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**ASPECTS OF PHYSICAL LITERACY IN  
PHYSICAL EDUCATION AND SPORT  
LESSONS**

**PhD thesis summary**

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**Key words:** physical literacy, pupils, physical education and sport, psychomotricity, physical domain, physical exercises

## **Importance and topicality of the topic**

Physical literacy depicts a multidimensional construct, which includes physical and psychic attributes that are considered fundamental for engagement in physical activities (Cairney et al., 2018). It provides the tools an individual needs to be physically active throughout life (Stoddart, 2018). Regarding the physical literacy journey, it is recommended that it starts at an early age, as appropriate motor development in the early years has a considerable input on the quality of life in later stages (Roetert et al., 2017; Farrey & Isard, 2015). Therefore, a physically literate child will choose to regularly engage in physical activities, manifesting healthy movement behaviors in daily life and thereby limiting sedentary behaviors (Longmuir & Tremblay, 2016).

The holistic nature and its potential to influence the lives of individuals has brought physical literacy into the international spotlight (Green et al., 2018). However, in Romania, as in most European countries, the concept of physical literacy has only recently begun to be approached (Carl et al., 2023). For this reason, there are no studies that address the concept in a broader way, which is why any attempt to study aspects of physical literacy is both topical and an opportunity to move in the direction proposed by countries that have adopted the concept and implemented it in different contexts.

Therefore, this paper focuses on studying the concept of physical literacy among both teachers and pupils. As far as physical education and sport teachers are concerned, the research aims to identify how they understand and perceive the construct in question, in order to capture an overview of the current level of knowledge as well as the importance given to the concept through the prism of perception. Regarding the pupils, the aim was to assess the level of physical literacy and implement an intervention program at the level of the physical domain.

The conduct of the research involves a review of the academic literature on the content of physical literacy, the main approaches to understanding the construct, the assessment methods used, and the methods and tools used to measure the concept. Thus, all the stages of the research bring elements of topicality, given the fact that it represents a first step in the broader approach to the concept of physical literacy in Romania while contributing to the identification and planning of future research directions.

## **Elements of novelty and originality**

This PhD thesis brings as a novel element the approach to physical literacy, a relatively new concept for specialists in the field of physical education and sport in Romania. The concerned concept was evaluated both among physical education and sport teachers, in order to identify the level of knowledge and how it is perceived by them, and among pupils, by identifying their level of physical literacy.

The originality of the paper is given by the use of an intervention program, in which some of the proposed exercises involved the use of a material called PENALTY BOX® which is mainly used in training athletes and in the field of fitness in the Occident. At the same time the tool battery used, *Canadian Assessment of Physical Literacy Second Edition*, was translated into Romanian language and used to evaluate all four domains of physical literacy: behavioral, physical, affective and cognitive. This allowed us to establish an individualized profile of the pupils from a physical literacy perspective, providing an overview of their development. Regarding the teachers, the aim was to establish how they understand and perceive this concept, the results obtained facilitating the identification of the need to find ways through which they are informed and to deepen the construct in question. The questionnaire used to assess the level of understanding and perception of physical literacy was also translated into Romanian language before being applied, this being another novelty of the paper.

Psychomotricity is another important concept approached in the thesis. The link between certain components and the intellectual level of the children included in the research was studied in order to highlight the relationship between body and mind, emphasising the benefits that can result from this association.

Another element of originality is represented by the selection of the age ranges of the participating pupils, namely 6-8 years and 10-12 years, at the base of choosing these intervals being the fact that they mark demanding and challenging stages during the pupils' school pathway. Both intervals involve a transition to a certain extent, highlighting the need to mobilize resources in order to adjust to school requirements but also to facilitate certain acquisitions.

The two concepts studied share a holistic approach to child development. Psychomotricity emphasises the interdependence between the motor, cognitive, affective and social domains, while physical literacy has as its central idea that lifelong involvement in physical activities is influenced by the development of all characteristics related to the component domains: behavioural, physical, cognitive and affective.

The studies carried out in this paper were based on a solid theoretical foundation, obtained by reviewing articles in the academic literature, which provided us with current information on the topics approached. The analysis of the scientific articles revealed that the concept of physical literacy is not well known in Romania, an aspect that influenced the decision to deepen the construct and place it in the center of this thesis.

This paper includes the importance and topicality of the topic and the elements of novelty and originality, followed by the three parts.

**Part I** of this paper is structured in four chapters as follows: theoretical approach to psychomotricity, theoretical approach to physical literacy, theoretical aspects regarding assessment and the different approaches to physical literacy in the academic literature, and instruments used to assess physical literacy extracted from the academic literature.

**Part II** presents the pilot study in which the aim was to identify and analyze possible links between the intellectual level and the type of laterality, spatial orientation and level of psychomotor development in pupils aged 6 to 8 years.

**Part III** includes two studies, one whose purpose was to analyze the relationship between the understanding and perception of the concept of physical literacy and the gender differences among physical education and sport teachers in Romania, and the second which aimed to develop physical literacy in pupils aged 10 to 12 years.

## **Summary of Chapter 1. Theoretical approach of psychomotricity**

Psychomotricity can be seen as the science through which the human being can be analysed from a holistic perspective, making significant contributions in establishing the relationship between the affective, cognitive and motor domains (Angel Angel & Bernardino Fernández, 2022). Present in the simplest gestures and in all actions that contribute to the development of motricity, in order to know and master one's own body, psychomotricity is a necessary element of particular importance for the global and unitary development of the child (Góes et al., 2023).

It focuses on understanding movement as an essential factor in the development and expression of the child in relation to other individuals and his environment and not on the human movement itself (Franco & Cobos, 2019). Based on a holistic view of the human being, but also on the unity between body and mind, psychomotricity makes it possible to integrate all cognitive, emotional, symbolic and physical interactions in the individual's capacity to be and act in a psychosocial context (Guanoluisa Pallo, 2016).

Over time, many definitions of psychomotricity have been presented in the academic literature, the content of which has been influenced by the interests and aspirations of the authors who formulated them. Of these, we can mention the definition given by Alicia Ruíz and Isaac Ruíz (2017), who state that psychomotricity is a technique whose characteristic is to favour the mastery of body movement, the relationship and communication that the child will establish with the world around him, in many cases through objects. It can be said that this includes the techniques that we need to use, so that children have better control over their own body, stimulating at the same time other areas of development, such as physical or cognitive.

The psychomotor domain is comprehensive, varied and encompasses many psychomotor components that must be given special attention when ensuring the child's holistic development. Through them, the pragmatic, social, aesthetic and educational adaptation of the child is achieved and, implicitly, important contributions are made to his overall development (Dumitrescu, 2008).

The acquisition of appropriate psychomotor behaviour is based on the development of psychomotor components, which are interconnected, an aspect that underlines the fact that each component is necessary and contributes to the development of the others (Constantin, 2020). Their development is marked by the degree of the child's psychophysical development, but also by the educational influences manifested during childhood (Iolanda & Constana, 2010).

In the academic literature, the following are presented as psychomotor components: body schema, dynamic coordination - of the whole body and segments, laterality, static coordination - balance, perceptual-motor coordination (perception of space, rhythm and of own movements), speed of movements, ideomotricity (as a dynamic synthesis of body schema and perceptual-motor coordination with the motor task) (Epuran, 1984, apud Martinescu, 2015).

Psychomotor development is a topic for which psychologists, educators and specialists in the field of physical education and sport have begun to show a major interest (Delgado & Montes, 2017). Based on the relationship between psychological and motor aspects, psychomotricity represents an essential psycho-behavioral component with significant contributions to individual development (Gozu & Pană, 2019).

