

## FLU-EM – ASSESSMENT OF HANDWRITING FLUENCY: DEVELOPMENT THROUGH CRITERIA AND AGREEMENT AMONG JUDGES

**Monique Herrera Cardoso, Priscila Biaggi Alves de Alencar,  
& Simone Aparecida Capellini**

*Investigation Learning Disabilities Laboratory (LIDA), Department of Speech and Hearing Sciences,  
São Paulo State University "Júlio Mesquita Filho" (UNESP) (Brazil)*

### Abstract

**Introduction:** Difficulties in legibility and writing speed are associated with impairments in cognitive integration, motor planning, eye-hand impairment, visual perception, visual-motor integration, kinesthetic perception, sustained attention, and manipulation with the hands, thus causing changes in the writing fluency development manual. **Aims:** This study aimed to develop the items of an Assessment Protocol for the Handwriting Fluency (FLU-EM) for Brazilian students aged 9 to 16 years old and present the preliminary findings of its validity and reliability. **Method:** (a) elaboration of items and criteria; (b) validation by judgment of specialists; and (c) definition of the final shape of the instrument and its scoring. The assessment protocol was applied to 32 students, 16 females and 16 males, four from each age group from 9 to 16 years old. **Results:** The protocol elaborated was easy to apply, due to the students' acceptability and understanding of the proposed tasks, with no need for semantic adjustments. **Conclusion:** The Assessment Protocol for the Handwriting Fluency (FLU-EM) can be applied in the Brazilian population; however new studies are being developed with the objective of providing greater reliability and validity of the instrument.

**Keywords:** *Handwriting, assessment, measurement, learning, education.*

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## 1. Introduction

The ability to write is not innate at birth, in other words, was developed only through education (Erdogan & Erdogan, 2012), being the period of literacy, therefore, a moment that involves cognitive, language and motor skills that require of the students, the capacity to words decoding and motor action suitable for the execution of the motor act of writing, this is, the use of sensory-motors and perceptive components (Capellini & Souza, 2008). International studies report that the disorder of written expression results in writing skills below that expected for age, related to legibility (quality of letter formation, alignment and spacing of letters and words and sizing of letters) and low speed (rate production) (Feder & Majnemer, 2007; Kushki, Schwellnus, Ilyas, & Chau, 2011), showing an important relationship between legibility and the writing speed, this is between the quality and quantity of handwriting.

Handwriting speed is fundamental for example in a moment of realization of exam/tests because the student needs to be able to transfer your ideas to paper while trying to keep up with his thoughts in a determined time (Prunty, Barnett, Wilmut, & Plumb, 2013). However, if the student has to write quickly this could affect the quality/legibility of the text or if he writes more slowly, trying to produce his best letter this could affect negatively the productivity/quantity of writing (Burger & McCluskey, 2011).

Though there in international literature several studies investigating the handwriting of different optics, such as handwriting speed, socioeconomics levels and laterality (Summers & Catarro, 2003), the fatigue effect about the handwriting production (O'Mahony, Dempsey, & Killeen, 2008), the handwriting difficulties associated with autism spectrum disorders (Fuentes, Mostofsky, & Bastian, 2009), with attention deficit hyperactivity disorder (Frings et al., 2010), in Brazil these studies are scarce, making it difficult to establish the profile of calligraphic of the students and, consequently, the investigation of problems related to handwriting.

## 2. Objectives

This study aimed to develop the items of an Assessment Protocol for the Handwriting Fluency (FLU-EM) for Brazilian students aged 9 to 16 years old and present the preliminary findings of its validity and reliability.

### 3. Methods

This study was approved by the Research Ethics Committee of the Faculty of Philosophy and Sciences of São Paulo State University, Júlio de Mesquita Filho, FFC/UNESP, Marília-SP, under number 0444/2012.

The FLU-EM was prepared through three procedures according to Pasquali (2003):

#### 3.1. Item and criteria construction procedure

In constructing the instrument, a review of the literature on the area of handwriting and handwriting fluency was used offered the elements for the formulation of 3 items of the protocol: task 01 - writing the alphabet, task 02 - best copy and task 03 - text production.

