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# Visual motor skills and reading fluency: a correlational study

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## ABSTRACT

According to Van Hoorn, reading and writing skills involve adequate performance in visual-motor coordination, motor planning, cognitive and perceptual skills, and accurate processing of tactile and kinesthetic information. Scientific instruments aimed at assessing visual motor integration can be used for early identification of difficulties in reading and writing skills. The Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI), in particular, allows to assess the level of development of skills such as perception, mental representation, motor planning and graphic reproduction. With regard to fluency of reading, the measure that best describes reading skills required in the various life contexts is given, according to Cornoldi, by the evaluation of the speed and accuracy of reading. The "Prove di Lettura MT2" (MT-2 Reading Test) are the most popular instrument, for the Italian language, which assesses reading literacy in terms of fluency (speed and accuracy). This paper proposes a correlational study between the results obtained by administering MT2 and VMI tests to a group of students from a lower secondary school, in order to experimentally attest the opportunity to use the VMI as a tool for early detection of visuo-spatial related difficulties in learning to read. **Key words:** READING FLUENCY, VISUAL-MOTOR COORDINATION, MOTOR PLANNING, COGNITIVE AND PERCEPTUAL SKILLS.



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## INTRODUCTION

According to Van Hoorn (Van Hoorn, Maathuis, Peters, & Hadders-Algra, 2010), reading and writing skills involve adequate performance in visual-motor coordination, motor planning, cognitive and perceptual skills, and accurate processing of tactile and kinesthetic information.

"The ability to read not simply involves the transition from the written sign to the sound, but it also needs the ability to give meaning to those signs, translate them into understandable sounds, in a reasonable time for the effective communication of the message. Learning written language presupposes a number of prerequisites, that most children acquire spontaneously in a period that coincides with the beginning of schooling and, for this reason, are often mistakenly taken for granted. Among these we indicate the acquisition of body image, lateralization, orientation and organization of space and time. Reading, in fact, as well as writing, following a precise direction, and requires an adequate development of spatiotemporal skills and lateralization; the spatial organization is then implicated in the process of differentiation of forms according to their order to be vertically or horizontally symmetric " (Trisciuzzi & Zappaterra, 2011).

The manipulation of space and of spatial reference systems appears to be recognized as a crucial skill in learning to read and to write.

According Berthoz, space can serve as the "common code" (Berthoz, 2011) through which the geometry of the motion is structured. In this meaning, writing can be considered as "gesture in the space that spatializes an idea or a material fact"(Berthoz, 2011).

Scientific instruments aimed at assessing visual motor integration can be used for early identification of difficulties in reading and writing skills (Ludovico, Di Tore, Mangione, Di Tore, & Corona, 2015; Raiola, 2012).

## MATERIAL AND METHODS

### *The Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI)*

The Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI)(Beery, 2004) , in particular, allows to assess the level of development of skills such as perception, mental representation, motor planning and graphic reproduction. Basically, it has in motor control and learning and self perception (Raiola, 2014, 2015) some aspects of scientific paradigm.

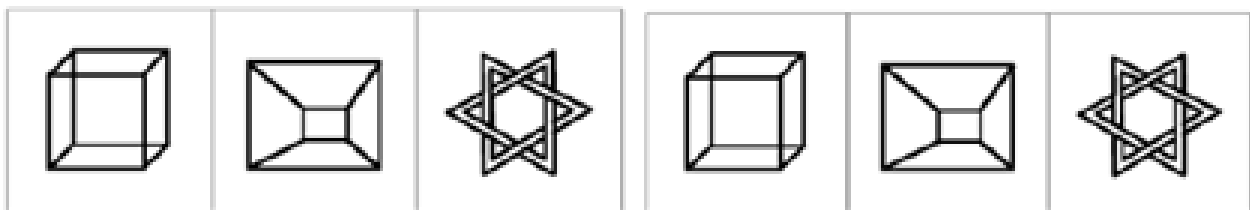


Figure 1. The Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI)

The VMI, widely used in psychodiagnostics, includes a series of geometrical drawings of increasing complexity. The task is to copy each item respecting the representation of the proposed model.