Psychomotricity, physical education and motor activity are areas that harmonize, directly influencing children's perceptual-motor, physico-motor, cognitive and harmonious relational development and represent areas of interest both in and out of school ( Gil-Madrona et al. 2021 ). As far as the domain of physical education is concerned, psychomotricity can contribute to the child's effective adaptation to the demands of the school environment through the systematization and appropriate approach of its components (Gozu, 2011).

During childhood, a key role in the motor, intellectual and spatial maturation of children is played by psychomotor experiences, which underpin the discovery of one's own body and



environment ( Gómez & Arboleda, 2021 ). Through psychomotricity, the child has the opportunity to carry out exploratory and intellectual activities simultaneously, making it easier for him to adapt to everything around. The child's interaction with objects is the basis for the formation of mental representation, an aspect that emphasizes that the motor and intellectual domains have similar development origins ( Piaget, 1952, apud Jenni et al., 2013 ).

## **Summary of Chapter 2. Theoretical approach of physical literacy**

Physical literacy is a multidimensional construct that contains physical, affective and cognitive elements and is an essential component in human development (Ma et al., 2021). Adopting a lifestyle in which physical activity is an integral part of it can have positive effects on children's health in the short and long term (Longmuir et al., 2015).

At the same time, physical literacy is perceived as the ability to have an active and healthy life, being a dynamic concept, which embodies a journey that spans throughout life, in which experiences, understanding and abilities are used to interact effectively with the surrounding world ( Lloyd et al., 2010; Whitehead, 2010; Longmuir, 2013 ).

The value of this construct is highlighted by the fact that it is a constitutive part of human identity and experience, as well as a means to achieve other goals, such as developing physical activity levels and increasing the number of those who engage in physical activity (Cairney et al., 2019; Cairney et al., 2016; Tremblay & Lloyd, 2010).

Deepening the concept of "physical literacy", in order to clarify its significance, but also to be able to identify the most effective means of intervention, involves a careful and rigorous study of its content. In the academic literature, the content is represented by certain components, which embodies capabilities needed to support engagement in physical activity across the lifespan (Hurter et al., 2022).

Whitehead (2010) divides physical literacy into three broad domains, which need to be addressed equally when promoting systematic engagement in physical activities: the physical domain, the cognitive domain and the affective domain. She classifies the components of physical literacy domains into two broad categories:

- a) Main components: motivation, confidence, physical competence and interaction with the environment;
- b) Secondary components: self-awareness and self-confidence, expressing and communicating with others, knowledge and understanding.

Another perspective on physical literacy is presented to us by Longmuir et al. (2015), who consider that physical literacy includes four essential, interdependent and interconnected components: motivation and confidence (affective domain), physical competence (physical domain), knowledge and understanding (cognitive domain) and engagement in lifelong physical activities (behavioural domain).

Combining these components can help improve and develop children's journey in terms of physical literacy, as their experiences will become richer and more meaningful, and this interaction of the four domains will support the conduct and involvement in physical and sports activities throughout life.

Physical competence is the component of the physical domain of physical literacy, and is the main attribute exhibited by a physically literate person (Whitehead, 2010). It represents a cornerstone for meaningful participation in physical activities (Barnett et al., 2009; Okely, Booth, & Patterson, 2001), and its development in early childhood may determine later involvement in various physical activities in adulthood (Kirk, 2005).

In all current definitions, physical competence is presented as a fundamental component, which must not, however, lead to a minimization of the importance of other components and domains of physical literacy (Scheerer et al., 2018; Whitehead, 2010). Given that current interpretations of the concept of physical literacy which place a strong emphasis on the physical domain, it should be mentioned that this component, on its own, it will never be the only constitutive element of physical literacy (Hyndman & Pill, 2018).

Therefore, high physical literacy and lifelong engagement in physical activity are therefore unlikely to be achieved without developing the other three domains, given that all are of equal importance (Durden-Myers et al., 2018).

In the academic literature there is an emphasis on the educational role of physical literacy, on how it can develop the practice of physical education, being seen as a possible first foundation in the development of children and adolescents throughout life (Lundvall, 2015). Given that some authors believe that a good time to intervene on physical literacy is during childhood (Higgs et al., 2008; Mandigo et al., 2009), a formal and conducive framework for developing this concept is represented by the school environment, with physical education and sport lessons being recognized as the most frequently used contexts to achieve this goal (Edwards et al., 2019). This reality is also supported by some research in the field, in which it has been highlighted that some children are physically active only in physical education and sport lessons, aspect that once again emphasizes the significant role that this discipline has in the integral development of the child (Capel & Whitehead, 2010).

Whitehead (2013, p. 32) highlighted the link between the two concepts, mentioning that „physical education is a subject that is in the curriculum, and physical literacy is the goal of physical education”. Understanding and integrating the construct of physical literacy into the school context will allow an appreciation of the particular nature of physical education, which actually provides children with opportunities to learn and adopt a healthy and active lifestyle (Mandigo, 2010).

### **Summary of Chapter 3. Theoretical aspects regarding assessment and the different approaches to physical literacy in the academic literature**

Across the world, physical literacy is perceived as a remarkable construct, its definition being achieved in many ways, by emphasizing and giving greater importance to certain components of it ( Edwards et al., 2017 ). The cultural importance of physical literacy, the specific purposes and areas of expertise of the institutions in charge, are some of the factors that have led to the emergence of different definitions of the construct in particular countries (Robinson & Randall, 2017; Shearer et al., 2018).

According to some authors, most of the existing definitions either relate to Whitehead's concept or have been taken from it (Edwards et al., 2018). In this regard, the most recent definition presents physical literacy as „the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for participating in physical activity throughout life” (Goss, 2021; Young et al., 2020).

The proposals made in terms of defining physical literacy in some countries by some researchers or organisations highlight that both the definitions and components of physical literacy are currently in the process of being updated (Bailey, 2021). There are also studies in the literature, which emphasize that there is no international consensus on how to implement physical literacy in practice, which is justified by the fact that physical literacy covers several disciplines, given the complexity of the dimensions that the concept portrays (Ke et al., 2022).

For specialists in the fields of education, sport, recreation and health, understanding and assessing physical literacy are topics of real interest (Whitehead, 2001). In terms of the assessment of physical literacy, there has been much debate over the years, with questions raised about whether this process is necessary and whether it is feasible, given the philosophical nature of the concept.

Aubert et al. (2018) attribute great significance to the assessment of children's physical literacy, given that there are numerous studies showing that physical activity levels among children

worldwide are reduced. Moreover, the period of childhood presents an essential stage of life, in which the foundations of physical literacy can be laid, and will influence the development of certain behaviors related to lifelong physical activity ( Belanger et al., 2018 ).

The assessment method used is influenced by the approaches used in understanding the concept of physical literacy (Edwards et al., 2018). According to Allan et al. (2017), physical literacy can be understood both from a holistic (Whiteheadian) perspective that considers the development of competence, confidence, connectedness and character, while giving weighted importance, to performance, participation and personal development, by promoting valuable interactions between people and the environment, and from a performance-oriented perspective, which is concerned with mastering basic motor skills and abilities in pre-determined environments, which makes the other components of physical literacy less prominent (Allan et al., 2017).

The paper by Edwards et al. (2018) highlights an idealistic and a pragmatic approach, which are also referred to in other studies as „academic" and „practical" (Higgs, 2010).

