Manuela Valentini
Università di Urbino Carlo Bo | manuela.valentini@uniurb.it
Monica Minucci
Università di Urbino Carlo Bo | minuccimonica97@gmail.com

Benefits of motor activity in children with sensory disabilities: systematic review
Benefici dell'attività motoria in bambini con disabilità sensoriale: revisione sistematica

Fuori Call

The objective of this systematic review is to identify research, reviews and trials that highlight the central role and importance of motor activity in the development and holistic growth of primary school children with sensory disabilities, with a focus on visual impairment. We considered 19 research projects, covering the period from 2000 to 2024. All the selected articles are consistent with our target audience and focus on proposals for motor activities for individuals with visual impairment within the school, to highlighting the importance of movement for everyone. The results of the research emphasizing that children with visual disabilities show greater difficulties in performing certain motor patterns or activities, underlining the need to encourage movement for the resulting physical, mental and social well-being.

Keywords: Blindness, primary school, motor activity, participation

L'obiettivo della revisione sistematica è quello di individuare ricerche, revisioni e sperimentazioni che evidenziano il ruolo centrale e l'importanza dell'attività motoria per lo sviluppo e la crescita olistica dei bambini di Scuola Primaria con disabilità sensoriale, con focus principale sulla disabilità visiva. Abbiamo preso in considerazione 19 ricerche, per un periodo compreso tra il 2000 e il 2024. Tutti gli articoli selezionati sono coerenti con il nostro target d'utenza e si concentrano su proposte di attività motoria con disabilità visiva all'interno della scuola, con l'obiettivo di diffondere e sostenere l'importanza del movimento per tutti e per ciascuno. I risultati delle ricerche sottolineano che i bambini con disabilità visiva mostrano maggiori difficoltà nell'esecuzione di determinati schemi motori o attività, si evidenzia la necessità di incoraggiare il movimento per il benessere fisico, psichico e sociale che ne deriva.

Parole chiave: Cecità, scuola primaria, attività motoria, partecipazione

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Corresponding Author: Manuela Valentini | manuela.valentini@uniurb.it

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1. Introduction

Sensory disabilities, specifically visual impairment, although with a wide and different internal symptomatology, often cause difficulties in the approach of motor functions. Today, there are 39 million blind people worldwide and 246 million with different degrees of visual impairment (WHO, 2022), which, although having a greater incidence in countries with a lower degree of development, still meets educational and development issues in all nations. Visual disability often causes many difficulties in approaching the world of movement, often due to preconceptions, rigidities and fears that arise from family or teachers' difficulties in approach (Hornem & Timmons, 2009; De Boer et al., 2011). However, children should not be removed from the world of sport and physical activity in general, as they would be less able to know and experience through their bodies and movement. It is important that the experiences of physical activity are not carried out exclusively within a specialized and medicalizing context. It is necessary that the school also takes on experiences of sharing with peers. Physical activity does not only affect a person's physical well-being, but also, and above all, their psychological development. In fact, the psychological well-being of children and adolescents is improved thanks to planned physical activity designed to be active and enjoyable, which significantly reduces the risk of symptoms associated with mental health conditions such as anxiety and depression (Dyson, 2001; Bano, Ikonomi, & Muka, 2018). In primary school, the approach to physical activity and the body in motion is also fundamental in terms of developing a sense of self-esteem and self-efficacy. Following various personal and shared reflections, we decided to create a questionnaire through teamwork with the Psychologist of Development and Education Dini, to collect as many experiences as possible related to the world of sensory disabilities. We received 1375 replies from 13 regions of Italy, thanks to which we have carried out a qualitative survey that has shown that more than 60% of the participants have never had children with sensory disabilities in class. Only 54% have participated in training on this subject. The encouraging issue is that more than 80% of respondents expressed a desire to train themselves and deepen their knowledge about sensory disabilities. In this direction, numerous studies emphasize the importance of movement and motor activity not only for the development of physical skills, but also for the value of the social interactions that result from it (De Mei et al, 2018). Carrying out a rethinking of the spaces and the environment will be essential, in order to respond to the needs of everyone, guaranteeing security and participation (Davis & Layton, 2011; Taylor & Ringlaben, 2012; EADSNE, 2012).

