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Boosting Physical Fitness in Primary School Students with Learning Disabilities: A Conceptual Framework Design

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Abstract

This study outlines a conceptual framework for designing and developing a Physical Fitness Intervention Module tailored for students with learning disabilities (LD) in lower primary schools. The module leverages Social Constructivism Theory, Social Learning Theory, the ADDIE Model, and McKillip's Needs Analysis Model. An extensive literature review on physical fitness, health-related fitness components, physical activities for children with special needs, the ADDIE model, Constructivism Theory, Social Learning Theory, and Design and Development Research (DDR) forms the foundation of this study. The research adopts a structured DDR methodology, divided into three phases: needs analysis, design and development, and implementation and evaluation. In the needs analysis phase, data will be collected through teacher-administered questionnaires to identify module requirements, analyzed using SPSS software to produce descriptive statistics. The design and development phase employs the Fuzzy Delphi Method (FDM) to achieve consensus from 15 experts in special education and sports science. The module's content will be validated using the Content Validation Index (CVI) based on evaluations from six experts. The final phase assesses the module's usability through interviews with special education teachers, adapting the USE questionnaire for this purpose. Additionally, a one-group quasi-experiment with pre- and post-tests will evaluate the module's effectiveness, using the SEGAK test to measure physical fitness levels before and after the intervention. This study aims to develop a comprehensive physical fitness intervention module to enhance physical activity and health outcomes for students with learning disabilities in lower primary education, ensuring its effectiveness and relevance through expert feedback and empirical testing.

Keywords: Physical Fitness, Physical Education, Special Educational Needs (SEN), Learning Disabilities, Design and Developmental Research Design (DDR)

Introduction

Good physical fitness should start from a young age and continue into adulthood, as high fitness levels in childhood positively impact adult health (Moliner-Urdiales et al., 2010;

Silventoinen et al., 2021). High physical fitness allows participation in various activities and reduces health risks, including heart disease, obesity, and musculoskeletal problems (Marttinen et al., 2018; Kao et al., 2020). Studies show that physical fitness improves physiological and psychological functions, reducing the risk of hypokinetic diseases (Ortega et al., 2008; Smith et al., 2014; de Lima et al., 2022), and enhancing academic performance, cognitive function, and mental health (Donnelly et al., 2016; Santana et al., 2017; Marques et al., 2018). In Malaysia, the importance of physical fitness is increasingly recognized, yet many children and adolescents still do not achieve the recommended levels of physical activity especially students with learning disabilities.

Children and adolescents with disabilities often exhibit lower physical fitness levels and are less active compared to their peers, leading to poorer health outcomes and higher rates of obesity, diabetes, depression, and stress (Must et al., 2015; Bandini et al., 2015; Ginis et al., 2021). In Malaysia, children with learning disabilities, including Down syndrome, autism, and dyslexia, face additional challenges in physical and educational contexts (Khan et al., 2018; Kementerian Pendidikan Malaysia, 2013). Physical Education (PE) for Special Educational Needs (SEN) students provide an essential platform for these children to engage in physical activities (Haegele, 2015; Pan et al., 2005). Effective PE can foster social skills, awareness, and leadership opportunities (Grenier et al., 2014; Grenier et al., 2023), while teachers' competence and confidence significantly affect students' engagement and success (Gustafsson et al., 2010; O'Connor & McNabb, 2021).

Despite the recognized importance of physical fitness, children with disabilities often lack adequate opportunities for physical activity (Curtin et al., 2010; Collins & Staples, 2017). Existing PE programs in Malaysia for LD focus more on skills than fitness, with inadequate emphasis on cardiovascular endurance and flexibility. The COVID-19 pandemic has exacerbated sedentary behavior among children with disabilities, highlighting the need for targeted interventions (Dunton et al., 2020; Roe et al., 2021). Data from various surveys indicate that Malaysian children have low levels of physical fitness and high sedentary behavior (Shahril et al., 2020; Huang et al., 2022), underscoring the urgency of this issue. The pandemic's impact on reducing physical activity and increasing sedentary lifestyles has further highlighted the necessity for effective interventions.

