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Title: The Arabic Handwriting Evaluation Scale (AHES) development, reliability and validity.

By: Sohair Herzallah, supervised by Prof. Sara Rosenblum.

Abstract

Writing is a complex human skill, which is used in all life stages. Difficulties in handwriting performance have an enormous effect on self-image and participation level. The occupational therapy profession has a vital role in identifying and treating writing difficulties. However, little attention was devoted regarding to the development of typical writing skills in literature and research, globally and in the state of Israel in particular. Hence, a database describing the process of writing skills acquisition in relation with the measurements of product and writing process is needed as a basis for comparison, intervention and research. This is also necessary for the Arabic language. This study examined the writing process and product of writing in Arabic language of typical children 8-10 years old. This study also focused on examining the differences between males and females. The results of this study regarding the handwriting performance of typical Arab children will constitute the basis for understanding the process of writing in children with handwriting difficulties in the Arabic language.

To our knowledge, no previous studies have investigated Arabic writing evaluation tools. Evaluation tools or reliable and valid standard assessments for examining the handwriting product in the Arabic writings do not exist. Thus, the purposes of the present study were to establish the reliability and validity (distinguishing and corresponding) of a tool built for this purpose, the Arabic Handwriting Evaluation Scale (AHES).

Study hypotheses:

1. The internal reliability of the questionnaire items will be higher than α (α=0.7)
2. Differences will be found between males and females in the written product's measurements and in the performance duration estimated by the AHES

3. Significant correlation will be found between the AHES's written product readability and the spatial measurements of ComPET and the final score of the REY test in each of the male and female groups.
4. Significant correlation will be found between the number of letters per minute and overall performance time estimated by the AHES and the ComPET's time measurements and the REY (copying) test's performance duration.

Participants: The study included 60 native Arabic language speakers children living in a village located in the northern part of Israel. All children attending regular education school, their aged ranged from 8-10 years, learn at 3rd and 4th grades and were selected by convenient sample. Children were sampled from a school in a northern Arab-populated village having only Muslim-Arabs residents. All research participants had a valid IQ level, lacking any neurological diseases, muscular diseases, and sight and\or hearing disorders. 30 participants were boys and 30 were girls. A correlation was performed between boys and girls regarding age and class variables.

Instruments: The Handwriting Proficiency Screening Questionnaire (HPSQ) was used in order to determine who is appropriate to participate in the study. (HPSQ) was given to the teacher in order to evaluate the children's writing skills (whoever received a score indicating that he\she has no writing difficulties, was recruited to participate in the research); also, a demographic questionnaire was given to the parents as well. In order to evaluate the study participants, the following tools were used: The REY complex figure test evaluating spatial organization ability; completion of different writing tasks while using AHES to evaluate the writing product. Tasks were done on a computerized board connected to the Computerized Penmanship Evaluation Tool (ComPET) which allows receiving of time, space and pressure measurements of the writing process.

Data analysis: The study hypotheses regarding differences between the boys and girls groups were analyzed by using t-tests and MANOVA test. The hypotheses regarding correlation between

the AHES evaluation tool variables and the writing process (ComPET) and performance on the REY complex figure test were analyzed with the Pearson Correlation analysis.

Main findings: A reasonable reliability of $\alpha=0.69$ was found for the AHES tool's items. Also, significant correlations were found in part of the written product's readability measurements with the REY test's final score, a finding indicating the existence of a correlation between writing ability and spatial organization ability. A significant negative correlation was found between the number of letters in the first minute and ComPET's time measurements among the two groups.

Conclusions: The results of the present study have implications for evaluation and intervention in occupational therapy: the research findings indicate the need for evaluating the spatial organization ability in the writing evaluation processes. The results also emphasizes the importance of objective evaluation by using a computerized system, which provides accurate and valid spatial measurements of the writing process in order to establish an evaluation based on a subjective impression of the evaluator in relation with the individual's global readability. This study is comprehended as the first phase in the process of establishing an evaluation tool aimed to evaluate writing difficulties in the Arabic language and establishing appropriate intervention programs.