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METACOGNITION AND PHYSICAL ACTIVITY – MENTAL AND PHYSICAL HEALTH

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SUMMARY

Metacognition and physical activity represent two important areas that can be interconnected to improve cognitive functions and overall human health. Metacognition refers to an individual's ability to understand and manage their cognitive processes, such as planning, monitoring, and adjusting thinking strategies. On the other hand, physical activity positively impacts physical health but can also have beneficial effects on mental processes, including metacognitive skills. The relationship between metacognition and physical activity lies in the fact that regular physical activity can enhance metacognitive abilities, such as attention, memory, concentration, and coping strategy development. Individuals who engage in regular physical activity demonstrate a better ability to reflect on their mental processes, which can lead to increased confidence in learning and problem-solving. Furthermore, physical activity can positively influence stress reduction and emotional well-being, which may improve and enhance metacognitive skills, such as self-awareness and emotional regulation. The implementation of physical activity into daily life offers a holistic approach to improving health, including cognitive aspects, and encourages the understanding and management of one's thought processes. Scientific research in this field is still exploring how different forms of physical activity affect specific metacognitive processes and how metacognition can be integrated into physical activity performances. The connection between metacognition and physical activity provides new opportunities for developing interventions that could enhance cognitive functions and the overall health of individuals.

Key words: *metacognition, physical activity, cognitive function*

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INTRODUCTION

Two key aspects of human life are metacognition and physical activity. Metacognition is the ability to think about one's thinking. It involves an individual's awareness of their thoughts, the thinking process, as well as the ability to plan and adapt thinking strategies. It plays an important role in learning, decision-making, and problem-solving by understanding one's cognitive processes (Stanton et al., 2021; Rivas et al., 2022). Physical activity is any bodily movement that requires energy expenditure. Due to its positive effects, it plays a crucial role in human life, not only for physical health but also for mental well-being (Tacchi et al., 2019; Briguglio et al., 2020). Regular physical activity can improve cardiovascular health, fitness, maintain a healthy body weight, and reduce the risk of many diseases. It can also reduce stress, depression, and anxiety, improve mood, and contribute to an overall increase in quality of life (Lasikiewicz et al., 2014; Warburton & Bredin, 2017; Firth et al., 2017). Physical activity is most commonly associated with physical health, while metacognition is linked to cognitive abilities and self-awareness (Stanton et al., 2021; Rivas et al., 2022). However, these aspects are interrelated, as physical activity can positively impact metacognition, and metacognition can influence physical activity. Engaging in regular physical activity can improve cognitive functions, including concentration, attention, and decision-making abilities. It can also reduce stress, which leads to improved metacognitive skills and better management of one's thoughts (Nuzum et al., 2020). Both physical activity and metacognition play significant roles in human daily life in various ways. In the workplace, metacognition can help employees manage their tasks, deadlines, and priorities more effectively, while physical activity can improve energy levels, productivity, and creativity, resulting in better work performance (Friedman & Miyake, 2017). Additionally, metacognition enables individuals to better understand their feelings and thoughts, which is crucial for decision-making, while physical activity helps reduce stress and improve mood, which can facilitate the process of making rational professional decisions (Awick, 2017). In education and learning, metacognition helps students better understand their learning strategies, set goals, manage time, and adapt their learning methods to achieve better results, while physical activity can improve concentration and cognitive abilities, facilitating learning and memory retention (Vrdoljak & Velki, 2012; Filipec et al., 2024). Metacognition enables individuals to better understand their emotional reactions and how to cope with them, while physical activity can improve mood and assist in dealing with emotional challenges (Erickson et al., 2012; Lasikiewicz et al., 2014; Warburton & Bredin, 2017). Together, metacognition and physical activity can improve and enhance the quality of life, contributing to better emotional, physical, and mental health in everyday life.

METACOGNITION: "KNOWLEDGE OF ONE'S OWN KNOWLEDGE"

