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Interactions Between Global and Fine Praxis, Psychomotricity Classification and School Success

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ABSTRACT

School success is directly related to several factors, including physical activity. In addition, intelligence has also been associated with motricity. Even so, so far, few investigations have related global and fine Praxis with school learning. Thus, this study had as main objective to verify the existing interaction between the global and fine praxis, the classification of psychomotricity and school success. Ninety-six young students 7.11 (± 0.320) years old, participated in this research. The psychomotor classifications were inferred through the psychomotor testing battery and a theoretical model was designed to achieve the study objectives. The results allowed us to conclude that there is a significant relationship between fine and gross motor skills and academic performance.

Keywords: Children's, physical activity, learning.

1. INTRODUCTION

Scholar success is dependent of many factors. Lately, several authors have been relating scholar success with physical activity (Branquinho, Forte, et al., 2022; Branquinho, Ribeiro, et al., 2022; Ferraz et al., 2020; Manfra et al., 2017). Even more in children with special needs (Ardoy et al., 2014; Esteban-Cornejo et al., 2015; Lees & Hopkins, 2013; Norris et al., 2015; Rasberry et al., 2011; Reed et al., 2010). Piaget (1972) already stated that the intelligence was related with motor skills. Moreover, intelligence was appointed as result of the environmental fit and the new skills acquisition Vigotsky. To Le Boulch (2001), it is the movement that allow the children to interact and socialize. Fonseca (2001) stated that motricity supports the main learnings to scholar success. Moreover, the author presented a set of human psychomotor variables. The Psychomotricity Battery (PMB) adapted by Fonseca (2001) present variables such as tonicity and equilibration, Lateralization, Body Concept and Spatio-Temporal Structuring. The functional dimension encompasses the global and fine praxis. The global and fine praxis are related with motor control, execution, sequencing and cognitive actions.

Praxis Analyses require the understanding of how children organize their movements. The Fine praxis encompasses all the psycho-neurologist of global praxis. The global praxis is a more complex and differentiated level. Global praxis requires manual skill to manipulate and control objects with and/or without eye contact (Fonseca, 2001). Upon that, the ability to grab a pen or pencil and hand skills may play an important role in school learning (Flores et al., 2022; Flores & Magalhães, 2019).

Psychomotricity seems to play an important role in the children path in pre-school education (Coler et al., 2010). The physical activities may be planned to stimulate sensorial, perceptive and motor capacities. Moreover, teachers play an important role detecting children's psychomotricity needs and lead them to psychomotricity therapy (Cueto et al., 2017; Invernizzi et al., 2022). Psychomotricity therapy allow improving integration, preparation and achievement processes in children. Thus, psychic structures might be improved by the knowledge transfer, execution and movement control (Fonseca, 2001). That means to educate thought through movement (Flores & Magalhães, 2019).

So far, few relations have been made between global and fine praxis with school learning. Moreover, most associations are based on theorical links and associations. The confirmatory research, the analysis is driven by theoretical relationships between the different variables that are hypothesized and tested. Thus, the aim of this study was to confirm whether the hypothesized interaction takes place between the global and fine praxis, psychomotricity classification and school success classification. The confirmatory model of such relationships based on existing exploratory research reported in the main literature could be useful, not only to define learning strategies but to promote feasible and effective ways to improve children's learning.

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2. METHODS

2.1. PARITICPANTS

Ninety-six young students participated in this research. The students were 7.11 (± 0.320) years old. Fifty-six were males with 7.13 (± 0.33) and forty were females with 7.10 (±0.30) years old. Teachers and parents gave their consent for children student's participation in this study and all procedures were in accordance with the Helsinki Declaration concerning human research. The Institutional Review Board of the Higher Institute of Educational Sciences of the Douro approved the study design.

2.2. PSYCHOMOTRICITY CLASSIFICATIONS

To assess the children's psychomotor classifications a psychomotor testing battery (PTB) was used (Da Fonseca, 2012). This is a valid instrument to assess able and disable children. This instrument allows assessing the psychomotor profile for youths between 4 and 12 years old.

The PTB tasks are related to factors such as tonicity, equilibration, lateral preference, body notions, space and time orientation, global praxis and fine praxis. The PTB scores resulted by the sum of each factor classification. The possible maximal score is twenty-eight, whereas the minimal score is seven. Then, psychomotricity classification was made based on Fonseca (2012): (i) 28 < high < 27; 26 < good < 22; 21 < normal < 14; 13 < dyspraxia < 9; 8 < deficit < 7.

