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Regular exercise interfering lucid dreams: A review

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Abstract

Exercise and lucid dreaming might seem unrelated, but there's an interesting connection between physical activity and the ability to experience lucid dreams. Several studies have shown evidence that it improves quality of sleep by increasing tendencies to reach rapid eye movement stage. It also lowers insomnia relating stress, anxiety and depression, so as rather help in having lucid dreams. Mindful exercise always enhance body awareness and aerobic exercise increase the tendencies of having lucid dreams more likely recall of dreams. Even researches showed that Exercising too close to bedtime might make it harder to fall asleep initially, but once you do, the intense physical fatigue could lead to deeper sleep and, subsequently, more vivid dreams. However, balance is key, as too much physical exertion might cause restlessness instead. By integrating exercise into daily routine and focusing on techniques that promote lucid dreaming, it can be said that dreams become more vivid, easier to recall, and more controllable. Different types of exercise, and their patterns control kind of dreaming in many ways which are yet to be nurtured and analysed.

Keywords: Lucid dreams, sleep, exercise, insomnia, mindful exercise

Introduction

Exercise benefits virtually every system of the body, leading to improved overall health and function. Regular physical activity positively impacts each physiological system. Out of which many odd and even aspects are already established by many researches. For example: Exercise strengthens the heart muscle, improves blood circulation, and increases the efficiency of the cardiovascular system. Regular physical activity helps lower resting blood pressure and reduces the risk of hypertension. Exercise improves the balance between HDL ("good") cholesterol and LDL ("bad") cholesterol, reducing the risk of atherosclerosis. Consistent physical activity lowers the likelihood of developing heart disease, stroke, and other cardiovascular conditions ^[1]. Though other physiological systems like respiratory, circulatory, musculoskeletal, brain and spinal cord, reproductive, integumentary, excretory, digestive and immune system acquire immense benefits from regular exercise ^[20]. Exercise increases lung capacity and improves the efficiency of oxygen exchange. Aerobic exercises like running or swimming enhance the ability to take in oxygen and expel carbon dioxide, which makes breathing easier and more efficient ^[3]. Activities that challenge your breathing, like high-intensity training, strengthen the diaphragm and intercostal muscles, which support breathing. Weight-bearing exercises (e.g., strength training, running) increase bone density and muscle mass, reducing the risk of osteoporosis and sarcopenia (muscle loss) ^[4]. Regular movement helps lubricate the joints, reduce stiffness, and improve flexibility, lowering the risk of arthritis and joint pain. Activities like yoga, tai chi, and strength training improve neuromuscular control, balance, and coordination, reducing the risk of falls, especially in older adults. Exercise increases metabolic rate, helping with weight control by burning calories even at rest ^[5]. Physical activity increases insulin sensitivity, allowing muscles to use glucose more efficiently, which helps control blood sugar levels and reduces the risk of type 2 diabetes ^[6]. Regular exercise shifts the body's energy usage toward burning fat, leading to better weight management and reduction of visceral fat. Exercise enhances blood flow to the brain, promoting cognitive function, memory, and concentration ^[7]. It also supports neurogenesis (the growth of new neurons) in areas like the hippocampus, which is involved in learning and memory ^[8]. Physical activity helps the nervous system become more efficient

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at controlling movement and coordinating muscle actions, especially through neuromuscular training. Regular physical activity lowers the risk of diseases like Alzheimer's and Parkinson's by preserving cognitive function and reducing inflammation^[9]. Exercise helps regulate hormone levels, including insulin, cortisol, and growth hormones, which are essential for metabolism, stress responses, and overall energy balance^[10]. Physical activity stimulates the release of endorphins, which elevate mood, reduce pain, and contribute to feelings of well-being ("runner's high"). Resistance training triggers the release of growth hormone and testosterone, which are important for muscle repair and regeneration^[11]. Regular moderate exercise enhances the circulation of immune cells (e.g., white blood cells, lymphocytes) that help the body fight infections and reduce the risk of illness. Physical activity helps lower systemic inflammation by reducing inflammatory markers like C-reactive protein, improving immune regulation^[12]. Exercise slows the age-related decline in immune function (immune-senescence), keeping the immune system more resilient in older adults. Exercise stimulates intestinal contractions, promoting more regular bowel movements and reducing the risk of constipation^[13]. Regular physical activity promotes a healthy balance of gut bacteria, supporting digestion, metabolism, and immune function. Physical activity can help regulate hunger hormones (e.g., ghrelin and leptin), reducing cravings and helping with weight management^[14]. Exercise boosts lymphatic flow by stimulating the movement of muscles and tissues, aiding in the removal of toxins and waste from the body. The enhanced lymph flow helps immune cells travel more effectively through the body, aiding in the detection and elimination of pathogens^[15]. Regular exercise can improve hormone regulation, menstrual cycle regularity, and fertility. It also reduces the risk of Polycystic Ovary Syndrome (PCOS) in women^[16]. Exercise increases blood flow and improves cardiovascular health, which enhances sexual function and reduces the risk of erectile dysfunction in men. Exercise boosts circulation and helps deliver oxygen and nutrients to the skin, promoting a healthy complexion and reducing signs of aging^[17]. Sweating during exercise helps eliminate toxins and impurities from the skin, contributing to clearer pores and a healthier glow. Exercise has been shown to alleviate symptoms of depression and anxiety by boosting mood-regulating chemicals and hormones^[18]. Physical activity helps lower cortisol levels, promoting relaxation and reducing the negative impact of chronic stress on the body. Regular exercise can improve body image, self-confidence, and overall psychological well-being^[19]. Overall, exercise benefits every system in the body, contributing to better health, enhanced functioning, and improved quality of life^[20].