Metacognition is a complex concept that refers to the ability to understand and manage one's cognitive processes. It involves awareness of one's memory, thoughts, perception, and problem-solving (Jankowski & Holas, 2014). This means that an individual is not only aware of visible external actions but also of their internal processes. The ability of metacognition represents more than mere awareness; it includes the ability to control and regulate one's cognitive processes (Rahnev, 2021). An example of this is recognizing a loss of concentration during learning and deciding to take a break. A person can reflect and ask themselves questions such as, "How am I thinking about this task?" or "Which strategy will I use to solve it?" This ability to think allows individuals to recognize their strengths and weaknesses and adapt their approach to achieve better outcomes (Jankowski & Holas, 2014; Szczepanik et al., 2020). It may include assessing one's understanding of the material during learning, planning time for tasks, setting goals for work efficiency, monitoring progress, and recognizing and correcting errors in thinking. Understanding and controlling one's cognitive abilities ensure successful coping with challenges in everyday life activities (Efklides, 2008; Kolesarić & Milić, 2014; Kuzmić & Filipec, 2022). Metacognition is not an innate ability; it develops over time and undergoes various developmental stages, especially during childhood and adolescence. During early childhood, children do not have full awareness of their cognitive processes, but around the age of four, they begin to develop a basic level of metacognitive awareness. An example of this is when a child is asked something they don't know and responds, "I don't know!" which signals the beginning of the ability to recognize their knowledge or lack thereof (Brinck & Liljenfors, 2013). As children grow, they begin to understand these abilities more and apply specific thinking methods regarding their actions and strategies for problem-solving. Later, during adolescence, metacognitive abilities become more sophisticated, and individuals become increasingly aware of their choice of strategies and techniques to improve cognitive processes. They develop the ability to assess their characteristics and think critically by setting realistic goals (Schneider, 2008). However, it is important to note that there is significant variation in the development of metacognition among individuals. For some, higher levels of metacognitive skills naturally develop, while others need to cultivate them through appropriate education and/or improvement through training and lifelong learning (Jackson & Kleitman, 2014; Faivre et al., 2018; Mazancieux et al., 2020; Abdelrahman, 2020). Understanding the process of metacognitive development and its formation throughout life can influence an individual's behavior and characteristics in various life situations, including its connection with physical activity.

METACOGNITION IN DAILY LIFE: THE POTENTIAL OF SELF-AWARENESS

Metacognition plays a crucial role in an individual's everyday life and can significantly affect their abilities, decisions, and emotional well-being. By using metacognitive abilities, individuals can better think about and analyze their problem-solving strategies and make better decisions. It also enables them to better assess their priorities and goals and make decisions aligned with their own needs and desires (Bhome et al., 2022). Individuals who are aware of their thoughts and feelings can better understand their reactions to stressful situations and apply coping strategies, such as recognizing their negative thoughts and redirecting them toward positive directions. Furthermore, metacognition can improve communication and interaction in social relationships. Understanding one's reactions and the ability to recognize the onset of conflict can ultimately contribute to better conflict resolution and the building of more positive interpersonal relationships. This can also be observed in everyday life during political and religious discussions. It is an essential characteristic, not only as an individual's ability to understand themselves but also to understand themselves about others by making fairer and more reasonable decisions (Jakovljević, 2005; Rollwage, 2018; Heyes et al., 2020). When metacognition is considered in the context of an individual's cultural background, the literature suggests that metacognitive abilities related to interpersonal relationships and personal functions are primarily enabled by cultural learning and are partially adaptive due to cultural selection (Heyes et al., 2020; Frith, 2023). A person's functioning in everyday life is also connected to metacognitive judgment abilities, including the monitoring of internal spatial cues and environmental signals. External environmental cues refer to the intake of global and local information from the external world, including auditory and visual signals (Chen et al., 2017), while internal spatial cues provide information about one's position in space (Stevens & Carlson, 2016). This confirms that metacognition plays a significant role in learning from the environment. For example, during daily human movement, individuals engage in monitoring environmental information by assessing and remembering paths, using a control mechanism to prevent loss of orientation. Environmental learning requires the encoding of verbal, visual, and spatial information, which occurs gradually and must be integrated over time. Depending on conditions, time, and motivation, various circumstances can affect the reliability of environmental cues. Relying on unreliable cues can undermine the accuracy of metacognitive judgment and the success of memory (Mason et al., 2022). Understanding one's cognitive processes and applying metacognitive strategies enables individuals to better understand themselves, make better decisions, and cope more effectively with life's challenges. This ability

can also positively impact the completion of everyday work tasks, as it facilitates better planning and management to achieve desired outcomes (Fleming & Bang, 2018; Shea & Frith, 2019).

PHYSICAL ACTIVITY

Physical activity is considered one of the basic human needs for functioning, to maintain and improve health. It encompasses a wide range of movements and includes all forms of human body movement that require effort and increase energy expenditure (Caspersen et al., 1985). People can engage in physical activities of varying intensity, duration, and type. For example, some may prefer moderate-intensity training in the gym, while others may prefer cycling or walking as forms of recreational physical activity. Physical activity also includes daily activities that are an integral part of life, such as climbing stairs, walking to the store, walking to work, or even performing household chores like cleaning and cooking. These everyday activities also contribute to the overall level of physical activity (Thomas et al., 2019; Miko, 2020). Engaging in physical activity has numerous physical and psychological benefits that contribute to overall health and well-being. It plays a vital role in preserving both physical and mental health and is a key component of a healthy lifestyle (Pearce, 2008; Pedersen & Saltin, 2015; Firth et al., 2020). Understanding what physical activity means, its benefits, and how it can be adapted to everyday needs helps individuals make informed decisions about their health.