2.2. THEORY MODEL

The theory model was designed based on the state-of-the-art research and to test it was the object of this study. Figure 1 presents the theoretical model adopted for student's performance based on psychomotricity score and variables. School classifications are associated with psychomotricity levels. So, as global and fine praxis increases so psychomotricity scores and school classification.

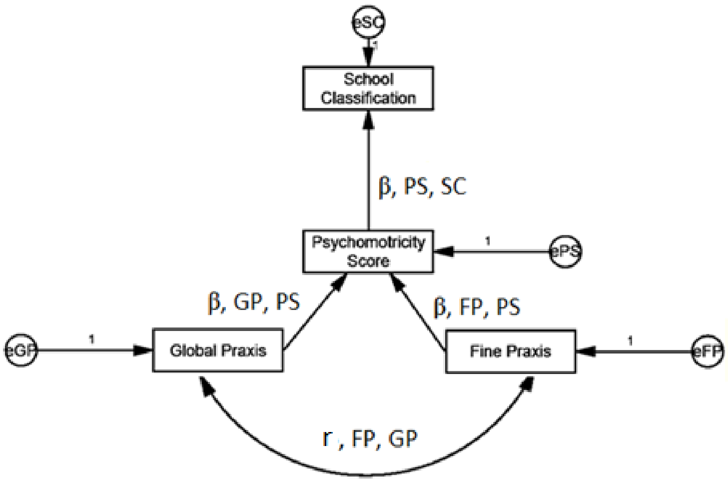

Figure 1. Theoretical path-flow model. β x_i,y_i—beta value for regression model between exogenous (x_i) and endogenous (y_i) variables; e_{xi}—disturbance term for a given endogenous variable; $r_{xi,yi}$—correlation coefficient between two variables; x_i®y_i—variable y_i depends from variable(s) x_i; x_i«y_i—variable y_i is associated to variable x_i.

2.3. STATISTICAL ANALYSIS

The Kolmogorov-Smirnov and the Levene analysed the samples normality and homoscedasticity assumptions, respectively. Descriptive statistics were computed for means and standard deviations. To assess the association between school classification and the remaining variables, Pearson correlation coefficients were computed between school classification and all selected variables (p ≤ .05). For the qualitative effect size assessments, the relationship was defined as: (i) very weak if R2 < .04; weak if 0.04; ≤ R2 < .16; moderate if 0.16 ≤ R2 < .49; high if 0.49 ≤ R2 < .81 and; very high of 0.81 ≤ R2 < 1.0. The level of statistical significance was set at p< .05. For the structural equation modelling the path-flow analysis procedure was used. The interpretation of this kind of approach is based on a previous investigation (Morais et al., 2012).

The quality of the model goodness-of-fit was measured by computing: (i) the ratio Chi-square/degrees of freedom (x2/df) and; (ii) the comparative fit index (CFI). The ratio Chi-square/degrees of freedom was considered as (Morais et al., 2012): x2/df > 5 bad adjustment; 5 ≥ x2/df > 2 low adjustment; 2 ≥ x2/df > 1 good adjustment; x2/df< 1 very good adjustment. The comparative fit index was considered qualitatively if (Morais et al., 2012): CFI < 0.90 bad adjustment; 0.90 ≤ CFI < 0.95 good adjustment; CFI ≥ 0.95 very good adjustment.

3. RESULTADOS

Table 1. Descriptive statistics of the variables selected with 95% confidence interval (95 CI) and the Pearson correlation between the dependent variable (School Classification) and remaining independent variables.
Note: CI= confidence interval; Max= Maximum; Min= Minimum.

Variables	N	Min	Max	Mean (± SD)	95% CI	Pearson Correlation Test	
						r	p
School Classification (Values)	96	1.75	3.625	2.78 (± 0.47)	(2.68; 2.87)	-	-
Psychomotricity Score (Level)	96	1	4	2.78 (± 0.08)	(2.63;2.94)	0.31	0.002
Global Praxis (Level)	96	1	4	2.78 (± 0.77)	(2.63; 2.94)	0.32	0.756
Fine Praxis (Level)	96	2	4	3.67 (± 0.54)	(3.56; 3.78)	0.07	0.498