According to the idealistic approach, physical literacy is a holistic concept whose domains can not be separated (Jurbala, 2015). A divided assessment of these would be in opposition with the philosophical basis of the concept, therefore proponents of this perspective make use of what qualitative research makes available to them when analysing the concept, namely observation, in-depth interviews, reflection (Edwards et al., 2017). Thus, this type of approach examines the physical, affective, cognitive and social domains in an interdependent manner using qualitative research methods.

Regarding the pragmatic approach, it supports the assessment of physical literacy because it considers that research can only be judged through the lens of its practical implications and proposes the use of a wide range of qualitative and quantitative research methods.

In terms of the pragmatic approach, it supports the evaluation of physical literacy because it believes that research can only be judged in terms of its practical implications and proposes the use of a wide range of qualitative and quantitative research methods, selected in such a way as to fit the intended objectives (Creswell, 2003; Higgs, 2010; Edwards et al., 2018).

Specialists seeking to assess physical literacy use qualitative and quantitative research methods to provide results based on certain evidence, with which to help change current practices related to physical literacy (Edwards et al., 2018).

The use of the pragmatic perspective is important because it contributes to acquiring an understanding of the components of physical literacy, aspect that allows the identification of what to look for in interventions, so that children become physically literate and also such an approach influences issues of reliability, validity and replicability of the development of certain intervention programs (Peers, 2020).

## **Summary of Chapter 4. Instruments used to assess physical literacy extracted from the academic literature**

The assessment of physical literacy should be carried out using an effective tool that allows observation and quantification or classification of what has been achieved according to some precise and predetermined criteria and should address all four domains of physical literacy: affective, behavioural, cognitive and physical (Robinson & Randall, 2017).

Starting from the idea that physical literacy portrays a multidimensional construct, where components from the behavioural, psychological and physical spheres are encompassed, several assessment tools have been designed through which the concept can be measured and quantified (Melby et al., 2022; Robinson & Randall, 2017).

Out of the instruments identified, only three are those that clearly assess physical literacy: Canadian Assessment of Physical Literacy - CAPL-2, Physical Literacy Assessment in Youth - PLAYfun, and Passport for Life - PFL, being designed by Canadian organizations that have adopted the concept (Shearer et al., 2021).

CAPL was developed in Canada to respond to the need to collect objective data on physical literacy and is a high fidelity information tool used to monitor children's physical literacy levels (Longmuir, et al. 2015). It provides a battery of standardized, useful assessment protocols through which children aged 8 to 12 can be assessed (Longmuir et al., 2015).

Out of the need to increase the clarity and accuracy of the test protocols, previous CAPL measurements were re-evaluated and adjustments were made, leading to the emergence of Canadian Assessment of Physical Literacy, Second Edition - CAPL-2 ( Dania et al., 2020 ). The objective of CAPL-2 is to provide a valid, effective and reliable assessment tool through which children's physical literacy can be measured and to contribute to the fight against childhood obesity (Tremblay & Lloyd, 2010; Longmuir, 2013; Longmuir et al., 2015; Tremblay, 2012). It has the ability to capture the multidimensional nature of physical literacy by merging many criteria into a comprehensive and unitary assessment ( Tremblay & Lloyd, 2010; Longmuir, 2013 ).

PLAY tools have been designed for use in research, but due to the fact that they have different facilities - the minimum training required for their use, the relatively short time to apply, the necessary equipment - they also found utility in evaluating the programs ( Canadian Sport for Life Society, 2014 ). These tools are intended for use by coaches, exercise specialists, physiotherapists, recreation coordinators, parents and children (Canadian Sport for Life, 2013; Tools, 2014). Through them, not only can children's fitness levels be measured, but information

can also be provided from multiple perspectives, including parents, teachers, and children themselves (Caldwell et al., 2021).

Developed by Sport for Life, these tools assess different domains of physical literacy (Caldwell et al, 2020). Within PLAY there are six different tools, PLAY Coach, PLAY Parent, PLAY Self, PLAY Fun, PLAY Basic, and PLAY Inventory, which can be used either separately or in different combinations to determine specific components of physical literacy (Canadian Sport for Life, 2013).

Passport for Life was developed by PHE Canada to support, raise awareness and promote physical literacy among pupils and teachers participating in physical education and sport lessons (Lodewyk & Mandigo, 2017). It presents a formative assessment tool and it is used in an educational context with the aim of helping students to develop, meet the goals they have set and also help set personal standards (Sheehan, 2018).

PFL cannot be used for reporting purposes and does not allow the identification of an overall level of physical literacy (Vizbarienė et al., 2023). Based on the information obtained from the use of this tool, further adjustments can be made to the physical education process in educational institutions in order to provide an enabling environment for pupils to make progress that contributes to their holistic development (Vizbarienė et al., 2023).

Each assessment tool has both advantages and disadvantages, and its applicability depends mainly on the context in which it is used and its purpose. All of the tools described can be used in the context of physical education, but it should be specified that some of them may create difficulties for teachers to use them due to their complexity (Stoddart, 2018).

## **Summary of Chapter 5. The influence of psychomotor development level on the intelligence of pupils aged 6-8 years in physical education and sport lessons - Preliminary study**

Movement is an essential component of a child's life, being the tool through which communication with the external environment is achieved and which facilitates the acquisition of independence in certain circumstances, making significant contributions to the child's overall development (Costa et al., 2015). It is through movement that learning takes place from birth and even before, which influences the child's effective cognitive, physical, emotional and social development (Machacón et al., 2015).

Cognitive structures related to attention, memory, perception, language and thinking are developed through movement, facilitating the understanding of concepts such as space and time (Mas et al., 2018).

From a psychomotor perspective, movement is a factor with particular implications for children's development as they relate to their environment through both physical and social actions (Corral-Guillé et al., 2019). Due to the interaction with the world, perceptual capacities, space-time structure, the ability to symbolize and regulate one's own actions are concretized, an aspect that underlines the importance of movement, reinforcing the idea that a major predictor of later cognitive function is the individual's ability to perform motor acts (Terner, 2010).

The general objective of the present study was to identify and analyze possible links between intellectual level and type of laterality, spatial orientation, and level of psychomotor development in pupils aged 6 to 8 years.

Starting from the general objective, the following specific objectives were pursued:

- a) To identify a significant association between intellectual level and the type of laterality.
- b) To identify a significant association between intellectual level and spatial orientation.
- c) To identify a significant association between intellectual level and the level of psychomotor development.

The group of subjects included in the research consisted of 120 primary school pupils, both girls and boys, aged between 6 and 8 years old, from the school with grades I-VIII Nr. 1 Reșița, National College "Diaconovici-Tietz" Reșița and Secondary School "Mihai Peia" from Reșița. In order to be able to carry out specific research activities, we obtained the acceptance of the legal guardians of the minors as well as the acceptance of the educational units.

The parameters studied in this study (intelligence, laterality, spatial orientation and psychomotor development at ages 6, 7 and 8) were not manipulated or controlled in any way, given the nature of the research: non-experimental, cross-sectional and correlational study.

Harris, Ozeretski-Guillmain and Piaget Head tests were used to assess the level of psychomotor development in order to subsequently establish a psychomotor profile of the subjects. The level of general intelligence was determined using a non-verbal perceptual test called the Raven's Colored Progressive Matrices.

Of the 120 participants, 66 were girls (55%) and 54 were boys (45%); 91.66% were from urban areas (N=110) and 8.34% from rural areas (N=10), with 49.16% living in a block of flats (N=59) and 50.84% in a house.