2. Objective

The objective of our systematic review was to investigate the relationship between motor activity and visual impairment in primary school children, analyzing the difficulties that disability determines and the benefits that movement can bring. We have considered research, reviews and articles that highlight the consequences of active motor activity in the development and growth of children with visual disabilities, especially within school contexts, underlining the importance of emotional, social and physical participation and involvement. The terminology and regulations used in individual articles may differ from one another, and for this reason it has not been possible to use a common and unambiguous definition of visual impairment in this paper due to the selection of articles from different countries and published at different times. However, to define precisely the main elements of the survey, we report below the analysis of focal points through the PICO model (Brown, 2020; Schiavenato et al., 2021), that are:

1. *Factor P*: Problem, Patient or Population. Refers to the subject of the research.
2. *Factor I*: Intervention. Indicates the type of path being taken, as the actions implemented.
3. *Factor C*: Control or Comparison. Indicates the initial state of the control group's research, which, at the end of the path, will allow us to understand the actual changes achieved.
4. *Factor O*: Outcomes. Refers to the results obtained at the end of the path.

P	I	C	O
Population	Intervention	Control	Outcomes
Primary school children, aged 6 to 10 years old, with visual sensory impairment.	Proposal of motor activity and movement also within the school, using different modes and strategies.	Attempts are made to identify the level of motor skills development in children with visual disabilities and the degree of involvement and participation in movement activities.	The research highlights differences at the motor executive level with regard to some basic motor patterns, but highlights the need to stimulate participation in order to activate beneficial consequences not only on a physical level, but also social and emotional.

Table 1 – PICO model on this systematic review (source: own elaboration)

3. Methodology

The research was conducted during December 2024, January, February and March 2025, following specific phases: choice and definition of keywords and insertion in search engines, critical analysis of titles and abstracts of various articles and first partial data collection, reading of articles and subsequent manual search for research and trials consistent with the objective, study of grids for the collection and organization of key data, preparation of tables for the arrangement of the main elements of each selected study/research/article.

The search platforms used were EBSCOHost, URBiS, PubMed and Google Scholar through which we had access to several databases, including ERIC, APA PsycArticles, SPORTDiscus, PlosONE, Saje and Scopus. The "advanced search" tool has been used to enter keywords, identified in line with the survey objective, using a combination of the Boolean operators AND and OR. A time filter has also been inserted to select only post-2000 publications. The keywords used were: Primary School or 6-10 years old, Sensory disability, Blindness, Physical activity or motor activity. The different data collected at the end of the research were organized into a table in which we outlined two further detailed macro-areas:

Bibliographic details: authors, title, year of publication, geographical area, search engine used;

Analysis of studies: sample and characteristics (age, number of participants, sex), setting, type of research, method of data analysis, purpose and result.

Research with languages other than English or Italian was excluded, with a population that does not correspond to the target audience from 6 to 10 years and that does not take sensory disabilities into account. Research of an experimental, systematic or longitudinal nature has been included; targeting a wider age range than the single 6-10 year age group.

Consideration and mitigation of bias risks

- Publication bias: scientific publications with significant and less results have been selected;
- Time lag bias: selected scientific publications with a wide period, between 2000 and 2024;
- Language bias: scientific publications selected by the main search engines and published in scientific journals of the sector.