Significant effects were founded between psychomotricity score and school classification (β = 0.22; p < 0.015), global praxis and psychomotricity (β = 0.37; p = 0.001), fine praxis and psychomotricity (β = 0.19; p = 0.021) and global praxis and fine praxis (β = 0.14; p < 0.002) (Figure 2). Thus, increasing 1 point in global praxis increase 0.14 points in fine praxis reciprocally; increasing 1 point in fine praxis, the psychomotricity score increases 0.19 points; increasing 1 point in global praxis, the psychomotricity score increases 0.37 points; and increasing 1 point in the psychomotricity score, the school classification increases 0.22 points. The computation of data presented goodness-of-fit to accepted values and concordance with theory (X^2 = 4.416; p = 0.004). The computation of data presented inadequate fit to accepted values and concordance with theory (X^2 = 1.109; p = 0.330)

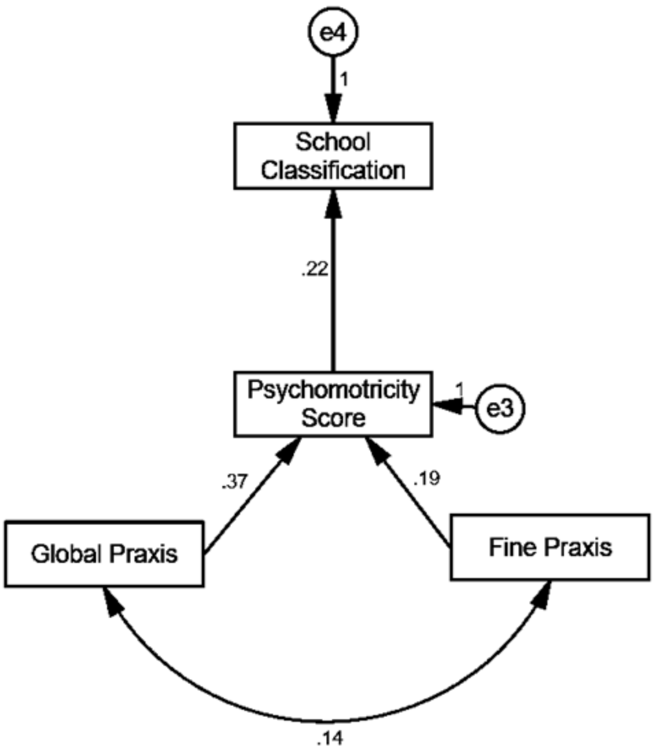

Figure 2. Confirmatory path-flow model including all variables computed based on theory model.

Significant effects were founded between psychomotricity score and school classification (β = 0.22; p = 0.014), global praxis and psychomotricity (β = 0.37; p = 0.014) and fine praxis and psychomotricity (β = 0.19; p = 0.019) (Figure 3). Thus, increasing 1 point in fine praxis, the psychomotricity score increase 0.19 points; increasing 1 point in global praxis, the psychomotricity score increases 0.37 points; and increasing 1 point in the psychomotricity score, the school classification increases 0.22 points. The computation of data presented goodness-of-fit to accepted values and concordance with theory ($X^2 = 4.416$; p = 0.004).

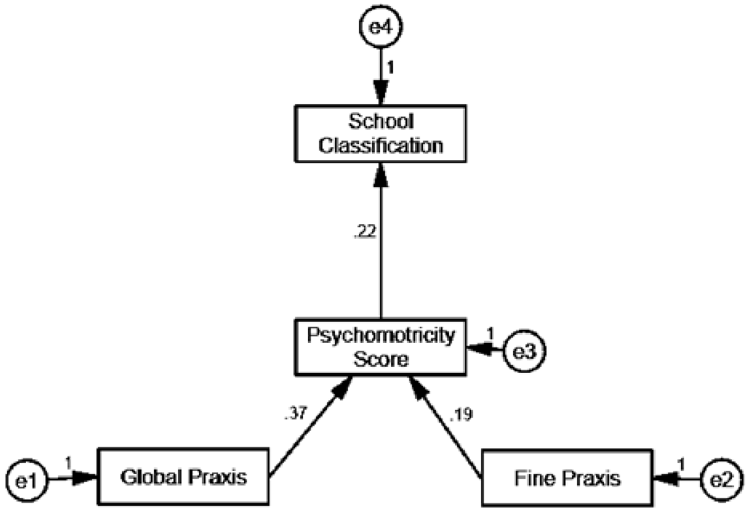

Figure 3. Confirmatory path-flow model between Global Praxis, Fine Praxis, and Psychomotricity Score with School Classification, deleting variable links that allowed reducing the residual error and improving the goodness-of-fit.