There is a critical need to develop a fitness-focused intervention module for primary school children with learning disabilities, tailored to their diverse needs and abilities, to improve their physical fitness and reduce sedentary behavior (Shahril et al., 2020; Huang et al., 2022). Such a module would help address the current gaps in physical education for these students, ensuring they receive the necessary support to enhance their health and well-being. The proposed intervention aims to provide a systematic, evidence-based approach to improving the physical fitness of primary school children with learning disabilities, fostering their engagement in physical activities, and promoting a healthier lifestyle. By integrating physical fitness into their daily routine, these children can benefit from improved physical health, better cognitive function, and enhanced emotional well-being, ultimately leading to a higher quality of life and better academic outcomes.

Physical Fitness

Physical fitness is one of the most relevant indicators of an individual's health (Ortega et al., 2008). Positive health is crucial at all stages of life, especially during early childhood. Healthy children have a higher chance of experiencing optimal and complete development, and reaching their full potential (WHO, 2023). Research indicates that improving physical fitness at an early stage, particularly in primary school, is vital for fostering healthy individuals (Mintjens et al., 2018; Tomkinson et al., 2018; García-Hermoso et al., 2019). High physical fitness levels reduce the risk of cardiovascular diseases, adiposity, mental health issues, cognitive problems, and bone health issues in children, while low fitness levels are

significantly associated with cancer-related mortality in later life (Ortega et al., 2013; Högström et al., 2019). Therefore, early physical fitness is essential due to its profound impact on children's health and development. In the 1970s, studies showed that low physical fitness adversely affected adolescent health (Blair et al., 1989; Cumming et al., 1994), prompting a focus on health-related fitness tests (Pillsbury et al., 2013). Research on health-related fitness in children and adolescents began in the early 1990s for cardiorespiratory fitness (Simons-Morton et al., 1988; Lang et al., 2018) and the early 2000s for musculoskeletal fitness (Smith et al., 2014; García-Hermoso et al., 2019). Globally, children's physical fitness has declined, particularly in industrialized Western countries. This trend has spurred efforts to promote physical activity and fitness among children and adolescents, notably by the WHO (WHO, 2019). There is now a clear awareness of the importance of physical fitness during childhood and adolescence.

Physical fitness is defined as the body's ability to function effectively and efficiently, enabling enjoyment of leisure time, health maintenance, disease prevention, and emergency preparedness. It is vital for daily activities, with endurance and strength limiting movement limitations in adulthood. Physical fitness is categorized into motor skill-related and health-related fitness. Health-related fitness includes cardiovascular endurance, muscle endurance, muscle strength, flexibility, and body composition (Amenya et al., 2021; Pinto et al., 2020). Skill-related fitness includes power, speed, agility, coordination, balance, and reaction time (Radzani & Ismail, 2017). This study focuses on health-related fitness to achieve its objectives. In conclusion, physical fitness is crucial for children and adolescents to maintain good health, and its benefits should be cultivated from an early age to ensure long-term well-being.

Health-Related Physical Fitness

Health-related physical fitness is critical for all students, including those with learning disabilities (LD), as it significantly impacts their physical and mental health (Pierantozzi et al., 2022). Effective maintenance of physical fitness reduces the risk of chronic diseases and obesity, conditions prevalent among children with special needs. Despite its recognized importance, numerous studies highlight that MBPK often exhibit unsatisfactory physical fitness levels. This gap underscores the necessity for targeted interventions to improve health outcomes for this vulnerable group.

The scarcity of comprehensive global data on health-related fitness for children and adolescents, particularly those with special needs, remains a significant barrier to progress (Huang et al., 2022). Report cards from countries like Finland, Spain, the United States, and Lithuania reveal insufficient data on the physical fitness of children with special needs,

reflecting a broader neglect in addressing their specific health requirements. South Korea's report card grades physical fitness among these children at a worrying D+ level. In Malaysia, data on the physical fitness of children aged 5 to 9 years is notably lacking, indicating a critical need for focused research and policy development to address these gaps.