INTEGRATION OF METACOGNITION IN PHYSICAL ACTIVITIES

The integration of metacognition in physical activities refers to an individual's ability to understand and manage their thoughts and thinking processes during performance. In applied contexts, it is typically associated with self-awareness and introspection aimed at improving performance and experience (Ngô, 2013). Some examples of integrating metacognition into physical activities include awareness of breathing, self-confidence and motivation, goal-setting, body monitoring, and performance analysis.

Breathing Awareness

One of the key components of metacognition in physical activities is breathing awareness. This involves an individual's focus and control over their breathing pattern during activity performance. Utilizing this awareness can improve the overall experience and performance quality of the physical activity. Understanding the rhythm and depth of breathing, along with controlling breath during exercise, can enhance endurance by optimizing breathing patterns. Breathing awareness helps individuals learn how to breathe properly during different physical activities. For example, during aerobic exercises such as running or cycling, deep and rhythmic breathing helps provide better oxygenation to the body, leading to increased endurance and reduced fatigue. Learning to breathe deeply and be controlled can calm the nervous system and reduce tension, which results in improved comfort and reduced stress. Additionally, during exercises or training, breathing awareness enables individuals to become more sensitive to signs of fatigue or physical overload. By noticing shallow and irregular breathing, a person can become aware that a break is needed or that the intensity should be reduced to prevent potential negative consequences (Baquet et al., 2003). Furthermore, breathing awareness can be used as a relaxation technique after activity or as part of meditation practices. Deep, focused, and controlled breathing aids in relaxing the mind, reducing muscle tension, and contributing to overall physical health. Properly directed breathing contributes to greater concentration and attention during everyday physical activities, training sessions, or sports competitions. This technique involves awareness of the way an individual breathes and the understanding that breathing is a critical part of the bodily process that influences performance quality, recovery, and overall experience during physical activities (Hölzel et al., 2011; Ngô, 2013). The integration of metacognition begins with becoming aware of the rhythm of breathing during exercise. For example, synchronizing breath with steps when walking, running, or the rhythm of movements in aerobic activities. Becoming aware of this rhythm improves oxygen supply to the body and enhances performance. Furthermore, an individual's awareness of the depth and control of their breath during various phases of physical activity allows for better adaptation, reduces fatigue, increases endurance, and contributes to better control of the body's response. For example, during intense physical activities, awareness of breathing can help individuals recognize moments of stress and apply relaxation breathing techniques to reduce tension and stress, contributing to physical and mental balance. Additionally, meditation techniques focusing on breathing can help calm the mind, achieve concentration, and enhance awareness during exercise (Marenus et al., 2023; Weng et al., 2021). Breathing awareness through the integration of metacognition contributes to a holistic approach to physical activity, where the focus is not only on physical performance but also on the mental processes that support and enhance it, improving the overall experience during physical activity performance.

Body Monitoring

In the context of metacognition, body monitoring in physical activities refers to the ability of an individual to consciously sense and interpret bodily sensations, movements, and other signs during performance. This ability enables a better understanding of one's body, awareness of proper movement execution and body positioning, as well as recognition its needs during

physical activity. By using metacognitive skills, a person can notice if they are performing a movement incorrectly or holding their body in an improper position. They can also consciously assess bodily sensations such as muscle tension, identify early signs of fatigue or discomfort, and ensure timely responses. By carefully monitoring their body, an individual can quickly identify potentially dangerous situations, such as overloading the musculoskeletal and/or cardiovascular system, and by responding promptly, reduce or avoid possible negative consequences such as injuries (Andersen et al., 2004). Additionally, body monitoring allows individuals to track their progress during performance by observing certain indicators. For example, one may notice gradual improvements in strength, endurance, or flexibility and use this information for further motivation and goal-setting. The integration of metacognition into physical activities fosters a deeper mental connection with the body, enhancing understanding of one's physical responses to stress, emotions, or fatigue. Through body monitoring via metacognition, individuals become more aware of their bodily needs, leading to improved safety, efficiency, and a more positive experience of physical activity (Williams, 2000; Andersen et al., 2004).