With regard to fluency of reading, the measure that best describes reading skills required in the various life contexts is given, according to Cornoldi, by the evaluation of the speed and accuracy of reading. The “Prove di Lettura MT2” (MT-2 Reading Test) (Cornoldi, Colpo, & Gruppo, 2011) are the most popular instrument, for the Italian language, which assesses reading literacy in terms of fluency (speed and accuracy).

This paper proposes a correlational study between the results obtained by administering MT2 and VMI tests to a group of students from a lower secondary school, in order to experimentally attest the opportunity to use the VMI as a tool for early detection of visuo-spatial related difficulties in learning to read.

## RESULTS

The study was conducted on a first class of secondary school, composed of 24 students (12 males and 12 females, aged between 10-12 years).

Pupils were administered the VMI and were administered the Prove di lettura MT-2, most popular instrument for evaluating the reading competence in Italian. The graph shows the scores obtained in the VMI test by examined subjects. Analysis showed that, in relation to the test of visual-motor integration, 3 of 24 subjects (the subjects are shown in light gray in the graph), achieved a score below the 5th percentile, or less than 75 standardized points.

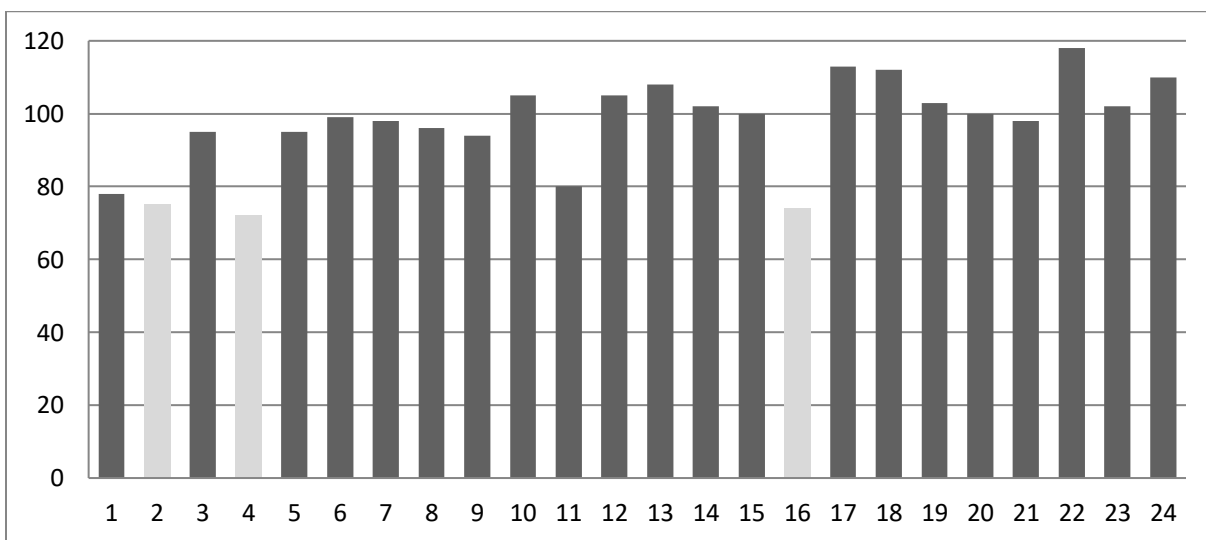


Figure 2. VMI Scores

In relation to the reading tests, 4 out of 24 subjects achieved a score significantly lower than the average, especially as regards the reading speed.