Health-related physical fitness encompasses several key components: cardiovascular endurance, muscle endurance, muscle strength, flexibility, and body composition (Ganley et al., 2011). Various researchers classify these components differently, but the underlying elements remain consistent. For instance, Ruiz et al (2009), highlight cardiorespiratory, musculoskeletal, morphological, and motor components, while Pan et al (2016), and Bushman & American College of Sports Medicine (2017), emphasize aerobic fitness, muscle fitness, flexibility, and body composition. Despite these differences, the essential aspects of physical fitness are agreed upon. This study focuses on cardiovascular endurance, muscle strength and endurance, flexibility, and body composition to address the specific needs of MBPK, aiming to provide detailed insights and effective strategies in subsequent sections.

Components of Health-Related Fitness

Health-related physical fitness is defined as a multidimensional construct comprising five components: cardiovascular endurance, muscle strength, muscle endurance, flexibility, and body composition (Caspersen et al., 1985). This definition, widely accepted and utilized in health-related research, emphasizes the importance of these components in physical training and their significant relationship to overall health (ACSM, 2014; Payne & Isaacs, 2016; Pate, 1988). Thus, the development of a physical fitness intervention module should encompass all these components to effectively address the needs of students with learning disabilities (LD).

Cardiovascular Endurance

Cardiovascular endurance, also known as cardiovascular fitness or cardiorespiratory capacity, refers to the ability of the respiratory system to deliver oxygen to the body to produce energy during physical activity (Caspersen et al., 1985; Lacy, 2011; Ross et al., 2016). It is the capacity of the respiratory and cardiovascular systems to sustain prolonged exercise (Ortega et al., 2008). Cardiovascular endurance is essential for children, as they can improve this fitness aspect between ages 6 and 14 (Malina, 2004). Factors influencing cardiovascular fitness include genetics, age, gender, race, physical activity, diet, obesity, sedentary behavior, environment, and socioeconomic status (Sui et al., 2017; Timmons et al., 2007; Howard & Hughes, 2013; Shikany et al., 2013; Júdice et al., 2017; Ortega et al., 2014; Mendelson et al., 2016; Santos et al., 2014; Hoehner et al., 2011; Ombrellaro et al., 2018).

Muscular Fitness

Muscular fitness includes three aspects: maximal strength, muscle strength, and muscle endurance (Caspersen et al., 1985). Maximal strength is the total force exerted by a muscle, muscle strength is the explosive force output, and muscle endurance is the ability to exert force repeatedly over time. This study focuses on muscle strength and endurance, vital for performing daily activities involving fine and gross motor skills (Behringer et al., 2011; Rivilis et al., 2011). Muscular fitness is a crucial health marker throughout life and a valuable indicator for monitoring children's and adolescents' health (Ortega et al., 2008; Ramírez-Vélez et al., 2017; Garcia-Hermoso et al., 2019). High levels of muscular fitness reduce the risk of

cardiovascular disease and improve bone health and self-esteem in children (Steene-Johannessen et al., 2013; Artero et al., 2012).

Flexibility

Flexibility refers to the range of motion in joints, influenced by the muscles' and tendons' characteristics (Howie & Pate, 2012; Willmore & Costill, 1994; Health and Human Service, 1996; Pate et al., 2012). Flexibility can be static or dynamic, with static flexibility involving a relaxed muscle's range of motion and dynamic flexibility involving muscle-tendon unit stretch within normal range (Knudson et al., 2000). While flexibility is an essential component of health-related fitness, its impact on health is debated. The Institute of Medicine (2012) recommended excluding flexibility tests from fitness assessments for adolescents due to a lack of evidence linking flexibility to health outcomes (Pate et al., 2012). Despite the debate, maintaining flexibility is believed to reduce injury risk and improve coordination (Donahoe-Fillmore & Grant, 2019; Behm et al., 2016).

Body Composition

Body composition refers to the physical body's makeup, typically described as the percentage of muscle, fat, bone, and water (Caspersen et al., 1985). It directly impacts the ability to perform daily activities energetically and effectively (Pillbury et al., 2013). Body composition assessment includes measuring fat mass and fat-free mass, with tools like Dual-Energy X-Ray Absorptiometry (DXA) and Bioelectrical Impedance Analysis (BIA) (Holmes & Racette, 2021). Children with special needs often face unique challenges in maintaining healthy body composition due to mobility limitations and potential cognitive impairments (Capio et al., 2018). Obesity rates are higher among children with disabilities, impacting their overall health and increasing the risk of cardiovascular diseases and diabetes (Rosly, 2022; Amo-Setién et al., 2022; Pan et al., 2016).