Setting Realistic and Specific Goals

Goal setting, in the context of metacognition and physical activities, refers to the process of defining realistic and specific goals related to physical fitness, exercise, or sports activities and managing thoughts and strategies to achieve these goals. These goals may vary, such as achieving a certain level of physical fitness, improving endurance, losing weight, or achieving a specific sports result. Metacognition enables individuals to reflect more deeply on their motives for achieving selected goals, why these goals are important, and how reaching them will impact their well-being. By becoming aware of metacognitive skills, an individual can track their progress and identify internal obstacles, such as negative thoughts or patterns that may hinder goal achievement. The integration of metacognition into goal-setting allows individuals to better understand their desires and needs, plan concrete steps and activities, and more effectively manage thoughts and strategies to achieve the set goals (Hall, 2008).

Self-confidence and Motivation

The integration of metacognitive skills into physical activities focuses on managing one's thoughts, emotions, and beliefs to improve self-confidence and maintain motivation during performance. Metacognition allows an individual to recognize negative thoughts and beliefs that may diminish motivation. This includes thoughts such as, "I'm not good enough, and I can't do this." Recognizing such negative thinking can represent the first step in countering or redirecting it toward positive and constructive solutions. This involves replacing negativity with affirmations like, "Every effort is a step forward, and I can do this" (Howie & Pate, 2012). By understanding and managing negative thoughts and doubts that may arise during physical activities, an individual can improve motivation and self-confidence. If a person are aware of their successes and achievements during exercise or other physical activities, they will develop greater self-assurance, monitor their progress, and feel more confident and motivated. The integration of metacognitive skills enables an individual to think more deeply about their motives and understand why they engage in specific physical activities, which helps maintain long-term motivation (Steeves et al., 2015). Additionally, individuals can use metacognitive skills to identify obstacles encountered on the path toward achieving set goals, and understanding these obstacles helps develop strategies for overcoming them, which also ensures sustained motivation. Awareness of one's thoughts and emotional state during physical activities leads to self-assessment. A person can track their thoughts and feelings to better understand their own needs and adjust their approach accordingly. This might also include planning rewards for achieving goals, which will motivate the individual to put in more effort to achieve their set objectives. The integration of metacognition into self-confidence and motivation during physical activities helps individuals become more aware of their thoughts and emotions, directing them toward the achievement of personal goals (Wells & Cartwright-Hatton, 2004; Bélanger, 2017).

Performance Analysis

Performance analysis refers to an individual's metacognitive ability to carefully and critically evaluate their performance during physical activities, identify their strengths and weaknesses, and develop strategies for improvement. Before beginning performance, a person can set clear goals as references for specific exercises or sports competitions and carefully track their performance (time, number of repetitions, technical characteristics), as well as their overall sense. Additionally, an individual's ability to critically reflect on their performance after completing the activity helps identify areas that need improvement and plan for progress. This includes identifying areas where the person feels confident and those that require further development (Mišigoj-Duraković, 2018; Zhang et al., 2020). By using metacognitive skills, a person becomes aware of both their mind and body, recognizing fatigue, pain, negative thoughts, and emotions that may arise. Instead of becoming discouraged by negative thoughts or self-criticism, a person can apply metacognition to focus on constructive feedback aimed at improvement and think about necessary self-help strategies. Based on performance analysis through metacognition, an individual can develop a plan for future physical activities or competitions, which may include setting goals for improvement, developing specific training regimens, and working on technical aspects of

performance. This allows individuals to mentally prepare, including visualizing successful performances, fostering positive self-confidence, and focusing on control during exercise. Performance analysis through metacognition helps individuals improve their physical activities by better understanding their performance and developing strategies for improvement. One can track their progress and assess whether the strategies applied are effective by comparing new performances with previously achieved results. This awareness also helps increase satisfaction and reduce stress during physical activities, allowing individuals to become more aware of their emotions and thoughts (Williams, 2000; Bao et al., 2024).

Planning Daily Activities

Metacognition can improve physical activity in everyday life, particularly for individuals who are not professional athletes but wish to engage in regular exercise to maintain a healthier lifestyle, regardless of their physical fitness level. It helps individuals plan their physical activities more effectively by setting priorities for performing exercises and incorporating physical activities into their daily schedule (Mišigoj-Duraković & Duraković, 2006). For example, an individual can use their metacognitive skills to design a weekly workout plan that fits into their family and work obligations. In everyday life, there are often obstacles that can hinder physical activity due to daily responsibilities.