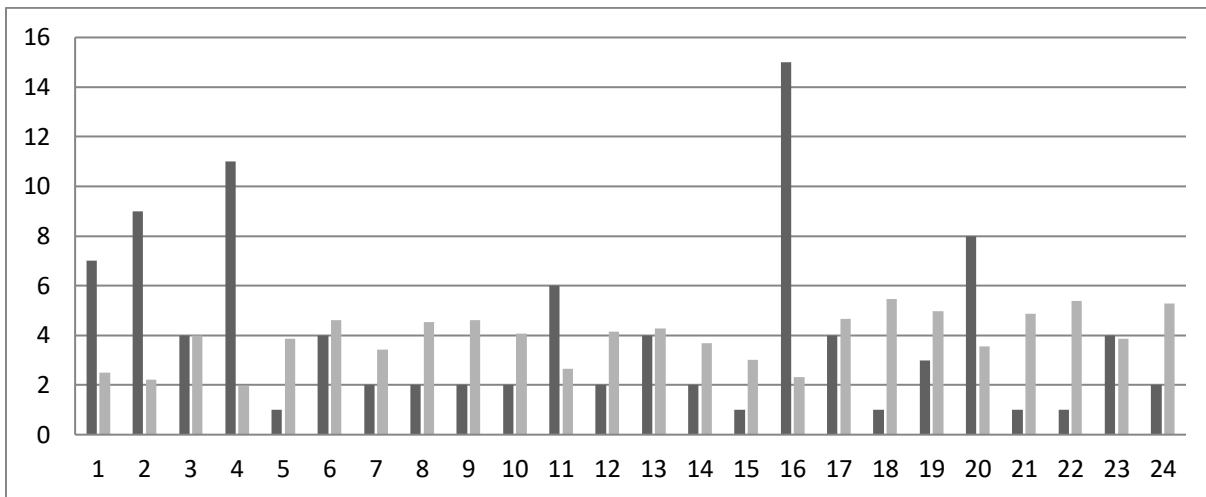


Figure 3. MT REading Test results ( Accuracy – Syllables /second) ■ Accuracy ■ Syllables / Second

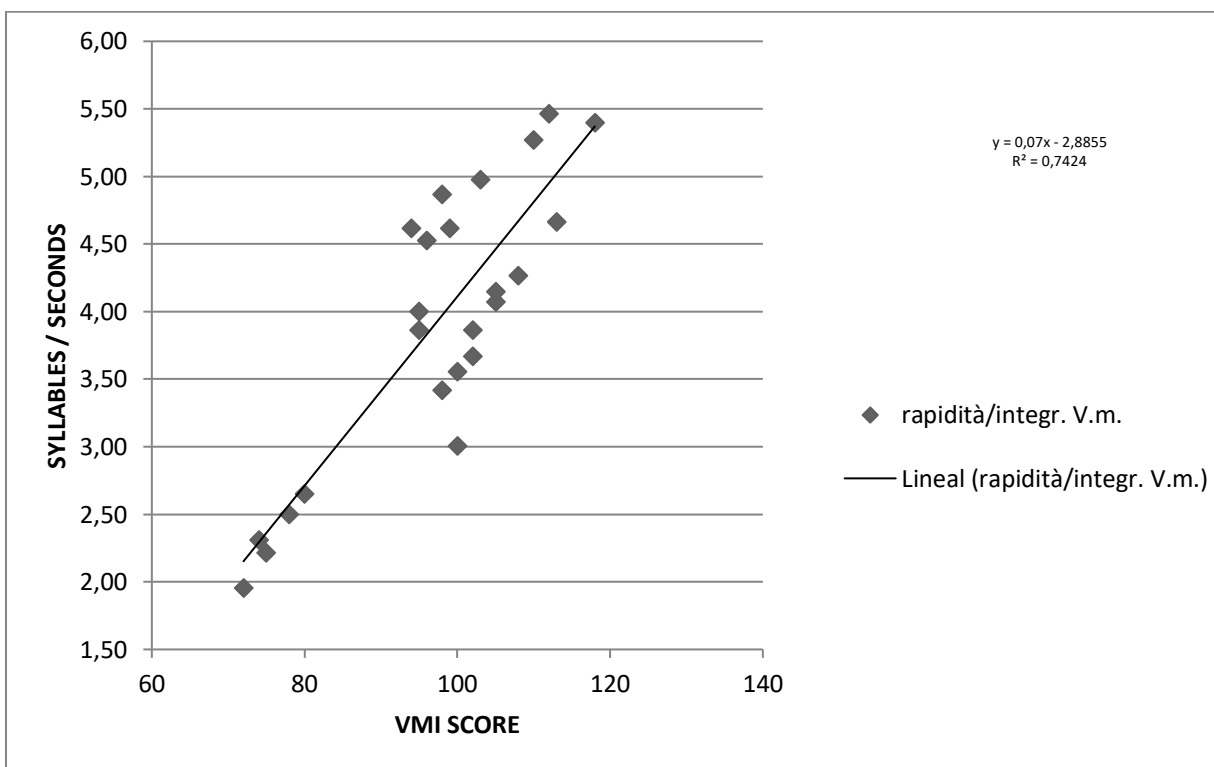


Figure 4. Reading Speed/Visual Motor Integration.

