
Group Total			5	10,35	9	9,16	14	9,58

and DIAGNOSIS, together with the corresponding mean age are illustrated in fig. 1. It is important to note the difficulty of obtaining fewer cases of children at the lower grades of elementary school, due to the absence of a systematic screening procedures for literacy and learning-related deficits in the first elementary levels in the Greek educational system.

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## Analysis and discussion

6 An initial summary of mean scores and corresponding standard deviations for every sub-scale of both WISC III and "AthenaTest" is illustrated in the following graphs (fig. 2 and fig. 3 respectively), having GRADE LEVEL as a grouping variable. Results presented in this poster are mainly concentrated on a preliminary stage of analysis, where correlational analysis was performed in order to obtain potentially

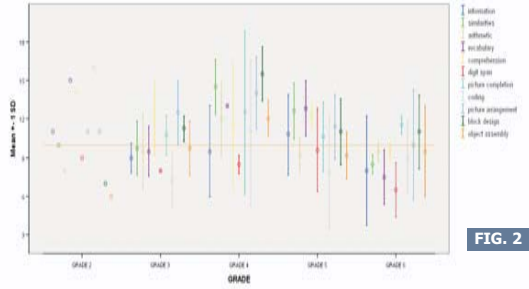


FIG. 2

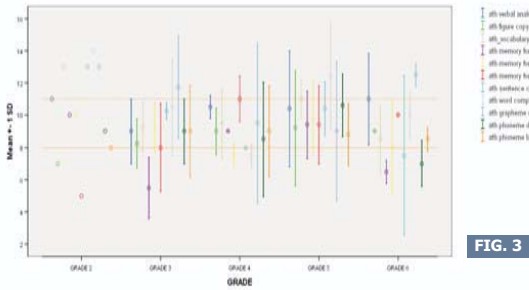


FIG. 3

7 strong linear relationships between sub test scores of WISC III and "AthenaTest", and the examined music sub skills. Interestingly, rhythm copying acuity showed relatively strong negative correlations with the WISC III similarities scores ( $r=-0.579$ ,  $p<0.03$  - Fig. 4), the WISC III vocabulary scores ( $r=-0.578$ ,  $p<0.03$  - Fig. 5), the WISC III comprehension ( $r=-0.661$ ,  $p<0.01$  - Fig. 6), and the

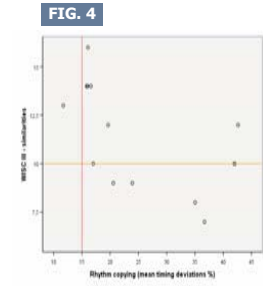


FIG. 4

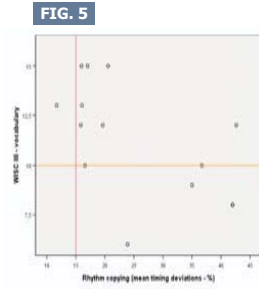


FIG. 5

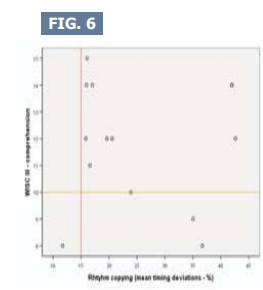


FIG. 6

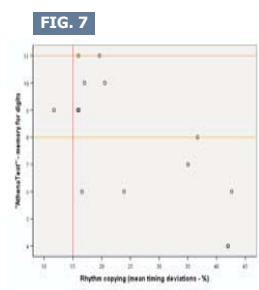


FIG. 7

8 "AthenaTest" memory for digits scores ( $r=-0.731$ ,  $p<0.003$  - Fig. 7). These results, which support previous findings (Overy et al., 2003; Tiffin-Richards et al., 2004) provide further evidence that assessment of certain aspects of children's musical rhythm perception and performance may be proven

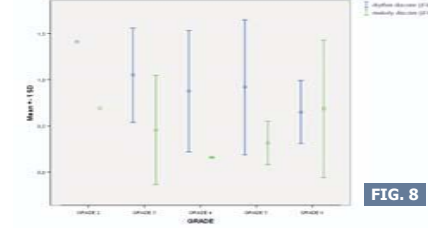


FIG. 8

of high screening value for learning disabilities. Moreover, discrimination data does not seem to improve with age (fig. 8), and generally are considerably low in comparison of recently selected control data from populations of Greek primary school children (Papadelis et al., 2006).

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