ABSTRACT

The aim of this study is to contribute to the standardization of the new diagnostic tools assessing the motor manifestations of laterality in adults and children aged 8 to 10 years, both in terms of determining the theoretical concept and the selection of appropriate items, and the verification of structural hypotheses concerning the design of acceptable models, including the diagnostic quality of individual parts of the test battery. Moreover in this study we try to suggest new approach in assessing of motor laterality manifestation by means of relationship between cerebellar dominance and hand performance.

The first part of this thesis deals with the concept of laterality, its manifestations and meaning in non-living systems and living organisms. As a human characteristic, laterality is manifested in a variety of functional and structural asymmetries. This part also discusses ways of diagnosing motor manifestations of laterality and the issue of cerebellar dominance, including its reflection in the form of asymmetry of the extinction physiological syndrome of upper limbs.

The second part focuses on the process of the standardization study, the statistical method of structural equation modelling, and the actual design of test battery construction.

The last part of this thesis presents the results of structural equation modelling, i.e., the dimensionality and diagnostic quality, including the reliability of various proposed models. The results are two test batteries.

The test battery for the adult population consists of three parts: a questionnaire, a preference motor task part, and a performance test part. The questionnaire part of the test battery has a unidimensional nature called “Preference of Locomotive Organs”. The strongest indicators were those of an instrumental nature. An interesting finding is that the frequently used indicator “which hand do you use to write” had to be removed in the modelling of the structure of this part, because it showed strong multicollinearity.

The preference motor task part has a two-factor structure with the factors “Upper Limb Preference” and “Lower Limb Preference”. The results of modelling in this part of the test battery show that in order to obtain a more precise picture of motor manifestations of laterality it is appropriate to include tasks exhibiting the nature of unskilled spontaneous activity, in addition to skilled instrumental motor tasks.

The performance tests have a two-factor structure with the factors “Upper Limb Performance” and “Lower Limb Perfromance”. This part of the test battery tested the

relationship between the cerebellar dominance and hand performance, which was found to be statistically significant, reaching the level of $p < 0.001$.

The test battery for the child population consists of two parts: a preference motor task part and a performance test part.

The preference motor task part has a two-factor structure with the factors “Upper Limb Preference” and “Lower Limb Preference”. It was found that the factor “Upper Limb Preference” is closely related to “reaching tasks”, where the subject can repeatedly work across the natural body axis. The perspective of the advantages and disadvantages of handling an object across the natural body axis could be the main indicator of preference.

The performance tests have a one-factor structure with the “Performance of Locomotive Organs” factor. The results of this part of the battery display a different lateralization of upper and lower limbs. The tests focusing on lower limbs showed that the more significant fine-motor nature emphasizing balance a certain activity exhibited, the less sensitive the tests were. This part also tested the relationship between cerebellar dominance and hand performance; as in the adult population, this relationship was statistically significant, reaching the level of $p < 0.001$.

The diagnostic quality in the form of generic reliability in both test batteries range from 0.78 to 0.95.

Keywords: asymmetry, laterality, handedness, cerebellar dominance, structural equation modelling, test development, dimensionality, reliability, kinesiology, motor control

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