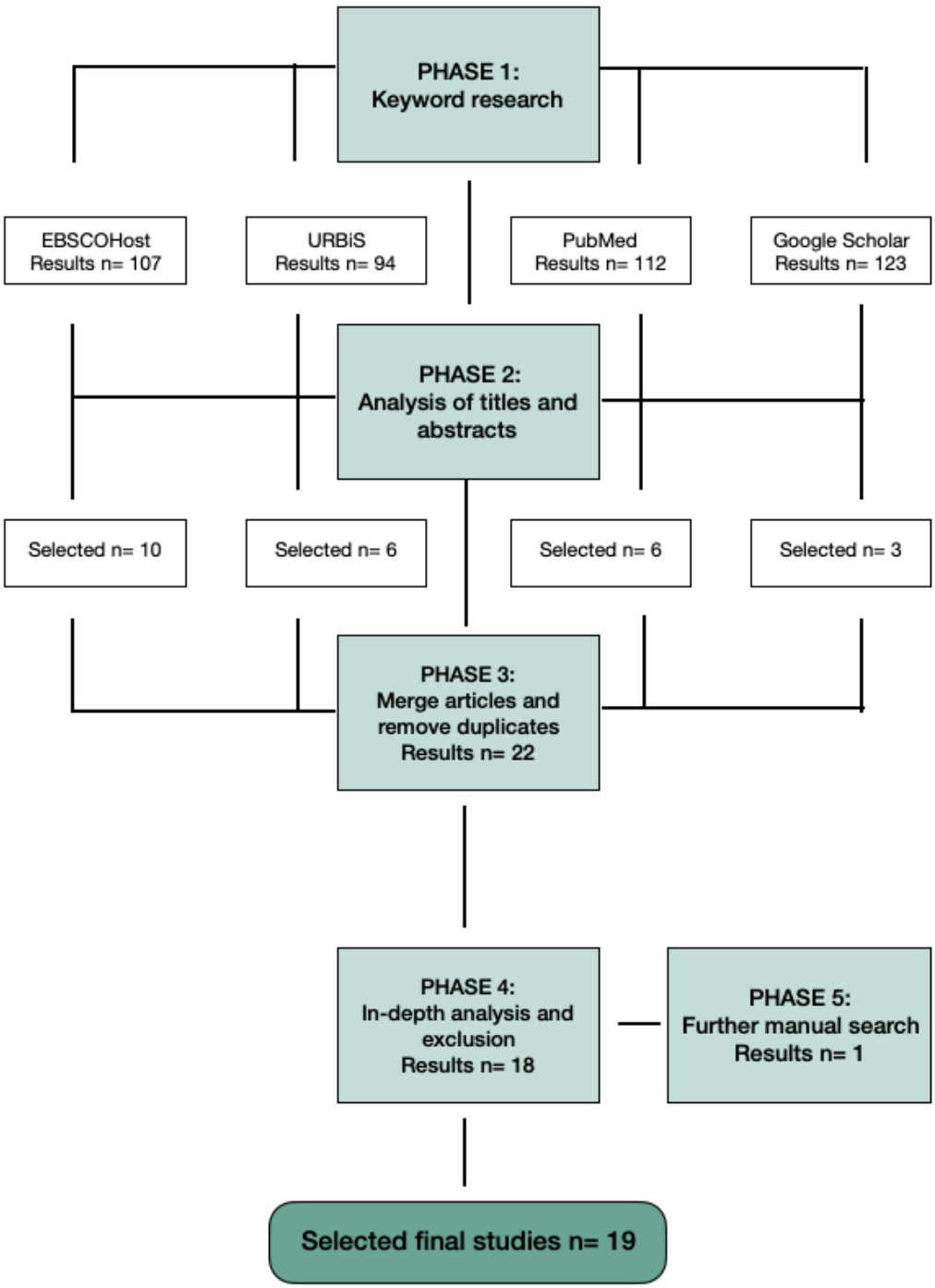

Figure 1– Flow diagram of the various research phases (source: own elaboration)

4. Results

For this systematic review, a total of 19 articles were included (n=19) and analyzed in the following table. Authors, year, search engine, country, sample (and characteristics), research methodology and results were analyzed.