Physical Activities for Children With SEN

Active participation in physical activities is crucial for enhancing physical fitness among children, serving as a foundational stage for developing motor skills and confidence in movement (Fühner et al., 2021). Engaging in physical activities offers numerous benefits, including improved physical fitness, cardiometabolic health, bone health, and psycho-cognitive development (WHO, 2020). Despite these advantages, current studies indicate that most children and adolescents worldwide do not meet the WHO's recommendation of at least 60 minutes of daily physical activity, leading to potential health issues, particularly among children with learning disabilities (MBPK) (Guthold et al., 2020; Bull et al., 2020; Faigenbaum & Myer, 2012).

International policies and efforts aim to enhance physical activity participation among children, including those with special needs. The UN's 2030 Agenda for Sustainable Development emphasizes global health and reducing health inequalities, advocating for inclusive physical activity engagement (United Nations, 2015). The updated WHO guidelines recommend an average of 60 minutes of moderate-to-vigorous physical activity daily, reflecting scientific evidence that supports the average daily activity over accumulating 60 minutes each day (Chaput et al., 2020; Bull et al., 2020). Additionally, these guidelines now include recommendations for people with disabilities and chronic diseases, pregnant and

postpartum women, highlighting the universal applicability and importance of physical activity (DiPietro et al., 2020).

Despite these initiatives, the participation rate of children with disabilities in physical activities remains low. Over 75% of children and adolescents with disabilities are inactive globally, facing higher risks due to physical inactivity compared to their peers (Ginis et al., 2021). Research focusing on physical activity and health in disabled populations is still limited, with less than 5% of articles in high-impact medical journals addressing these groups from 1999 to 2019 (Rimmer, 2012). This underscores the urgent need to prioritize and improve the inclusion of children with special needs in physical activities, ensuring they receive the health benefits and opportunities for active living available to their peers.

Study Design

The design and development research (DDR), founded by Richey and Klein in 2007, is a structured and systematic method focusing on the design, development, and evaluation of specific products and tools (Richey et al., 2004; Nurulrabihah et al., 2019). This approach is

particularly suited for this study, which aims to develop and evaluate a physical fitness intervention module for lower primary school students with learning disabilities. The DDR methodology ensures that the developed module is of high quality through its distinct phases or stages (Saedah Siraj et al., 2020). This study adopts the Type I approach, focusing on developing and evaluating the usability of a specific product—the physical fitness intervention module for LD. The process includes gathering user perceptions (teachers), identifying the module's strengths and weaknesses, and evaluating its usability. The study's conclusions are specific to students with learning disabilities in lower level primary schools, making the Type I DDR approach highly appropriate for achieving the research objectives.

The research methodology involves three phases: needs analysis, design and development, and evaluation (Hidayatul Fariha, 2019; Ugur-Erdogmus & Cagiltay, 2019; Muhammad Nidzam, 2017; Mohd Ridhuan, 2016). During the needs analysis phase, the researcher identifies the requirements and appropriate components for the module. The design and development phase involves creating the module based on expert input, while the evaluation phase assesses the module's usability with feedback from experts and practitioners. The research employs various methods such as questionnaires, Fuzzy Delphi Method (FDM), Content Validation Index (CVI), and interviews to ensure comprehensive analysis and evaluation.

The study utilizes the ADDIE model (1990), within the DDR framework, drawing on Social Constructivism and Bandura's Social Theory. The ADDIE model, known for its systematic and easy-to-follow framework, is widely used in educational research (Branch, 2009). Each phase incorporates specific models: McKillip's model (1987), for needs analysis, Taba's Curriculum Model (1962), for design, and the USE Model (2011), for usability evaluation. This structured approach ensures that the module is meticulously developed and assessed, addressing the unique needs of LD students in primary education.

