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Motor Proficiency and Factors Influencing Motor Proficiency Throughout lifespan: A Narrative Review

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ABSTRACT

Motor proficiency plays a crucial role in physical and cognitive development, affecting various domains of an individual's life including academic performance, social interactions, and overall well-being. This narrative review synthesizes the existing literature to explore the intrinsic and extrinsic factors that affect motor proficiency. The key determinants identified include biological factors such as age, gender, and neurological health; psychological elements such as motivation and confidence; environmental influences including socioeconomic status and physical environment; and the role of physical activity, physical fitness, and physical education. The interplay of these factors reveals the complexity of motor proficiency development, emphasizing the need for holistic interventions and further research to address the gaps in understanding.

Keywords: Motor proficiency, factor influencing, biological, environmental, physical development

INTRODUCTION

To be proficient is to be skilled or competent. Motor proficiency is skilled or competent in performing motor tasks or movements [gross, fine, or both]. Motor proficiency refers to the ability to perform coordinated and efficient movements that involve both fine motor skills (e.g., writing and buttoning) and gross motor skills (e.g., running and jumping). It encompasses precision, timing, control, and adaptability in executing motor tasks[1]. Motor proficiency is the capacity to execute smooth, accurate, and purposeful movements, and is a critical component of a child's physical development and an indicator of overall motor competence[2]. Motor proficiency describes the level of skill and efficiency in performing coordinated motor actions that integrate sensory-motor, cognitive, and biomechanical systems to achieve specific physical goals[3]. Motor proficiency is defined as the ability to perform motor tasks that require strength, endurance, balance, and coordination, and is essential for physical health, social interaction, and daily activities[4].

Motor proficiency encompasses the ability to perform and refine motor tasks efficiently by integrating the physical, cognitive, and sensorimotor functions. It serves as a cornerstone for physical activity, sports, and everyday tasks, and contributes to overall health and social participation. Despite their importance, motor proficiency is influenced

by a range of factors that vary across developmental stages and environments.

Motor proficiency is largely studied across the lifespan, but there are few studies encompassing motor proficiency in adults. This study aims to review the literature on motor proficiency across lifespan and the factors that influence the emergence and refinement of motor proficiency or motor competency, as well as the factors that are affected or influenced by motor proficiency.

METHODOLOGY

This narrative review included studies focusing on motor proficiency and its influencing factors. The search was conducted using databases such as PubMed, Google Scholar, and Scopus, employing keywords like "motor proficiency," "developmental coordination disorder," "environmental factors," and "psychological factors."

This review included articles published only in English. Articles were included if they provided insights into the biological, psychological, environmental, or educational determinants of motor proficiency.

A total of 56 articles were found in the literature. A total of 25 full text articles were included. The studies included various observational, correlational, longitudinal, cross-sectional, reviews, and experimental study designs. Observational correlational studies have revealed relationships between various factors, motor proficiency, and motor competencies. Longitudinal studies have examined the emergence, development, and maturation of motor skills and motor abilities across the lifespan.

RESULTS

The results of this review are narrated under various subheadings to summarize the findings associated with factors affecting motor proficiency and factors affected by motor proficiency.

1. Biological Factors

1.1 Age and Developmental Stages

In general, we already know of the influence of biological and genetic factors on motor proficiency. Motor proficiency is closely tied to developmental milestones that vary with age. Motor skills develop rapidly during early childhood, with critical periods for foundational skill acquisition. As children grow, their motor proficiency often improves because of maturation and practice[5].

Studies have shown that older adults tend to have lower performance levels than younger adults. In addition, regardless of learning gains, older adults functioned at a lower level. Most studies have revealed that performance gains in fine motor skills diminish in older adults. Thus, performance differences between younger and older adults have increased in practice[6,7].

1.2 Gender Differences

Sex-related physiological and hormonal differences influence motor proficiency. For example, boys often outperform girls in gross motor tasks, such as running and jumping, while girls tend to excel in fine motor tasks, such as drawing and handwriting[8].

Owing to the physiological differences, girls performed poorly relative to boys in object control skills, and this childhood object control proficiency helps predict adolescent proficiency[9].

1.3 Neurological Health

Conditions such as cerebral palsy, autism spectrum disorder, and developmental coordination disorder (DCD) significantly affect motor proficiency by affecting balance, coordination, and motor planning[10].

2. Environmental Factors

2.1 Physical Environment

Natural environmental stimulation plays a critical role in optimal child motor and social development in the early stages of life. A developmentally

rich contexts, such as that of nature schools, can provide assured, confident, and enriching opportunities for the development of almost all motor proficiency and social maturation of preschool children[11].

Access to safe and stimulating environments such as playgrounds or sports facilities provides opportunities for practicing motor

skills. Conversely, urban settings with limited play space can restrict motor development[12].

2.2 Parental and Peer Influence

Supportive parental behaviors such as encouraging active play and participation in sports positively impact motor proficiency. Similarly, peer interactions also provide opportunities for skill practice and social learning[13].