Regarding the practice of sports activities outside the school, according to the parents' statements, 44 of the children ( 36.67% ) practiced this type of activity, while 76 ( 63.33% ) didn't. Of the total participants, 15.83% ( N = 19 ) allocated daily between 1 and 2 hours for play, 52.50%

( N = 63 ) spent between 3 and 4 hours playing and 31.67% ( N = 38 ) spent more than 4 hours of their time playing.

Concerning smartphone/tablet/computer use, 39 participants used them daily for less than 1 hour (32.50%); 57 used them for 1 hour a day (47.50%); 19 spent 2 hours on this activity (15.83%), and 5 participants spent more than 2 hours a day using their smartphone, tablet or computer (4.17%).

In this research, the study sample was divided into three groups as follows: group 1 - subjects aged 6 years (N=29 representing 24.17%), group 2 - subjects aged 7 years (N=58 representing 48.33%), group 3 - subjects aged 8 years (N=33 representing 27.50%).

In order to test the associative hypotheses launched, we started by checking the shape of the distributions for each of the four parameters investigated at the level of the entire sample studied (N = 120), using the Kolmogorov-Smirnov test of normality of distributions.

Subsequently, an analysis of the shape of the distributions for the research variables was also carried out for each age group, using the Shapiro-Wilk test of normality distributions for the group consisting of 6 year olds (N=29) and 8 year olds (N=33) and the Kolmogorov-Smirnov test of normality distributions for the group consisting of 7 year olds (N=58).

For the group of 6 year old pupils, the distributions for the variables laterality, spatial orientation and psychomotor development level were found to be asymmetric ( $p < 0.05$ ), while the variable IQ had a normal distribution. Therefore, the mentioned correlational hypotheses were tested using Spearman's rho coefficient.

Following applying the Kolmogorov-Smirnov distribution normality test for the 7 year group, it emerged that all distributions are asymmetric. This led to the choice of the Spearman coefficient for testing hypotheses.

In the case of the 8 year old group, the distributions of IQ, laterality, and spatial orientation variables did not meet the normality criterion ( $p < 0.05$ ), while the level of psychomotor development had a normal distribution ( $p = 0.08 < 0.05$ ). Since only one investigated variable presented normally distributed data, Spearman correlation was chosen as the statistical technique for hypothesis testing.

In order to obtain a detailed picture of the relationship between the variables investigated, statistical analyses were also carried out according to the gender of the participants. The Kolmogorov-Smirnov test of normality of distributions was applied to both boys (N=54) and girls (N=66) for each research variable. The values obtained indicate that none of the distributions met the normality criterion.



## Hypothesis 1

Given the asymmetric shape of the distributions of the IQ and laterality variables, the Spearman coefficient was used as a statistical technique for hypothesis testing.

It was found that there was a statistically significant association between IQ and laterality, given the significance threshold value ( $p=0.01$ ). The  $\rho$  coefficient value of  $-0.22$  indicates that the association obtained is negative and weak. The observed effect size being low to medium  $r^2=0.05$ .

The negative association between the two variables suggests a tendency for high scores on the IQ variable to be associated with low scores on the laterality variable (as scores on one of the two variables increase, scores on the second variable decrease).

For a more complex approach to the association between the two variables, the hypothesis was also tested for each age group.

The correlation between IQ variables and laterality within the group of 6 year old pupils was tested using the Spearman coefficient, given that the distributions of the two variables did not meet the normality criterion. Analyzing the results obtained, it was found that there is no statistically significant correlation between the two variables investigated ( $p > 0.05$ ).

The statistical technique chosen to test the hypothesis was the Spearman coefficient for 7 year old pupils, since the distributions of the variables whose possible association was tested did not meet the normality criterion. Given that the significance threshold was greater than 0.05 ( $p = 0.27$ ), it was concluded that there was no significant association between IQ and laterality for these participants.

The data belonging to both variables studied were not normally distributed in the group of pupils aged 8 years, therefore, the Spearman coefficient was chosen as the statistical technique for testing the hypothesis. It was found that there was a statistically significant correlation between IQ and laterality ( $p < 0.05$ ). The nature of the mentioned association is negative ( $\rho=-0.38$ ) and weak. The  $r^2$  value of 0.14 indicates that the effect size is strong.

As in the case of the result obtained at the level of the whole group, also in the case of the present group, that of the 8 year old pupils, the tendency of high scores belonging to the IQ variable to be associated with laterality types coded numerically with lower digits in the database was observed.

Regarding the relationship between intellectual level and type of laterality by gender, for male participants, the results did not show a statistically significant relationship. A Spearman coefficient of  $-0.21$  and a significance level of 0.06 ( $p > 0.05$ ) were obtained, which showed that the association between the two variables was not statistically significant. Regarding the situation of female subjects, the data supported the hypothesis that between IQ and type of laterality, there

was a statistically significant association ( $p=0.03 < 0.05$ ). The  $\rho$  coefficient value of -0.22 indicated that the association was negative and weak, but the effect size was small ( $r^2=0.04$ ).

## **Hypothesis 2**

The Spearman's rho coefficient was used to test this hypothesis, as the distributions of the investigated variables were asymmetric.

The results showed a statistically significant positive association between the two variables ( $p < 0.05$ ). Thus, the higher the scores for the IQ variable, the higher the scores for spatial orientation, in the sense that the test applied to assess the latter variable was successfully completed by the research participants (in the database, failure in the spatial orientation test was numerically coded as 0 and success in the test was coded as 1). The correlation between the two parameters was weak ( $\rho=0.34$ ), and the observed effect size was medium ( $r^2=0.11$ ). The working hypothesis was supported by the results.

In the case of 6 year old pupils, given the asymmetric shape of the distributions of the two variables, testing required the use of the Spearman coefficient statistical technique. The significance threshold value of 0.43 showed that there was no statistically significant association between the variables tested.

At the 7 year group level, since the data pertaining to the two parameters investigated were not normally distributed, the Spearman coefficient was chosen for hypothesis testing. The results indicated the existence of a positive association, the degree of association being weak to reasonable ( $\rho=0.39$ ). This is reflected in the association of high scores of the IQ variables with success in the spatial orientation test (the high score for this variable being represented by success in the test -1). The correlation identified was statistically significant ( $p < 0.05$ ), and the effect size observed was strong ( $r^2 = 0.16$ ).

For the group of 8 year old participants, the relationship between the variables mentioned was statistically significant, given the significance threshold value of 0.00 ( $p < 0.05$ ). The association was positive and reasonable ( $\rho = 0.46$ ), which meant that high IQ scores were statistically significantly associated with success on the spatial orientation test. The observed effect size was strong  $r^2=0.21$ .

The Spearman coefficient was used as a statistical technique for testing the hypothesis according to the gender of participants in both groups, due to the fact that the distributions of IQ variables and spatial orientation did not meet the normality criterion. In the case of boys, it was found that there was no statistically significant correlation between IQ and spatial orientation ( $p = 0.12 > 0.05$ ), while in the girls' group a statistically significant association between the two variables ( $p = 0.00 < 0.05$ ) was observed. The association between IQ and spatial orientation in

female subjects was positive and reasonable ( $\rho = 0.47$ ). The observed effect was strong ( $r^2 = 0.22$ ).

### **Hypothesis 3**

The hypothesis testing was performed using the Spearman correlation due to the fact that both the intellectual level and the level of psychomotor development had the data distributed asymmetrically.