Authors Year	Nation Motor of research Setting	Publication title	Characteristics and age of the population	Research methodology used	Results
Bouchard, D., & Tetreault, S. 2000	France SAGE Journals Journal of Visual Impairment & Blindness	The Motor Development of Sighted Children and Children with Moderate Low Vision Aged 8–13	60 children aged 8 to 13, 30 visually impaired and 30 with moderate visual impairment.	Experimental research: data were collected using the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP) (Bruininks, 1978) and a questionnaire addressed to relatives.	It appears that visually impaired children have lower motor skills than sighted children, especially when it comes to balance.
Levtzion-Korach, O., Tennenbaum, A., Schnitzer, R., & Ornoy, A. 2000	Israel PubMed J Paediatr Child Health	Early motor development of blind children	40 blind children (experimental group) and 40 sighted children (control group) of school age.	Experimental research that used Bayley Developmental Scale and Revised Denver Developmental Screening Test to measure children's motor skills.	The motor development of blind children is significantly delayed compared to all 10 motor skills examined. The visual channel is a fundamental mode of sensory input for the process of sensory-motor development. It is assumed that an appropriate and stimulating environment and proper parental management can help reduce the developmental gap in motor activity.
Brambring, M. 2006	Germany ERIC Journal of Visual Impairment & Blindness	Divergent Development of Gross Motor Skills in Children Who Are Blind or Sighted	10 children with visual impairment accompanied from 0 to 8 years, with subsequent checks and records.	Longitudinal study to analyse the developmental stages in which blind children acquire 29 motor skills.	There are delays in the development and acquisition of motor skills compared to the visually impaired and a high degree of variability in the acquisition delays within the scope of the various domains analyzed.
Houwen, S., Visscher, C., Hartman, E. , & Lemmink, K.. 2007	Netherlands PubMed	Gross motor skills and sports participation of children with visual impairments	20 children with visual sensory disabilities and 100 sighted children of about 9 years.	Experimental study on the difference in motor skills between children with and without vision.	Children with visual impairment show significantly less object control, but there were no significant differences between children with moderate and severe visual impairment. Children (both sighted and non-sighted) who play sports show significantly higher scores for object control.
Houwen, S., Hartman, E. , & Visscher, C. 2009	Netherlands PubMed National Library of Medicine	Physical activity and motor skills in children with and without visual impairments	96 children aged 6 to 12, both visually impaired and non-disabled.	Experimental research using the Test of Gross Motor Development-2 to measure the development of children's motor skills.	The results show that the development of motor skills is closely related not so much to the type of disability, but to the level of sedentary activity. For these reasons, it is argued that time must be devoted to motor activity.
Houwen, S., Hartman, E. , & Visscher, C. 2009	Netherlands Exceptional Children ResearchGate	Motor Skill Performance of Children and Adolescents With Visual Impairments: A Review	Children of school age with visual impairment.	Systematic review including 39 studies analysing different variables: effects on the child and consequences of environmental variables (26), expert advice on performance variables (13).	Weak relationships were found between the degree of visual impairment and dynamic balance and manual dexterity and between interventions on movement and motor performance.
Houwen, S., Hartman, E. , & Visscher, C. 2010	Netherlands PubMed	The relationship among motor proficiency, physical fitness, and body composition in children with and without visual impairments	60 children with visual impairments and 60 visually impaired children aged 6 to 12.	Experimental research using the Test of Gross Motor Development-2 to measure the development of children's motor skills.	Blind children score worse on locomotion and object control skills. There is also a high sample of children with obese visual disabilities (25%), which highlights the need to increase levels of physical activity from an early age.