Metacognition enables individuals to recognize these obstacles and develop strategies to overcome them, by identifying negative thoughts such as, "I'm too tired," or "I don't have time," and applying techniques to counter these thoughts (Rhodes et al., 2018). By understanding priorities, individuals can better manage their resources and time to ensure that physical activity remains a regular part of their daily life. Maintaining motivation for regular exercise in daily life is often challenging, but metacognition can help individuals understand their motivations and recognize how positive thoughts about the importance of physical activity can boost their motivation. Individuals who apply metacognitive skills regularly assess their activities to determine whether they have achieved their goals, allowing them to adjust their plans and strategies according to their needs in specific life circumstances. The metacognitive approach enables better understanding of one's behavior, thoughts, and emotions related to physical activity, which leads to positive changes in lifestyle (Loprinzi & Nooe, 2016).

„THE MIND AND BODY SPEAK THE SAME LANGUAGE" - PROMOTING AWARENESS OF METACOGNITION IN PHYSICAL ACTIVITIES

Promoting awareness of metacognition can help individuals become more conscious of their emotions and thoughts related to physical activity. Increased awareness provides the potential to improve health and well-being by fostering positive lifestyle changes and daily habits. It contributes to a broader understanding of how awareness of one's emotions and thoughts can be beneficial for maintaining an active lifestyle and achieving specific goals. Cognitive processes are often automatic, much like breathing. Therefore, it is essential to consider whether individuals pay attention to their thoughts, how they think, whether they understand them, and what decisions they make. Metacognition plays a crucial role in this by facilitating the interaction between the brain, mind, body, and behavior, integrating effective strategies through which mental, social, and behavioral factors can influence health (Jakovljević & Ostojić, 2015). Education and fostering collaboration across various disciplines such as education, public health, psychology, psychiatry, and sports sciences are necessary to integrate metacognition and expand the understanding of the effects of physical activity and a healthy lifestyle. This could involve lectures, workshops, and/or online materials explaining what metacognition is and how it can be applied to enhance physical activity and overall health. Furthermore, collaboration with media, physical activity experts (e.g., physiotherapists), and other promoters of healthy lifestyles within the fitness industry is crucial for raising awareness about metacognition and how it can improve physical activity and/or athletic performance. Integrating metacognition education into school curricula, especially for younger generations, is important to highlight the significance of understanding one's emotions and thoughts in the context of physical activity. Students could be taught how to develop positive metacognitive strategies and recognize and control negative thoughts that hinder them from being active. Collaboration with mental health professionals, applying metacognitive techniques, can also contribute to improved mental health, both for individuals struggling with depression, anxiety, and stress, as well as for the general population (Jakovljević & Muck-Šeler, 2013). Promoting funding and supporting research projects focused on metacognition and physical activity will encourage further research and the development of metacognitive approaches. This may include the availability and application of practical apps and the development of digital tools that assist individuals in applying metacognitive techniques during physical activities. Furthermore, organizing initiatives and campaigns to educate the wider public about the concept of metacognition in physical activities can provide concrete and useful practical recommendations. This would help individuals and professionals (educators, coaches, decision-makers) utilize metacognitive strategies during physical activities in their work or daily lives. This may involve developing strategies for monitoring one’s thoughts, emotions, and physical sensations during performance, as well as recognizing negative patterns of thinking that may interfere with specific physical activities. It is essential to encourage and motivate people to develop positive metacognitive

strategies to cope with negative emotions and thoughts, paying attention to fears, frustrations, and low self-confidence that may arise during the execution of certain activities. Additionally, providing information on available educational methods for applying metacognitive skills to achieve better mental and physical health is necessary.

CONCLUSION

Metacognition, as an important factor in physical activities, can be crucial for achieving and maintaining physical activity, as well as for increasing motivation and overcoming barriers to engaging in physical activities. Improving metacognitive skills can have a positive impact on the overall health and well-being of individuals. Greater awareness of one's emotions and thoughts can reduce stress, anxiety, and depression, contributing to better physical and mental health. Additionally, metacognition can serve as a tool for prevention and intervention in the fight against physical inactivity and its negative consequences. Various metacognitive techniques need to be integrated into programs for the prevention of obesity, cardiovascular diseases, and other health issues associated with a lack of physical activity. Developing metacognitive skills can encourage individuals to establish healthy habits and maintain long-term lifestyle changes, as well as overcome challenges that typically lead to the abandonment of physical activity. It is crucial to include different populations and groups in the promotion of metacognition in physical activities by providing tailored approaches for individuals, as well as synthesizing key insights and emphasizing the importance of metacognition in physical activity for practical application in their lives. Finally, it is essential to highlight the transdisciplinary nature of the field, aimed at restoring cognitive, physical, behavioral, and affective functions that can contribute to achieving healthcare not only for individuals but also for public health and global health protection at the population level (Jakovljević & Bevanda, 2024).

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