4. DISCUSSÃO

The purpose of this study was to investigate the relationship between global and fine praxis, psychomotricity classification, and school success. The findings revealed that both fine and gross motor skills contribute significantly to a high level of psychomotricity, which in turn helps to promote academic success. A significant relationship was discovered between fine and gross motor skills and academic performance. The findings emphasize the significance of incorporating motor interventions into early childhood education programs to close the achievement gap and, ideally, result in early learning success (Cheung et al., 2022). Thus, one of the major goals of modern developmental science is to map temporal trajectories from early age characteristics to mature phenotypes (Bornstein et al., 2013).

Previous research found that infants who were more motorically mature and explored more actively at 5 months of age performed better academically as 14-year-olds (Bornstein et al., 2013). Data from the Medical Research Council National Survey of Health and Development (the British 1946 birth cohort; N = 3,083) revealed that delayed gross motor development in childhood predicted the risk of reading impairment at age of 11 (Gaysina et al., 2010).

These findings support previous research indicating that children with Developmental Coordination Disorder perform poorly in gross and fine motor skills, as well as static and dynamic balance (Hoare, 1994; Wright & Sugden, 1996), attention (Dewey et al., 2002; Wilson & Russell, 2003), visual-spatial processing, and information processing in general, have been reported when compared to typically developing children (Wilson & McKenzie, 1998). It has implications for our understanding of the relationship between developmental dyspraxia and learning disabilities, as well as the debate over developmental delay vs. pathology. Early identification of motor-cognitive difficulties may be essential to early intervention, in both motor and academic areas. Task specific assessment leads to task specific methods and educational intervention practices, in order to improve learning, academic and performing difficulties (Asonitou et al., 2010).

Several researches discovered that motor-exploratory competence in infancy initiates a developmental cascade that affects subsequent levels of child intellectual functioning, which in turn helps to shape academic achievement in adolescence (Bornstein et al., 2013; Campos et al., 2000). The variety of controls suggests that this predictive pathway is present in children. The findings support a systems approach to development in which primary abilities serve as a foundation and formative building blocks for later functioning. Many developmental accounts hold that more fundamental earlier emerging skills contribute to the formation of more integrative later emerging capacities (Thelen & Smith, 1994). This developmental cascade is analogous to a hierarchy of functions at various levels of aggregation (Bornstein et al., 2006).

According to developmental science, motor-exploratory competence in infants has long been linked to improvements in perceptual and cognitive abilities (Cadoret et al., 2018). Piaget & Duckworth (1970), proposed that infants' developing motor actions and exploration of the world lay the groundwork for later learning, and that mental life builds in a hierarchical fashion on earlier developing abilities. Many developmentalists, on the other hand, believe that human performance varies qualitatively at different stages of life, that infancy is distinct from the rest of the life course, and that development after infancy is unstable and noncontinuous. Motor activity and movement help humans adapt to their environment, and they play an important role in emotional and social life from an early age. Most of the changes that enable children to explore their environment occur during the infancy stage (Borrego-Balsalobre et al., 2021). For example, for a child to learn to pick up a pencil and begin to trace and write, they must first have developed the ability to properly manipulate their hands and fingers, as well as the synchronization of their movements (Feder & Majnemer, 2007). Proper hand control allows for the successful development of reading and writing. The child needs to work with a variety of materials to achieve the appropriate level of accuracy and coordination required for general tasks, especially those that involve the simultaneous use of the eyes, hands and fingers. Similarly, it is necessary to carry out exercises that promote the development of hand-eye coordination that will lead the child to mastery of the hand and other elements involved in its movement (wrist, forearm and arm), taking advantage of the development and improvement of the motivational aspects through their achievement orientation (de Caso-Fuertes & Garcia-Sanchez, 2006). In the same line of thought several studies insist on the enhancing role of physical activity especially when Practicing gross and motor skills that support positive effects on cognitive development (Flores et al., 2023; Hattabi et al., 2022; Pesce et al., 2016; Tsay et al., 2018) and functions (such as perceptual skills, intelligence quotient, school performance and readiness, verbal and mathematical tests, developmental level) (Fedewa & Ahn, 2011; Petrigna et al., 2022; Singh et al., 2019), non-executive cognitive functions, core executive functions and higher executive functions (Petrigna et al., 2022).

In this holistic approach in early childhood Education, psychomotor development must go beyond the physical aspects, on an upward trajectory that culminates in integration, perfection, and automation. Core competencies are therefore the knowledge, skills, and attitudes that all individuals need for both personal growth and development and for integration into society (Borrego-Balsalobre et al., 2021).

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