Haegele, J. A., & Porretta, D. 2013	USA - Colombia, Ohio State Human Kinetics Journals Google Scholar	Physical Activity and School-Age Individuals With Visual Impairments: A Literature Review	Primary school children with visual disabilities.	Systematic review of 18 studies.	The main findings suggest that low levels of physical activity among visually impaired people of school age are related to the presence of barriers to participation, including lack of adequate activities and proposals.
Wagner O.M., Haibach, S.P., & Lieberman, J.L. 2013	USA ScienceDirect Research in Developmental Disabilities	Gross motor skill performance in children with and without visual impairments - Research to practice	28 children from 6 to 12 years blind (ICD-0 H 54.0) and 28 children with visual inspection of the same age range.	Experimental research using the Test of Gross Motor Development-2 to measure the development of children's motor skills.	The results indicate that blind children have significantly worse performance in the various locomotor systems assessed and object control, running and jumping, kicking and grasping skills are those most affected, where there is a greater difference with sighted people.
Fotiadou, E., Christodoulo, P., Spyridon-Georgios, S., Tsimaras, V.K., & Mousouli, M. 2014	Greece Journal of Education and Practice ResearchGate	Motor Development and Self-Esteem of Children and Adolescents with Visual Impairment	37 children with visual impairments and 37 children with normal vision, aged between 8 and 13.	Experimental research using the Bruininks-Oseretsky Test of Motor Proficiency (BOT-2) (Bruininks & Bruininks, 2005) to assess the participants' motor skills and the Self-esteem Inventory developed by Coopersmith to evaluate their self-efficacy	The results indicate that the scores of children with visual disabilities in terms of both motor development and self-esteem are lower than those of typical participants. There is also an interaction between motor development and self-esteem.
Haibach, P.S., Wagner, O.M. & Lieberman, L.J. 2014	USA ScienceDirect Research in Developmental Disabilities	Determinants of gross motor skill performance in children with visual impairments	100 children aged between 6 and 12 with visual sensory impairment.	Experimental research using the Test of Gross Motor Development-2 to measure the development of children's motor skills.	Difficulties arise in the items of running, grasping, kicking and balance. The study points out that the major difference between sighted and blind people in terms of motor skills stems mainly from the lack of exposure to the various situations of the second group.
Lund, E.M., & Seekins, T. 2014	USA ERIC Physical Disabilities: Education and Related Services	Early Exposure to People with Physical and Sensory Disabilities and Later Attitudes toward Social Interactions and Inclusion	50 students of the university (about 20 years old) who during primary school shared the path with a/ a child/ a visual impairment.	Study analysing the evolution of social relations between sighted and blind people over the years.	Inclusive exposure to visual impairment is found to help nurture the development of meaningful bonds even in adulthood.
Raiola, G., Altavilla, G. & Gomez Paloma, F. 2015	Italy ResearchGate SportScience	Effects of physical activity and sports in the reduction of stereotypy in blind subjects	Primary school children with visual disabilities from birth showing numerous motor stereotypes.	Systematic review that analyzes the importance of performing motor activity to decrease motor stereotyping.	The data collection shows that an early approach to motor activity contributes significantly to the reduction of motor stereotyping in blind children.
Haegele, J.A., Brian, A., & Goodway , J. 2015	USA Review Journal of Autism and Developmental Disorders Google Scholar	Fundamental Motor Skills and School-Aged Individuals with Visual Impairments: a Review	Primary school children with visual sensory impairment.	Systematic review of 11 studies, including 6 comparative, 2 longitudinal, 2 validation and 1 descriptive.	Children with visual impairments tend to have greater difficulty in performing the main motor functions.

Dalbudak, I., Gürkan, A.C., Yigit, S.M., Kargun, M., Hazar, G., & Dorak, F. 2016	Turkey EBSCOSport International Journal of Environmental and Science Education	Investigating Visually Disabled Students' Attitudes about Physical Education and Sport	100 visually impaired students (8 primary school, 30 secondary school, 62 university students)	Experimental research using the scale "Physical Education and Sport Attitude Scales", comprising 12 positive items and 12 negative ones. The scale was developed by Demirhan and Altay (2001) in order to investigate the sports attitudes of students.	There is good participation of students with visual impairment in sports and physical activities. The important benefit of this in their present and future lives is argued.
Columna, L., Haibach, P., Lieberman, L., Fernández-Vivó, M., & Cordero-Morales, I. 2016	USA Google Scholar Journal of Blindness Innovation and Research	Motor Development and Physical Activities for Families of Children with Visual Impairments and Blindness	Groups of children from 6 to 9 years old with visual impairment and involvement of their families.	Motor workshop with the involvement of children and families. Motor skills were analysed through the Test of Gross Motor Development (TGMD) 2 (Ulrich, 2000)	Both from the data analyzed and from the impressions of families, it emerges the need to create a collaborative work of sharing techniques and materials between professionals and parents to promote the development of motor activity of children with visual impairments.
Columna, L., Lepore-Stevens, M., & Kavanagh, E. 2017	USA British Journal of Visual Impairment	Effective education for families of children with visual impairments and blindness in physical activity environments: A workshop model with focus on Orientation and Mobility Skills	Experimental physical activity programme involving, for the first time, 20 children aged 4 to 15 and their families.	A series of routes and requests for motor activities to be carried out together, in collaboration between parents and children have been proposed.	Clearly emerge the impressions of parents on the importance of "living" the visual difficulties of their child and the centrality that the movement must have in daily life, even facing it together.
Grbovic, A., & Jorgic, B. 2017	Serbia GoogleScholar Physical Education and sport	Motor Abilities of children with different levels of visual acuity	51 participants of both sexes, aged 7 to 12. 24 children with normal visual abilities, 27 with visual impairments, themselves divided into students with moderate visual impairments and students with severe visual impairments.	Experimental study that used 8 tests of the "Eurofit battery of tests" to evaluate the motor skills of the subjects involved.	Results show better performance in children with normal visual development. However, there are few differences between the two sub-groups with visual impairments, making further study and investigation necessary.
Fadda, R., Pia, T., Congiu, S., et al. 2024	Italy SCOPUS International Journal of Environmental Research and Public Health	Social Support at School for Students with Sensory Disabilities	Referred to primary school children.	Systematic review that analyzes the importance of social gratifications (also in the context of motor activity) for the development of the personality of children with sensory disabilities.	The results of the studies analysed underline the need to provide adequate support at school level for children with sensory disabilities, in particular visual disability, for active and engaging performance in all activities and appropriate personality development.