#### 3.2. Scale validation study through consultation with experts sample

Ten independent judges participated in the study being three speech therapists, two occupation therapy, two teachers at elementary school and three psychologists.

#### 3.3. Pilot study

The FLU-EM was applied to 32 students, 16 females and 16 males, when four in each age group, from 9 to 16 years old. Even as a selection criterion a cognitive assessment test was applied (Raven Progressive Matrices), to the exclusion of cases of mental retardation. Was also carried out a survey with pedagogical coordinators on students who had school complaint, psychoaffective problems or even speech therapy diagnostics (e.g., autism, ADHD, dyslexia, etc.), and in these cases excluded from the sample data from this study.

The selection of these students was realized by call list, being invited to attend the first two boys and first two girls from of the list. They should follow the inclusion criteria, as described above and having ages according to seriation school (Table 1). If the student did not fit these selection criteria, the next name on the list was invited to participate.

Table 1. Age corresponding to seriation school.

Seriation school	Age
4 <sup>th</sup> grade of elementary school	9 years to 9 years and 11 months
5 <sup>th</sup> grade of elementary school	10 years old to 10 years old and 11 months
6 <sup>th</sup> grade of elementary school	11 years old to 11 years old and 11 months
7 <sup>th</sup> grade of elementary school	12 years old to 12 years old and 11 months
8 <sup>th</sup> grade of elementary school	13 years old to 13 years old and 11 months
9 <sup>th</sup> grade of elementary school	14 years old to 14 years old and 11 months
1 <sup>st</sup> year high school	15 years old to 15 years old and 11 months
2 <sup>nd</sup> year high school	16 years old to 16 years old and 11 months

All the students were applied three tasks proposed in FLU-EM, as described below:

Task 01 – Alphabet writing: The student was oriented to write the alphabet, in order, with cursive letters lowercase, continuously for one minute. On reaching the letter “z” and there was still time, the school should start the alphabet until the end of time.

Task 02 – Best Copy: The student should write, without interruption, a determined sentence, classified as pangram (sentence containing all the letters of the alphabet - One day Max played soccer with his neighbor Pedro) with your best handwriting, for two minutes, that is, copy the phrase as often as he managed, within two minutes.

Task 03 – Text Production: The student was requested the elaboration of a wording on the theme “My Life” for 10 minutes, however, every two minutes the student should make a mark in the text, which allows us to monitor the frequency production of the children in different periods of time.

The data collection with the students was realized in groups of four students in a single session, not exceeding the time 50 minutes duration.

### 4. Results and discussion

There was a return of 70% of the questionnaires sent. Two treatments were carried out on this material. The first consisted of surveying the reliability indices between judges using the Kappa measure

(a measure of interobserver agreement, which quantifies the degree of agreement between judges on categorical scales) and the second, in the analysis of the items for which found an agreement rate between judges above 70%.

In the pilot study the students were asked about the possible difficulties to understand and perform the proposed tasks, and all reported complete understanding. Therefore, this step revealed easy applicability of the instrument, due to the acceptability and understanding of the students in the proposed tasks, there is no need for adjustments final semantic in the adapted version of the procedure.

According to the literature the group of judges should be formed by experts in the field of knowledge about the theme (Pasquali, 2003), so the judges were speech therapists, psychologists occupational therapists and educators, that is, professionals who work with handwriting and analysis of handwritten of students, which facilitated discussions for the best composition of the FLU-EM.

The application of the instrument in the target population (pilot study) followed exactly the number of students requested in specialized literature (Beaton & Guillemin, 2000) that is between 30 to 40 students. This step was important, not only for permitting the verification of understanding of the items, but also allow for discussion of the viability of application of the instrument in the Brazilian population, since they were selected educational levels and age groups corresponding the original procedure and found value in a satisfactory internal consistency.

## 5. Conclusion

The Assessment Protocol for the Handwriting Fluency (FLU-EM) can be applied in the Brazilian population; however new studies are being developed with the objective of providing greater reliability and validity of the instrument.

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