A positive and statistically significant association was identified ( $p < 0.05$ ), with a  $\rho$  value of 0.41 indicating that the association was positive and reasonable. Thus, the higher the IQ scores, the higher the level of psychomotor development of the participants. The observed effect was strong ( $r^2 = 0.17$ ).

As with hypotheses 1 and 2, testing this hypothesis also required the use of Spearman's coefficient as a statistical technique to test the association between IQ and the level of psychomotor development of 6 year old pupils. The significance threshold of 0.04 indicated that there was a statistically significant correlation between IQ and level of psychomotor development ( $p < 0.05$ ). The  $r$  coefficient value of 0.38 showed that the association was positive in nature, with a weak correlation, meaning that participants with higher IQ also had higher values of psychomotor development level. The observed effect size was strong ( $r^2 = 0.14$ ). The hypothesis was supported by the data.

At the level of the group of pupils aged 7 years, the significance threshold value of 0.00 ( $p < 0.05$ ) showed that the association between the variables was statistically significant, while the value of  $\rho$  of 0.54 indicated that the association was positive and reasonable. Thus, the high scores obtained by the participants for the IQ variable were statistically significantly correlated with the levels of psychomotor development. The effect size was strong ( $r^2 = 0.29$ ). In conclusion, the results supported the working hypothesis.

In the case of the group of 8 year old pupils, the results obtained highlighted the existence of a statistically significant association between IQ and the level of psychomotor development ( $p < 0.05$ ). The value of  $\rho$  of 0.52 showed that the association was positive and reasonable. In other words, the higher the scores for IQ, the higher those related to the level of psychomotor development. The effect size was strong ( $r^2 = 0.27$ ).

The association between the two variables was highlighted by the results for both genders. For boys, a significance level of 0.03 ( $p < 0.05$ ) was obtained, which showed that the association between the two variables was statistically significant. The correlation between IQ and level of psychomotor development was positive and weak ( $\rho = 0.25$ ), and the observed effect was of medium intensity  $r^2 = 0.06$ . The link between the variables in question in girls was also statistically

significant ( $p=0.00 < 0.05$ ). The  $\rho$  coefficient value of 0.51 indicated a positive and reasonable correlation. The observed effect was strong ( $r^2= 0.26$ ).

The objective of the present paper was to identify and analyze possible links between intellectual level and certain psychomotor components in pupils aged 6 to 8 years. The testing of the hypotheses launched led to the confirmation of the following specific research objectives: to identify an association between intellectual level and type of laterality; to identify an association between intellectual level and spatial orientation for the whole sample studied; to identify an association between intellectual level and level of psychomotor development.

Regarding the whole group of participants ( $N=120$ ), a statistically significant and negative association was observed between IQ and laterality ( $\rho=-0.22$ ,  $p=0.01$ ), while positive and statistically significant associations ( $p=0.00$ ) were found between IQ and spatial orientation ( $\rho=0.34$ ) and between IQ and psychomotor development level ( $\rho=0.41$ ).

In the case of the 6-year-old group, there was a statistically significant positive association between IQ and level of psychomotor development ( $\rho=0.38$ ,  $p=0.04$ ). No statistically significant associations were observed between IQ and laterality, respectively, between IQ and success on the spatial orientation test.

Regarding the group of participants of 7 years, it was found that IQ is statistically significant and positively associated with spatial orientation ( $\rho = 0.39$ ,  $p = 0.00$ ) and with psychomotor development level ( $0.54$ ,  $p = 0.00$ ). No statistically significant link between IQ and laterality was found.

In the case of the 8-year-old group, it has been observed the existence of a statistically significant and negative association between IQ and laterality ( $r=-0.38$ ,  $p=0.02$ ), a statistically significant positive correlation between IQ and spatial orientation test performance ( $r=0.46$ ,  $p=0.00$ ), and a statistically significant positive association between IQ and level of psychomotor development ( $r=0.52$ ,  $p=0.00$ ).

The analysis and hypothesis testing by gender revealed that for boys, IQ correlated positively and statistically significantly only with the level of psychomotor development ( $\rho=0.25$ ,  $p=0.03$ ). In the situation of female participants, there was a statistically significant and negative correlation between IQ and laterality ( $\rho=-0.22$ ,  $p=0.03$ ) and statistically significant positive correlations between IQ and spatial orientation and psychomotor development level ( $\rho=0.47$ ,  $p=0.00$  and  $\rho=0.51$ ,  $p=0.00$ ).

The results provide insight into the relationship between intelligence level and laterality, spatial orientation, and psychomotor development in six, seven and eight year old pupils in Romania. They outline the profile of pupils in terms of intelligence and psychomotricity, with emphasis on the association between them, and contribute to a detailed knowledge of the state of

affairs, which allows the selection of appropriate intervention methods where this is found to be necessary. By knowing and understanding how general intelligence relates to psychomotricity, parents, teachers, and other professionals will be able to support pupils to develop harmoniously and achieve performance and success in their academic, personal, and professional lives.

## **Summary of Chapter 6. Study on the understanding and perception of the concept of physical literacy among physical education and sport teachers in Romania**

Social changes have led to the adoption of an inactive, sedentary lifestyle among both adults and children (Nelson et al., 2006). This worrying reality has been emerging since early childhood, with the phenomenon of sedentary lifestyles manifesting itself in the context of the use of all current technology before the age of two (Downing, Hnatiuk, & Hesketh, 2015). In addition, it has been found that sources of physical activity such as walking, cycling, and active outdoor play have been removed from daily life and replaced by motorized travel and sedentary recreational activities such as watching certain TV programs and computer use (Colley et al, 2011). Thus, in many countries, both developed and developing, the number of children at risk of obesity has increased significantly (Pop, 2020).

Regular physical activity brings many physical and mental health benefits and is an essential element of a healthy lifestyle (Tomaczkowski & Klonowska, 2020). This is also supported by Janssen and LeBlanc (2010), who points out that in addition to the previously mentioned benefits, physical activity is also important for the social and cognitive health of school-aged children and young people. It is also crucial for the normal growth and development of children, especially between preschool and adolescence (Hills et al., 2007; Hills et al., 2010).

A potential cornerstone for increasing the number of those engaging in physical activity from an early age is physical literacy (Brown et al., 2020). This concept is seen as a key element in discussions about how sport, recreation, health, and physical education can help to address the problems of physical inactivity and obesity (Roetert & MacDonald, 2015). ,

Physical literacy encompasses both the desire to participate in physical activity and to gain meaningful, fulfilling experiences through it. It redefines how physical activity is understood and places importance on the holistic development of an individual's physical potential (Whitehead, 2010). Some authors consider physical literacy to be an essential life skill that ensures participation and active engagement in society (Roetert & Jeffries, 2014) and, as such, should be seen as an

essential component of a child's holistic development in the educational environment (Roetert & Couturier MacDonald, 2015).

In the school setting, physical education lessons provide an appropriate and formalized framework for promoting and increasing physical literacy (Stoddart & Humbert, 2017), and teachers play a critical role in its development. The choices physical education teachers make during the lesson determine what pupils learn and whether the goal of physical literacy is achieved.

School plays a significant role in a child's overall development, so it is very important that physical education teachers understand the phenomenon of physical literacy. Knowledge of physical literacy will enable them to maximize opportunities to engage pupils in a variety of ways, which will lead to their development from this perspective.

Physical education and sport teachers also play a key role in promoting understanding and awareness of the importance of the concept of physical literacy among both other teachers and parents. It is, therefore, imperative that physical education and sport teachers are aware of the complexity of the concept, given that physical literacy involves aspects of three domains of learning: cognitive, affective, and psychomotor (Graham et al., 2013).