Social Constructivism Theory

Social Constructivism is a learning theory proposed by Lev Vygotsky in 1968, widely applied in education and teaching practices (Harun et al., 2022). This theory posits that individuals construct their knowledge through questioning, assessment, and investigation, actively building new knowledge through their interactions with the environment (Kanno, 2018). When individuals receive new knowledge, they integrate it based on their existing beliefs or reject it if deemed irrelevant (Kussmaul & Pirmann, 2021). The theory encourages students to apply practical methods to acquire knowledge through peer discussions in the classroom rather than rote memorization of others' concepts and definitions. Constructivism emphasizes learning through scientific observation, asserting that students build knowledge from their understanding or experiences (Fleury & Garrison, 2014). Knowledge construction is further facilitated through sharing with peers, teachers, and others, fostering collaborative learning (Mohammed & Kinyo, 2020). The Zone of Proximal Development (ZPD), a key concept in this theory, refers to the gap between what students can do independently and what they can achieve with guidance, aiming to keep students within their ZPD by providing challenging, meaningful learning opportunities (Roosevelt, 2008).

In this study, the Social Constructivism Theory by Lev Vygotsky (1978), serves as the foundation for developing a physical fitness module for students with special educational needs (MBPK) in lower primary school. This theory views students as active builders of knowledge, supported by Noriati et al (2012), who emphasize the importance of linking new knowledge with existing knowledge for effective learning. The Curriculum Development

Division (BPK) (2016), also highlights the necessity for teachers to understand students' existing knowledge to plan and implement effective learning processes. Effective learning occurs when students can connect old and new knowledge. Interaction with others is crucial in understanding social constructivist learning (Pritchard, 2017), and teachers play a vital role in facilitating this social activity (Moore, 2012). The physical fitness intervention module is designed to help teachers understand physical fitness activities and assist MBPK in building knowledge about physical fitness. The module considers the existing knowledge and abilities of MBPK and applies the ZPD concept to guide students in mastering new skills with teacher support. This approach aims to enhance the physical fitness levels of MBPK, including cardiovascular endurance, muscular endurance, strength, flexibility, and body composition.

Social Learning Theory

Albert Bandura, a prominent researcher in social learning, developed the theory of observational learning, which posits that individuals naturally engage in learning by observing others. This process involves learning skills by watching others, retaining the observed information, and then imitating the observed behavior. Factors that enhance the likelihood of imitation include similarity in age, gender, shared interests, and admiration or higher social status of the observed individuals. Bandura's theory emphasizes three main factors supporting the learning process: environmental, individual, and behavioral factors (Bandura & Hall, 2018). Children learn not only through cognitive means but also through social interactions with parents, peers, and teachers, making learning a social activity. The theory explains the influence of social factors on children's learning processes and highlights the importance of understanding, predicting, reshaping, or changing children's behavior. Key elements in this

theory are observation, retention, reproduction, and motivation, which collectively enhance the effectiveness of learning through modeling (Demirbas & Yagbasan, 2006; Gaspar, 2010).

In educational settings, Bandura's Social Learning Theory is widely applied, emphasizing the significance of observation, imitation, and modeling in learning. For this study, direct modeling is employed, where teachers act as role models in conducting physical fitness activities for LD students. These students observe and imitate the activities demonstrated by the teachers, and those who successfully replicate the behavior receive positive reinforcement to encourage repetition. This approach aims to improve health-related physical fitness among LD students by leveraging social imitation and motivation. Previous research indicates that social imitation is crucial in education, where children learn from each other through observation, imitation, and modeling (Amoyedo-Peter, 2023; Bandura, 2006). The effectiveness of this learning process is significantly influenced by the characteristics of the role model and the observed behavior, demonstrating that positive role models play a vital role in facilitating desired behavior changes (Newman, 2007).