2.3 Socioeconomic Status (SES)

SES significantly influences access to resources that promote motor skill development such as sports facilities, equipment, and nutritious food. Children from lower-SES backgrounds often face greater challenges in achieving motor proficiency[14].

3. Psychological Factors

3.1 Cognitive Abilities

Motor proficiency relies on executive functions such as attention, memory, and problem solving. Deficits in these areas, such as those seen in attention deficit hyperactivity disorder, can hinder motor skill development[15].

3.2 Motivation and Confidence

Self-efficacy and intrinsic motivation are critical to motor skill acquisition. Children with higher confidence levels are more likely to engage in physical activities that enhances motor proficiency[16].

3.3 Mental Health

Perceived social support plays an important mediating role in understanding the link between motor proficiency and emotional outcomes in young adults. Lower perceived social support can affect mental health. It is known that individuals with movement problems are more likely to withdraw from social participation, particularly physical and sporting participation[17].

4. Physical Activities and Physical Educational

4.1 Physical Activities

Early childhood is regarded as an important period for motor and cognitive development and understanding the effects of physical activity on motor skills and cognitive development in preschool children. There is causal evidence of the relationship between physical activity and both motor skills and cognitive development in preschool children, with increased physical activity having significant beneficial effects on motor skills and cognitive functioning[18].

Motor Competency categories locomotor and stability skills are more frequently and strongly associated with the health-related fitness index in both boys and girls aged 7-14 years[19].

A positive correlation exists between motor competency, health-related fitness, and perceived motor competency in college-aged males, but these relationships are expressed differently depending on individual skills and the type of measurement used[20].

4.2 Physical Education Programs

Structured physical education programs that emphasize skill variety, engagement, and individualized instruction are crucial for enhancing motor proficiency[21].

Curriculum-based physical education classes can have a substantial effect on the development of overall motor competence in children and adolescents. To enhance motor competence, teacher-led physical education classes should operationalize a specific curriculum, including fundamental motor/movement skills, physical literacy, and/or gymnastics, which appears to be more effective than teacher-led non-specific/standard physical education[22].

5. Exposure to screentime

Children who spent more time in front of a screen at age four also did so at ages five and seven. A negative relationship was observed between screen time at ages four, five, and seven and motor proficiency at age 7[23].

There is an adverse association between screen time and manual dexterity skills[24].

DISCUSSION

Motor proficiency refers to the ability to perform coordinated and efficient movements that involve both fine motor skills (e.g., writing, buttoning) and gross

motor skills (e.g., running, jumping). It encompasses precision, timing, control, and adaptability in executing motor tasks[1]. This motor proficiency, when expressed in terms of advanced motor skills, is referred to as motor competency in the literature. The development of motor proficiency is shaped by an intricate interplay between biological, psychological, and environmental factors. For instance, while biological predispositions set a baseline for skill potential, environmental support and psychological factors often determine whether the potential is realized.

The literature suggests that the process of development occurs according to the pattern established by the genetic potential and the influence of environmental factors. First, the family in which the child is reared plays a leading role in child development. Factors such as the family's socioeconomic status, the mother's educational level, and the existence or absence of siblings affect children's development. Permissive, accepting families, providing a healthy and effective environment, and many opportunities for perceptual-motor experiences help children's development[25].

The importance of physical activity has been emphasized in the literature on motor proficiency. Physical activity and motor proficiency showed interdependent relationships. Physical activity in the form of physical fitness in adolescents and physical education classes in children were positively correlated with motor proficiency. In addition, motor proficiency improves with physical activity and correlates with various physical fitness attributes. A reciprocal relationship exists between these two variables.

A study identified positive associations between motor competence and physical activity, composite fitness scores, muscular endurance, muscular power, muscular strength, cardiovascular endurance, perceived motor competence, and motivation, and inverse associations between motor competence and weight status, speed, and agility in adolscents[26]. This finding provides evidence that there exists an interplay between motor proficiency, motor competency, physical fitness, and its attributes.

The literature also highlights the importance of limiting screen time in children, which could hamper physical activity and thus have an adverse effect on motor proficiency. There is growing evidence to support the benefits of a structured and diverse form of physical education classes[22].

CONCLUSION

Motor proficiency is influenced by a multifaceted array of factors spanning the biological, psychological, environmental, physical activity, and physical education domains. Recognizing these interconnected factors is essential for creating targeted interventions to enhance motor skill development and reduce disparities.

Implications for Practice

Educators, healthcare professionals, and policymakers should recognize the diverse factors that influence motor proficiency. Interventions should be tailored to individual needs, addressing not only skill deficits but also underlying barriers with respect to the population and specific causes.

Limitations and Future Research

Although this review provides a broad overview, it is limited by the heterogeneity of the included studies and potential publication bias. Future research should focus on longitudinal studies that explore the causal relationships between factors and motor proficiency.

Declaration by Authors

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