The aim of this study was to analyse the relationship between the understanding and perception of the concept of physical literacy as well as the gender differences among physical education and sport teachers in Romania.

In this research, the following hypotheses were made:

**Hypothesis 1:** It is assumed that there is a connection between the understanding and perception of the concept of physical literacy among physical education and sport teachers participating in the study.

**Hypothesis 2:** It is assumed that the understanding and perception of the concept of physical literacy differs according to the gender of the subjects.

The study involved 169 physical education and sport teachers in Romania (42% women and 58% men). Most of the participants were from the western part of the country (86.39%). The objectives of the study, as well as the research procedure, were made known to all subjects prior to obtaining consent for voluntary participation in the study.

Understanding and perception of physical literacy were assessed using a questionnaire adapted from the model developed by Essiet et al. (2022). Participants provided responses on a five-step Likert scale. In terms of scoring, high scores indicated a high level of understanding while also highlighting the perceived meaning of the construct in question. The Romanian version of the questionnaire was created with the help of a specialized translator, and the Google Forms questionnaire creation tool was used for data development and collection, with the questionnaire being completed online by the subjects.

Most of the study participants (38%) were aged between 25 and 34 years. The 35 to 44 age group included 34% of the teachers who completed the questionnaire. Within the 45 to 54 and 21 to 24 age groups were 17%, respectively, 7% of the teachers involved in the research. Only 4% of physical education and sport teachers were aged 55 or over.

Regarding the degree programme completed, according to the data collected, the majority of participants (64%) have completed master's degree programmes, 33% bachelor's degree programmes and 3% doctoral degree programmes.

In terms of professional experience in the field of education, 28% of physical education and sport teachers who completed and responded to the questionnaire questions fell into the 1 to 4 year range, while 27%, respectively 9% fell into the 5 to 9 and 10 to 14 year ranges. The category of professional experience between 15 - 19 years included 15% of the specialist teachers and the category of professional experience between 20 - 24 years 14% of the total participants. Only 7% of subjects had experience of 25 years and over.

The classification of the participants according to the teaching grades obtained showed that 16% of them were classified as junior teachers, 39% obtained the final grade, 11% obtained the second grade, and 34% obtained the first grade or doctorate.

The internal consistency of the used questionnaire after translation into Romanian was calculated using Cronbach's alpha fidelity coefficient. The value of 0.70, with a percentage of 100%, means that the scale had a good internal consistency.

Verifying the relationship between the understanding and perception variables first required a scatter plot. A dispersion coefficient of  $r^2=0.019$  was obtained. A positive relationship was revealed by the scatter line, which indicated that a high value of the understanding variable was associated with an increased value of the perception variable.

The distributions of the understanding and perception variables were checked prior to testing the hypothesis of the associative hypothesis using the Kolmogorov-Smirnov normality test.

The distributions of the two investigated variables did not meet the normality criterion ( $p < 0.05$ ), which led to the choice of the Spearman coefficient as the appropriate testing technique for this hypothesis.

The coefficient value  $\rho=0.45$ , at the 0.00 significance threshold, indicated that there was a positive and reasonable statistically significant association between the two variables.

The correlation identified highlighted that higher understanding scores were associated with higher physical literacy perception scores in the sample studied.

Concerning the second hypothesis, which aimed to identify possible gender differences in subjects' understanding and perception of the concept of physical literacy, the statistical technique used was the non-parametric Mann-Whitney U test for independent samples.

The values obtained showed that female subjects had significantly higher scores on the variable perception of physical literacy ( $U=2329$ ,  $N_1=98$ ,  $N_2=71$ ,  $p=0.00$ ). No significant difference was identified between the two groups for the understanding variable ( $U=2883$ ,  $N_1=98$ ,  $N_2=71$ ,  $p=0.05$ ).

The present study aimed to identify a possible connection between the understanding and perception of the concept of physical literacy in a sample of 169 physical education and sport teachers in Romania and to capture gender differences in these variables. A positive, moderate, and statistically significant correlation was identified between understanding and perceived importance of physical literacy, which led to the confirmation of the associative hypothesis launched. Understanding and perception were found to be dependent on only 19% of study participants.

A statistically significant difference by gender appeared in the variable of perception of physical literacy. No statistically significant difference by gender was found for understanding. Thus, although the level of understanding did not differ between the groups constituted by gender, the level of perceived importance was higher among female physical education and sport teachers.

Given that the two variables were positively associated, we can conclude that documenting and having a thorough knowledge of the aspects related to the concept of physical literacy can generate significant influences on the perceived importance of the concept in question. The association identified may be useful for specialist teachers, highlighting the need for them to have comprehensive information on the concept of physical literacy.

## **Summary of Chapter 7. Assessment of physical literacy in pupils aged 10-12 years**

The transfer of good habits and behaviors into adult life can easily occur when they are implemented from childhood (Jones et al., 2013). Among the positive behaviors that can be adopted in everyday life is physical activity, which generates many health benefits and reduces the risk of many diseases in children and adolescents (Sallis et al., 2000; Ortega et al., 2008). At the heart of physical activity is the concept of physical literacy, a complex construct that encompasses "the motivation, confidence, physical competence, knowledge and understanding to maintain appropriate levels of physical activity throughout life" (Whitehead, 2007, p. 287). Adopting a physically active lifestyle, with physical literacy as its foundation, can make significant contributions to the development of the whole person, emotionally, cognitively, physically and socially (Saunders et al., 2018).



However, in Romania, there are too few studies that have focused on the concept of physical literacy, and this leads to a lack of programmes to promote and develop the concept of physical literacy. Carl et al. (2023) pointed out that in Romania, physical literacy has only started to gain notoriety since 2021, and for this reason, research on this topic is still limited, with physical literacy continuing to be a novelty in our country.

Starting from this reality, the present study aims to deepen the concept of physical literacy among children, focusing on one of the basic components of physical literacy - physical competence, highlighting the effect that specific physical exercises and movement games carried out in physical education and sport lessons can have on this component and implicitly on physical literacy.

The main purpose of the study was to develop the level of physical literacy in pupils aged between 10 and 12 years, through intervention on physical competence, with the help of specific exercise and movement games.

Assessing the level of physical literacy of children can contribute to the development of standards, expectations, and profile of physical literacy and physical education, which will lead to an increase in the number of more active and physically literate children (Tremblay & Loyd, 2010; Corbin, 2016). It can also be used to monitor a person's individual progress, promote learning, and highlight areas requiring developmental support and intervention (Penney et al., 2009; Green et al., 2018). It is therefore important to be aware of the significance of physical literacy in terms of its benefits in physical education and sport lessons and the role of the physical education and sport teacher in supporting the development of physical literacy.

The specific objectives were:

- a) To identify statistically significant differences between the two groups in the post-test phase in terms of physical competence following the application of the intervention in the experimental group.
- b) To identify statistically significant differences between the two groups in the post-test phase in terms of physical literacy levels following the intervention in the experimental group.
- c) To identify the predictor factor of physical literacy.
- d) To identify a negative correlation between physical literacy and body mass index in the experimental group.

### *General hypothesis:*

It is assumed that there are significant differences between the experimental and control groups in terms of the level of physical literacy as a result of applying the intervention through specific exercises and movement games.

### *Specific hypotheses*

In order to achieve the objectives of the study, the following working hypotheses were launched:

Hypothesis 1. It is assumed that there are statistically significant differences between the two groups in the post-test phase in terms of physical competence following the application of the intervention in the experimental group.