Addie Model

The ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), pioneered by Michael Molenda in 2003, was chosen for developing this intervention module due to its widespread use across various fields (Morrison, 2010). This model provides a flexible guide comprising five phases, which are essential for creating effective tools (Ahmad, 2013). It is particularly suited for this study's goal of developing and evaluating a physical education intervention module for special needs students (MBPK) in primary school. The

ADDIE model facilitates continuous feedback during module development, ensuring systematic construction through its clear and non-confusing phases (Syahputra, 2020). Each phase of the ADDIE process includes formative evaluation, aiding researchers in developing an effective module to enhance physical activity among MBPK through physical education (Gure, 2019; Yeh & Tseng, 2019). The model's flexibility, organization, and extensive application in producing effective educational programs make it valuable despite its criticisms of being time-consuming and costly (Adnan & Ritzhaupt, 2018; Santally et al., 2012).

The ADDIE model is extensively used in special education to design and develop modules and programs for MBPK in both primary and secondary schools (Wijiastuti et al., 2019; Yong, 2022; Fudholi et al., 2020; Ping et al., 2022; Sohaeir et al., 2023). It focuses on systematic material creation, enhancing the quality of teaching and learning in schools (Zulkifli et al., 2018). Researchers prefer ADDIE for its ease of use, flexibility, and systematic approach, allowing iteration back to previous phases when needed (Vejvodova, 2009). The process supports the advancement of students while aligning learning environments with workplace requirements, thus boosting success potential (Branch, 2009). Given its numerous advantages, the ADDIE model was selected as the primary framework for developing the instructional materials in this study, demonstrating its systematic and widely adopted nature in educational fields (Johnson-Barlow & Lehnen, 2021).