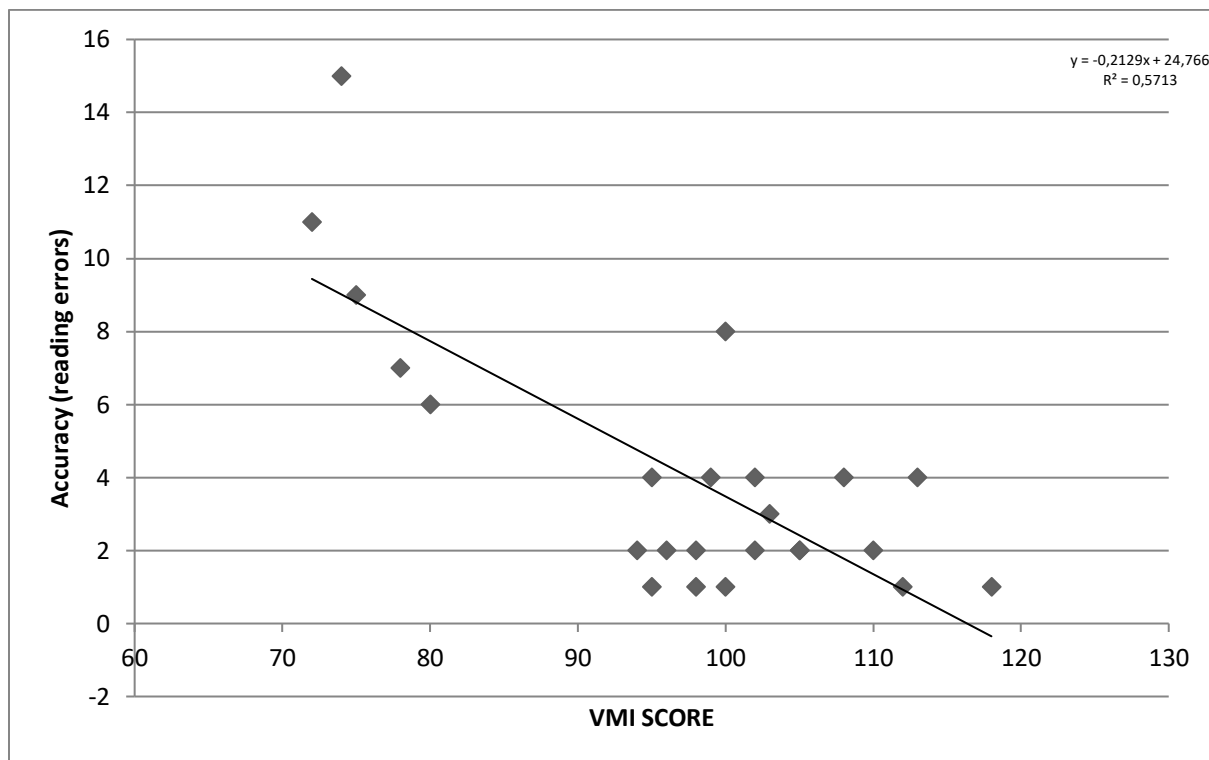


Figure 5. Accuracy/Visual Motor Integration

## DISCUSSION & CONCLUSIONS

The Pearson correlation coefficient was calculated in order to reveal any relationship between the performances of reading and visual-motor integration skills. The correlation coefficient between the parameters "speed reading" and "standard score VMI" ( $r = 0.86$ ) indicates a strong direct relationship between the speed of reading and the ability of visual-motor integration, while in relation to the parameters "accuracy" and "standard score VMI" ( $r = -0.75$ ), the Pearson coefficient showed the presence of a strong inverse relationship between the two parameters taken into account (the higher the VMI scores, the fewer errors during reading). The analysis shows that there is a strong relationship between the two parameters that determine the degree for development of reading skills (speed and accuracy) and the ability for visuomotor integration measured by the VMI test.

The results, given the small sample size, are certainly not be generalized, however, with the sole aim of this pilot study, results were considered encouraging by the project team, which decided to extend the screening to the entire student population of the institute. In this way, it could be testing also the second language (Rio et al, 2015) in the same time and assess the relationship to physical skills by V.M.I.

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