Hypothesis 2. It is assumed that there are statistically significant differences between the two groups in the post-test phase in terms of the level of physical literacy following the implementation of the intervention in the experimental group.

Hypothesis 3. It is assumed that in the experimental group, the level of physical competence is a predictor of the level of physical literacy.

Hypothesis 4. It is assumed that there is a negative association between physical literacy and body mass index in the experimental group in the post-test phase.

The study's sample size was 80 children, aged between ten and twelve years old, in grades four and five. Part of the subjects are pupils of the "Diaconovici-Tietz" National College in Reșița, and the other part is enrolled at the "Mihai Peia" Secondary School in the same town. In order to carry out the specific research activity, written consent was obtained from the parents and legal guardians of the children. The children also gave their verbal consent to voluntarily take part in this study, being informed that they could withdraw at any time during the conduct of the study if they wished to do so.

The sample was divided into two groups: the experimental group (EG) and the control group (CG). The children were randomly assigned to the groups, each group having 40 subjects. Participants who did not fall within the age range analyzed, and those whose data were incomplete were excluded from the study.

The study involved 40 ( 50% ) girls and 40 ( 50% ) boys. The experimental group included a number of 40 subjects, of which the number of girls was 19 and that of boys 21. Unlike the experimental group, where the number of girls ( N = 19 ) was lower than that of boys ( N = 21 ), in the control group, the girls ( N = 21 ) were found in greater numbers than the boys ( N = 19 ).

In the present study, the parameters targeted were: body mass index, daily behavior, physical competence, knowledge and understanding, motivation and confidence, and physical

literacy. The physical competence parameter was intervened on through component elements, thus being a pretest-posttest experimental study with a control group (Aniței, 2007).

Anthropometric measurements were taken to determine the body mass index (BMI) of the children included in the study. Height was measured in cm using a thallimeter, and weight was assessed in kg using an electronic scale. In addition to these two measurements, the waist circumference of each subject was determined and measured in cm using a tape measure. The "BMI Calculator for Children and Adolescents" provided by the Centers for Disease Control and Prevention (CDC), was used to determine the subjects' BMI. Based on the results, the subjects were classified as underweight, normal weight, overweight and obese.

In order to identify and characterize the level of physical literacy as well as its components, “ *Canadian Assessment of Physical Literacy, Second Edition ( CAPL-2 )* ” ( HALO, 2017 ) was used. It is a holistic, easy-to-use, and robust tool that can be used to evaluate children between the ages of eight and twelve and uses a complex battery of protocols, which assesses the four domains of literacy, reflecting: child motivation and confidence, physical competence, knowledge and understanding and involvement in lifelong physical activities ( Longmuir et al., 2015 ).

CAPL-2 consists of three tests to assess physical competence, two tests to assess daily behavior, and a 22-item questionnaire that assesses children's knowledge and understanding as well as motivation and confidence. Children can score 100 points overall on the assessments. CAPL-2 allows subjects to obtain individual scores for each domain, as well as an overall score for physical literacy.

The research took place in the 2021 - 2022 school year. In the first semester, the necessary approvals were obtained, and measurements were made for the pretest phase. From February to May 2022, the intervention on the physical competence variable was applied in the experimental group. No intervention was carried out in the control group. In the post-test phase, measurements were made on the parameters investigated to determine whether the intervention made any changes to the test results of the pretest phase.

The statistical analysis started with checking the internal consistency of the questionnaire used to determine the variables of motivation, confidence, knowledge, and understanding. The Cronbach's alpha coefficient value obtained was 0.78, which reflected good internal consistency.

#### *Analysis of results in the pretest phase*

At the same time, an analysis was carried out to determine possible differences between the control group and the experimental group based on the data obtained in the pretest phase. Thus, all the variables representing the studied parameters were investigated: daily behavior, physical competence, knowledge and understanding, motivation and confidence, physical literacy, and

BMI. The shape of the distributions related to the variables in question was checked using the Shapiro-Wilk test of normality of distributions.

Considering the normality test values and significance thresholds identified, it was observed that in the control group, the variables daily behavior, physical competence, motivation and confidence, and BMI did not meet the normality criterion ( $p < 0.05$ ), while the variables knowledge and understanding and physical literacy had normal distributions ( $p > 0.05$ ).

In the case of the experimental group, the variables whose distribution met the normality criterion were physical literacy and BMI. Data related to the other parameters were not normally distributed. Thus, to test for differences between the two groups, the Mann-Whitney U non-parametric test was chosen as the statistical technique for the variables of daily behavior, physical competence, knowledge and understanding, motivation and confidence, and BMI, and the t-test for independent samples was used for the variable physical literacy.

Regarding the daily behavior variable, a coefficient  $z = -1.60$  was obtained at the 0.10 significance level ( $p > 0.05$ ), which showed that there were no statistically significant differences between the groups. The scores for the physical competence variable also did not show a statistically significant difference, as the  $z$  value was  $-0.91$ , and the significance threshold was  $0.36$  ( $p > 0.05$ ). Statistically insignificant differences were also revealed for the motivation and confidence and BMI variables, given the values shown:  $z$ -coefficients of  $-1.28$ , respectively,  $-1.29$  and significance thresholds of  $0.19$  and  $0.19$  ( $p > 0.05$ ).

However, it was found that there was a statistically significant difference between the experimental group and the control group in terms of pupils' knowledge and understanding. The  $z$ -coefficient value equal to  $-2.69$  at the 0.00 significance level ( $p < 0.05$ ) showed that the two groups differed in terms of the level of the variable in question, with scores in the experimental group tending to be higher than those of the pupils in the control group.

In the case of the physical literacy variable, the independent samples t-test was used. A  $t$ -coefficient of  $-1.95$  was obtained at the significance level of  $0.054$  ( $p > 0.05$ ), which indicated that there was no statistically significant difference between the two groups.

#### *Analysis of results in the posttest phase*

In order to test the first working hypothesis, the shape of the data distribution for the variable in question was first analyzed for both groups. As both distributions met the normality criterion ( $p > 0.05$ ), the independent samples t-test was chosen as the statistical technique for testing the hypothesis. Thus, a coefficient  $t = -2.87$  and a significance threshold of  $0.00$  ( $p < 0.05$ ) was obtained, which indicates that the difference between the means of the two groups for the physical competence variable was statistically significant. The scores in the experimental group in

the posttest phase were significantly higher. The observed effect size was medium. The hypothesis was confirmed.

For testing the second working hypothesis, given that the data were normally distributed for the variable under investigation, the t-test for independent samples was chosen as the statistical technique.

The t-coefficient of -2.22 and the significance threshold of 0.02 ( $p < 0.05$ ) indicated statistically significant differences between the two groups at the post-test phase regarding physical literacy. Thus, the mean in the experimental group was statistically significantly higher than that in the control group for the variable in question. The observed effect size was low. Thus, the working hypothesis was confirmed.

In order to get a more detailed picture of the differences between the groups in terms of physical literacy, a statistical analysis was also conducted on the components of physical literacy. Thus, in addition to the physical literacy previously analyzed (Hypothesis 1), differences between the experimental and control groups were tested in the post-test phase for the other three components: daily behavior, knowledge and understanding, and motivation and confidence.

In the case of the control group, it was found that the data were normally distributed for the variables knowledge and understanding and motivation and confidence ( $p > 0.05$ ), while for the variable daily behavior, the data were asymmetrically distributed.