Conceptual Framework

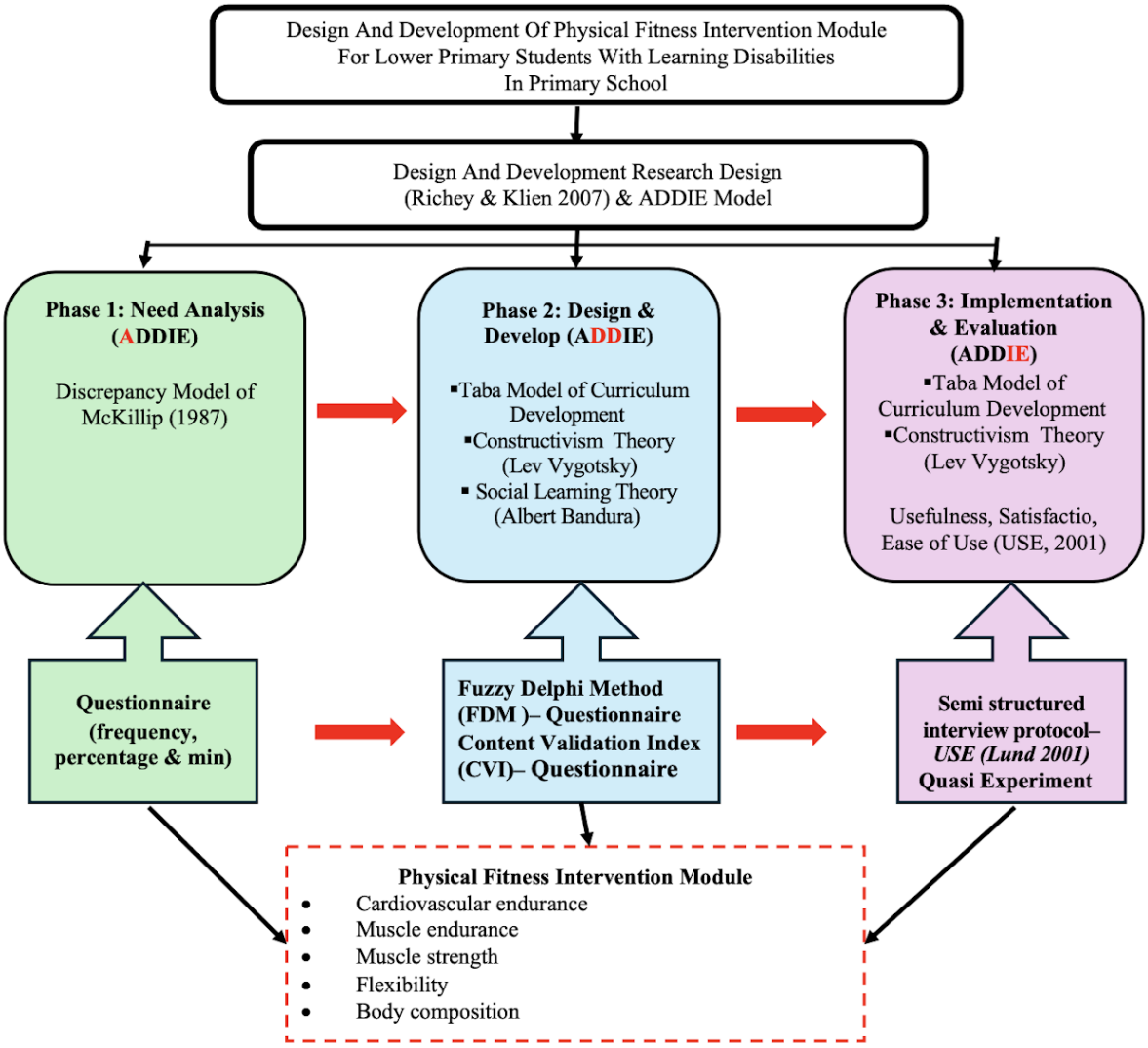

Figure 1 Conceptual Framework

This study is a Design and Development Research (DDR) using the ADDIE Model to develop a physical fitness intervention module for students with LD in lower primary school. The study consists of three phases: needs analysis, design and development, and implementation and evaluation. Theories and models such as Social Constructivism Theory, Social Learning Theory, ADDIE Model, McKillip Model, and Taba Curriculum Model, guide the development of this intervention module. During the needs analysis phase, the McKillip Model was used as the framework. The researcher surveyed teachers using a questionnaire to identify the needs for developing the module. The five steps of the McKillip Model were followed to perform the needs analysis. The findings from this phase helped the researcher understand the existing problems. SPSS software was used to analyze the data, with descriptive statistics such as frequency, percentage, and mean used to report the findings.

The next phase is the design and development phase. The Taba Curriculum Model was used to design the content of the module. The researcher followed the seven steps in this model and appointed experts from various fields, utilizing the Fuzzy Delphi Method during the design stage. A Fuzzy questionnaire was developed by interviewing five field experts, and 15

experts then answered the questionnaire to design the intervention module. During the development stage, the content of the module was validated with the views of various experts. Content validity was carried out using the Content Validation Index (CVI). Six experts answered the online questionnaire, and the data were analyzed.

The final phase of the design and development study is the implementation and evaluation phase. In this phase, the usability of the developed module was evaluated by interviewing special education teachers using the USE questionnaires. The USE questionnaire was adapted into an interview protocol to gauge teachers' perceptions of the module's usability. Additionally, a one-group quasi-experiment was conducted with pre-and post-tests. The one-group quasi-experiment consisted only of the treatment group. The SEGAK test was administered to determine the physical fitness level of students with LD in lower primary school, followed by the intervention (module) and finally the post-test (SEGAK).

Conclusion

In this study, an extensive literature review was conducted on various relevant topics, including physical fitness, health-related physical fitness, components of health-related fitness, physical activities for children with special needs, the ADDIE model, Constructivism theory, Social Learning Theory, and Design and Development Research (DDR). Based on the literature review, the researcher developed a conceptual framework to design and create a physical fitness intervention module for students with learning disabilities in lower primary schools. The study employs DDR as the research methodology and is organized into three phases: needs analysis, design and development, and evaluation.

In the first phase, data will be collected using a questionnaire instrument for the needs analysis. The data obtained will be analyzed using SPSS software, with descriptive statistics such as frequency, mean scores, and percentages. In the second phase, the Fuzzy Delphi Method (FDM) will be utilized to achieve consensus from 15 experts in fields such as special education and sports science. The developed module will undergo validation using the Content Validation Index (CVI), based on evaluations from six experts. The third phase will assess the usability of the module through an interview protocol adapted from the USE questionnaire. Additionally, a one-group quasi-experiment will be conducted with pre-and post-tests to evaluate the module's effectiveness. This structured approach ensures a comprehensive evaluation and validation of the physical fitness intervention module, leveraging expert consensus and empirical testing to enhance its relevance and effectiveness for students with learning disabilities in lower primary education.

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