Table 2 – Studies selected for systematic review (source: own elaboration)

5. Discussion

The analysis was carried out as follows. In the initial phase of entering keywords into search engines, a total of 436 studies (n=436) were identified, of which n=107 were found on EbscoHost, n=94 on URBiS, n=112 on PubMed and n=123 on Google Scholar. Subsequent analysis of titles and abstracts led to the selection of 10 studies from EbscoHost (n=10), n=6 from URBiS, n=6 from PubMed and n=3 from GoogleScholar, for a total of 25 studies included (n=25) and 411 excluded (n=411). Of the 25 studies considered

valid in line with our research objective, n=3 duplicates were eliminated. The inclusion and exclusion criteria were then further checked, resulting in the elimination of another 4 studies, arriving at a total of n=18 studies. Finally, with a last phase of manual research, one last article was added, bringing the total number of selected studies to 19 (n=19). At the end of the analysis of the selected protocols, some important observations were made. With regard to the countries of origin of research, despite a prevalence of studies conducted in the United States (n = 7), we can still highlight a geographically varied distribution, demonstrating the wide interest in this topic. According to the World Health Organization's 2022 estimates, there are 285 million visually impaired people and 36 million blind in the world. Considering, therefore, also the involvement of acquaintances and family members it is possible to understand the reasons for the cultural and social relevance of the analyzed topic and its spatial diffusion.

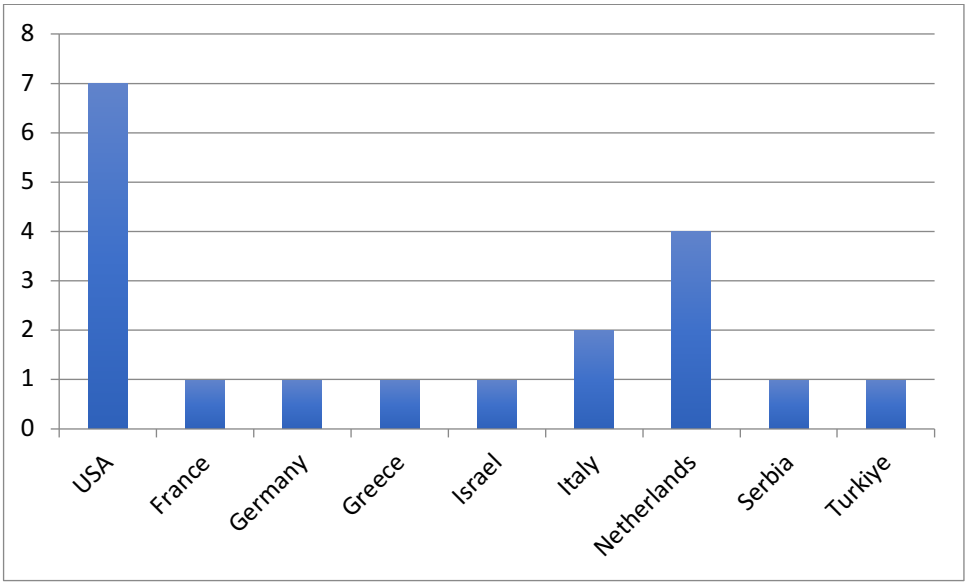

Figure 2 – spatial variable analysis (source: own elaboration)