In the experimental group, the only variable with normal distribution was motivation and confidence, while daily behavior and knowledge and understanding did not meet the normality criterion.

Differences between groups in daily behavior were tested using the non-parametric Mann-Whitney U test. A z value of -2.58 and a significance threshold of 0.01 ( $p < 0.05$ ) indicated that scores in the experimental group were significantly higher than those of the control group at post-test.

Regarding the knowledge and understanding variable, the verification also required using the non-parametric Mann-Whitney U test. A coefficient  $z = -1.02$  was obtained, at a significance level of 0.30, which indicated that the difference between the groups regarding knowledge and understanding was statistically insignificant.

For the motivation and confidence variable, the fact that the data were normally distributed in both groups led to the choice of the independent samples t-test to identify possible differences between the groups studied. The t-test value of -0.19 at the 0.84 significance level ( $p > 0.05$ ) showed that there were no statistically significant differences between the groups in motivation and confidence levels.

Thus, given the results obtained from the analysis of the components of physical literacy, it was concluded that the significant difference between the experimental and control groups in terms of physical literacy was based on the tendency of scores in the experimental group to be higher than those in the control group for the daily behavior and physical competence variables, despite the fact that there were no significant differences between the groups in terms of knowledge and understanding and motivation and confidence levels.

In the case of the third hypothesis, that in the experimental group, the level of physical competence is a predictor of the level of physical literacy, a coefficient  $\rho$  of 0.41 was obtained at a significance threshold equal to 0.00, which meant that the association between the two variables was statistically significant ( $p > 0.05$ ). The correlation was positive and high, indicating that high scores related to physical competence were associated with high scores of physical literacy in pupils in the experimental group in the posttest phase. The observed effect was strong ( $r^2 = 0.59$ ). Analyzing the results obtained, it was found that the variable physical competence predicts physical literacy at the significance threshold of 0.00, with  $r^2 = 0.59$ .

The testing of the last hypothesis was performed using the Pearson  $r$  coefficient since the data for both variables investigated were normally distributed. The  $r$  coefficient value of -0.29 showed that the association between the variables was negative and weak, while the significance threshold of 0.03 revealed that the identified association was statistically significant ( $p < 0.05$ ). Thus, participants in the experimental group who scored high on the physical literacy variable had lower BMI values. The observed effect size was medium ( $r^2 = 0.08$ ).

The present study aimed at developing the level of physical literacy in children aged between 10 and 12 years, through intervention on physical competence, with the help of specific exercise and movement games. Confirmation of hypotheses aimed at identifying statistically significant differences between the experimental group and the control group in terms of the level of physical literacy, but also of physical competence, in the post-test phase led to the achievement of that objective. Thus, it was found that in the group in which it intervened, the results were significantly higher for the variables in question. It was also found that in the experimental group, physical competence was a predictor of the level of physical literacy. A statistically significant negative association was recorded between the physical literacy variables and BMI at the level of the experimental group.

It was found that the level of physical literacy was improved as a result of the specific exercise intervention on the physical competence variable, with children in the experimental group performing better in the post-test phase compared to those in the control group for both the physical competence and physical literacy variables. The results obtained coincide with those found in the literature and mentioned in the „Discussion" section. Thus, it is concluded that the purpose of the

intervention in the study was achieved, and the effect of the intervention was as expected. At the same time, the identification of physical competence as a predictor of physical literacy is an important aspect highlighted through the present research. This shows that the study subjects with a higher level of physical competence also have a higher level of physical literacy. A statistically significant and negative association was found between physical literacy and BMI variables, with children in the experimental group with higher body mass index having lower physical literacy values.

One aspect that should be mentioned is that there were no significant differences between the groups studied for the variables knowledge and understanding and motivation and confidence, which highlights the need for a more rigorous intervention on these components with a focus on the specifics of each of them. Given that these variables are representative of the cognitive and affective spheres, it is possible that the absence of differences between the groups is also due to the individual characteristics of each subject, for example, cognitive abilities, level of intelligence, and psycho-emotional state. External factors are also important in explaining this result. In spite of these results, the variable physical competence was identified as fundamental in increasing physical literacy, given that the total values were not modified by the absence of differences in the previously mentioned variables. This is consistent with studies that identify physical literacy as a core component of physical literacy.

We conclude by highlighting the idea that physical literacy, as well as its assessment, can play a key role in identifying, understanding and addressing the domains and components considered significant for lifelong engagement in physical activities, both in the school setting and in the community of which the subjects being assessed are a part.

### *Research limitations*

A limit to this research is given by the approach in the intervention through specific physical exercises of a single component of physical literacy - physical competence, the other three components of the concept in question are not taken into account. Thus our approach was rather linear, which could lead to minimizing the complex and multifaceted nature of physical literacy.

Another limitation of the study is the sample size (N = 80) used, which imposes certain restrictions related to a possible generalization of results. However, it can be seen as a first step in conducting larger studies, in which the number of subjects is significantly higher, given that the results obtained showed that the intervention used achieves improvements in the physical competence component, which also generates changes in physical literacy.

Regarding the instrument used to evaluate the components and the physical literacy (CAPL-2), certain limitations can be identified, given that in the literature, CAPL-2 is seen by

certain authors ( Robinson & Randall, 2017 ) as being largely focused on the physical field. Thus, subjects can obtain thirty points in the evaluation of components related to the motor and emotional sphere ( daily behavior, physical competence, motivation and confidence ) and only ten points for the cognitive field ( knowledge and understanding ). The higher share of these components may influence the overall score of physical literacy.

At the same time, it is important to emphasize that the CAPL-2 tool used provides a singular picture that reflects only one moment in the entire evolution of the physical literacy journey, and the results of the assessments may be influenced by the way the subject approaches this situation, that is the extent to which he or she is motivated and willing to cooperate in carrying out the assessment tasks.

## **Summary of Chapter 8. Final conclusions and future research directions**

The importance given by specialists in other countries to the concept of physical literacy, as well as the benefits generated by the adoption of this construct in the school context and in particular in physical education and sport lessons in the respective countries, have been the basis of the choice to study this topic in this thesis.

Through our research, we aimed to highlight, in the first phase, the association between intellectual level and type of laterality, spatial orientation and level of psychomotor development in primary school children, thus addressing one of the domains of physical literacy, the physical. Subsequently, the research was extended to the other component domains of physical literacy by examining the impact that an intervention programme through specific physical exercises and movement games can have on physical literacy development. In another stage, the role of physical education and sport teachers in the development of physical literacy was identified by determining their understanding and perception of the concept in question.

The main results obtained show that intellectual level is associated with the type of laterality, spatial orientation and psychomotor development level in primary school children participating in physical education and sport lessons. The study that focused on physical literacy concluded that the level of physical literacy of pupils was improved after the intervention on the physical competence variable. Regarding teachers' understanding and perception of physical literacy, the results support a correlation between the two variables.

Therefore, based on the results obtained, we underline the need to implement an intervention programme aimed at improving the physical literacy level of pupils. In order to encompass all the components of physical literacy, we recommend collaboration between



specialists from different fields in order to develop a multidisciplinary approach in the design of the intervention programme.

Future research directions could consider the following:

To target larger samples of subjects, which would allow more detailed analysis and at the same time, facilitate the generalization of results.

To propose a more comprehensive intervention program that addresses several elements of physical literacy, thus targeting all areas of physical literacy.

To use different qualitative research methods or mixed methods (qualitative and quantitative) to analyze children's physical literacy.

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