Effects of various types of exercises in dreaming

Incorporating regular exercise into your routine can improve both the quantity and quality of sleep, contributing to better overall health. Different types of exercise can influence the quality and content of your dreams by affecting sleep stages, particularly REM (Rapid Eye Movement) sleep, the stage most associated with vivid dreaming^[21]. Many researches have shown that various modes of exercise have shown remarkable effects upon the health which are as follows.

Aerobic exercise (E.g., running, cycling, swimming)^[12, 23]

Aerobic exercise helps promote longer periods of REM sleep, which is the sleep stage where most dreaming occurs.

The extended time in REM can lead to more vivid, detailed, and memorable dreams. Consistent aerobic activity can enhance overall sleep quality, which may lead to better dream recall as you wake up from clearer, more structured REM sleep cycles. Due to its role in reducing stress and promoting endorphins, aerobic exercise can lead to more positive or pleasant dreams. Feelings of happiness or accomplishment after exercising may carry into dream content. Improved sleep quality and mental health benefits from aerobic exercise can reduce the occurrence of nightmares or stressful dreams, especially in individuals dealing with anxiety or PTSD.

Strength training (E.g., weightlifting, resistance exercises)

Strength training is particularly effective at increasing the amount of deep sleep (slow-wave sleep). While dreaming is less common in deep sleep, it sets the foundation for better overall sleep quality, which may lead to more vivid REM sleep later in the night. With improved overall sleep health and more restorative deep sleep, individuals may experience clearer REM sleep, which can promote the occurrence of lucid dreaming (being aware of dreaming while in a dream). Strength training can help reduce physical and mental stress, which might reduce the number of anxiety-induced or negative dreams that people experience during periods of high tension^[24].

Yoga and mind-body exercises (E.g., pilates, tai chi, meditation)

Yoga and similar practices often lead to more restful sleep and a peaceful state of mind before bed. This relaxation can translate into more vivid and peaceful dreams. Mind-body practices also encourage a state of mindfulness, which may lead to more positive or emotionally balanced dreams. Meditation and yoga promote mindfulness and present-moment awareness, skills that can extend into the dream world. This may lead to a higher likelihood of experiencing lucid dreams or heightened awareness during dream states. Since mind-body exercises reduce stress and anxiety, they can help mitigate nightmares or disturbing dreams often triggered by emotional distress^[25, 26].

High-Intensity Interval Training (HIIT)

HIIT helps regulate the sleep-wake cycle by reducing sleep onset time and increasing the amount of deep and REM sleep. While deep sleep is important for physical recovery, more REM sleep allows for vivid dreaming. Due to the energy expenditure and increased physical demands of HIIT, it may trigger more intense or emotionally charged dreams, especially if done late in the day. Some people may report more intense or surreal dreams after high-intensity workouts due to residual adrenaline and stress hormone levels. Performing HIIT late at night can sometimes overstimulate the body, leading to difficulties falling asleep. If sleep onset is delayed, it could interfere with REM sleep, reducing overall dreaming time^[28, 29].

Endurance training (E.g., long-distance running, cycling)

Endurance training can lead to physical exhaustion, which in some cases increases the likelihood of REM rebound, a phenomenon where the body compensates by spending more time in REM sleep after a period of REM deprivation. This can result in longer or more vivid dreams. During

periods of intensive endurance training, dreams may incorporate elements of physical exhaustion or activity, such as running or chasing themes. This could be a mental reflection of the strain and focus endurance activities require [29].