As far as the time variable is concerned, the protocols chosen are in the period between 2000 and 2024. In detail, two studies were conducted in 2000 (n=2), one in 2006 (n=1) and another in 2007 (n=1). Two further articles were identified in 2009 (n= 2), one in 2010 (n= 1), two in 2013 (n= 2), three in 2014 (n= 3), two in 2015 (n= 2), 2016 (n= 2) and 2017 (n= 2), one in 2024 (n= 1). The selected research and the corresponding publication dates allow us to assume a real need to know and deepen topics related to visual disability and movement in primary school contexts.

5.1 Benefits of motor activity in children with sensory impairment

The objective of this systematic review was to discover the relationship between motor activity and visual impairment in children aged 6 to 10 years. Understanding the motor difficulties that are most often encountered by blind or visually impaired children was necessary, both with specific demands for movement, and also for contextual situations not always favorable to ensure the participation of all. The priority of our research was to exalt the feedback and positive effects that proposals for activities in motion create in the child and the development of his personality as a person with his dreams, goals and desires.

Specifically, the data obtained from several studies highlight the motor difficulties shown by children with visual disabilities, especially in terms of balance, control of objects and motor patterns at greater intensity (Bouchard et al, 2000; Brambring, 2006; Houwen et al., 2007; Houwen et al., 2009; Wagner et

al., 2013; Haibach et al., 2014). It is also reported a delay in the development of certain abilities and a higher index of obesity in blind people than in those with adequate eye development (Houwen et al., 2010). For example, the study that examined 100 children with visual disabilities aged 6 to 12 years old, conducted in 2014 in the USA by Haibach and his collaborators, established the presence of obvious motor difficulties. Through the use of TGMD-II (Test of Gross Motor Development II), the motor skills of the experimental group (blind or visually impaired children) and the control group were evaluated in response to the demand for specific movement activities. The difficulties prevailing in running, grasping, throwing and maintaining balance items are highlighted. However, the research also leaves open a further important clue for reflection, linked precisely to the type of exposure to motor activity that children with visual disabilities have: fewer activities are proposed, lower are the possibilities to approach them and develop certain skills and competencies (Haibach et al., 2014).

We have also examined protocols and surveys that highlight the need to break down barriers that hinder everyone's participation, due to different natures. For example, the systematic review conducted in America by J.A. Haegele and D. Porretta underlines the contextual problems that determine low participation in the motor proposals of children with visual disabilities. We find the lack of adequate activities, unable to meet the needs of all and this leads to an insufficient level of inclusion (Haegele & Porretta, 2013). In addition, the management of family emotional dynamics also often influences the type of activities proposed to the child. It is not rare to see overprotection relationships that tend to keep the child away from carrying out activities considered dangerous. It is important to create an environment of cooperation and sharing, where everyone can feel welcomed and even families can find space for their doubts, fears and curiosities. Sharing materials, techniques and tools can constitute a valid factor of continuity between the various areas in which the child is located, guaranteeing security and opportunities for participation (Columna et al., 2016).

Reflections

We believe that it is of primary importance to support movement and physical activity also for children with visual disabilities. Through an organic and functional re-thinking of environments and the structuring of educational proposals, it will be possible to involve everyone, supporting the path of growth of the Person, and allowing holistic development to the maximum of its potential. A motor activity programmed on basic motor patterns such as walking and running, as important skills for daily autonomy also soliciting balance, dexterity and control of objects, with playful content and adapted material can improve communication and relationships with peers, sharing indoor, outdoor places prepared, strongly influencing the level of personal self-esteem. This will also help children with disabilities to overcome the deficit and establish themselves as competent individuals capable of achieving significant goals (Fotiadou et al, 2014). The involvement of families and all teams that orbit around the person is a key point in the path of development and growth, allowing to extend the motor activity to all levels of life, not only school, and thus encourage movement in everyday life (Columna et al., 2017; Fadda et al., 2024). A motor for all to guarantee a healthy lifestyle and age-appropriate learning: seeing beyond the darkness of foreclosures.

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