Anaerobic exercise (E.g., sprinting, high-intensity lifting)

Anaerobic exercises increase sleep depth, particularly in non-REM stages, which may support overall sleep health. As with strength training, it improves deep sleep, but the effects on REM sleep and dreaming are more indirect. Some individuals may experience less dream recall after anaerobic exercises, as these intense activities often lead to longer periods of deep, non-REM sleep, which is less associated with vivid dreaming [30].

Evening exercise

While evening exercise has many health benefits, vigorous exercise close to bedtime can delay the onset of sleep by keeping the body temperature elevated and adrenaline levels high. This might result in reduced REM sleep early in the night and fewer dreams. However, if exercise is performed early enough in the evening (a few hours before bed), the body can still recover and enter deeper, more restorative sleep stages, increasing the likelihood of vivid dreams [31].

Stretching and relaxation before Bed

Gentle stretching before bed helps calm the nervous system and relax the muscles, leading to smoother transitions into sleep. This relaxation may influence the types of dreams you experience, making them more peaceful and pleasant. By reducing muscle tension and physical discomfort, stretching improves overall sleep efficiency and allows the body to spend more time in REM sleep, increasing the potential for dreams [32, 33].

On the contrary it can be said as exercise offers several benefits for sleep quality and overall sleep health by improving duration, quality, lowering insomnia, improving biological clock, by reducing stress and anxiety, and also by reducing sleep apnoea etc. [34]. Exercise at any time of day benefits sleep, but engaging in physical activity earlier in the day, such as in the morning or early afternoon, can be especially helpful. Strenuous exercise too close to bedtime may temporarily increase alertness, making it harder to fall asleep for some people [35].

Exercise induces lucid dreams

Whether exercise can play a role in inducing lucid dreams or not required more extensive researches still some of the evidences provoke about, that sequential dreaming and can sometimes controlled by the dream's content. While exercise itself isn't a direct trigger for lucid dreaming, it can create favourable conditions for its occurrence by improving sleep quality and enhancing awareness during sleep [36]. Though there are no such psychological or neurological markers offer significant contribution to the effective lucid dreaming but other factors relating those can be enough to find significant correlation. Researches showed that, regular exercise, particularly aerobic and strength training, leads to more restorative sleep by increasing both deep sleep and REM sleep [37]. Better sleep quality means your mind is more refreshed, making it easier to recognize dream states and become aware of your dreams. Consistent physical activity stabilizes sleep patterns, resulting in more

predictable and efficient sleep cycles. This consistency can help with timing lucid dreams, as they often occur during the later stages of the sleep cycle (when REM sleep is more prominent) [38]. Aerobic and endurance exercises tend to extend the amount of time spent in REM sleep, where most vivid dreaming happens. With longer REM periods, there are more opportunities for your brain to recognize and become aware that you're dreaming, which is essential for lucid dreaming. After intense physical exertion or a period of sleep deprivation, the body may experience REM rebound, meaning it spends more time in REM sleep to compensate [39]. This surge in REM sleep can increase the chances of lucid dreams, as more dreams are likely to occur during these periods. Exercises like yoga, tai chi, and meditation promote mindfulness and awareness [40]. These practices can carry over into the dream world, making it easier to achieve lucidity in dreams. Mind-body exercises train your mind to be more present and aware, both in waking life and during dreams [41]. Exercises like yoga, tai chi, and meditation promote mindfulness and awareness. These practices can carry over into the dream world, making it easier to achieve lucidity in dreams. Mind-body exercises train your mind to be more present and aware, both in waking life and during dreams [42]. Since regular exercise leads to improved sleep, you are more likely to wake up after REM sleep cycles, a key time when dreams are most vivid and easiest to recall. Enhanced dream recall is a key factor in achieving lucid dreams, as remembering dreams allows you to become more familiar with your dream patterns and triggers [43]. With regular exercise and consistent sleep schedules, your body becomes accustomed to certain sleep patterns. This predictability helps in dream journaling and recognizing common dream signs, both of which are essential for training the mind to become lucid during dreams [44].

Discussion

Physical exhaustion from high-intensity or endurance exercise may lead to deeper physical relaxation during sleep, which allows the mind to remain more alert. This contrast where the body is exhausted but the mind is alert can sometimes trigger lucid dreams. Your body may rest deeply while your mind remains focused enough to recognize dream states. If exercise is done too close to bedtime, it can delay sleep onset and disturb the early stages of sleep, but it may also intensify REM sleep later in the night [45]. This heightened REM activity can enhance dream intensity and increase the potential for lucid dreaming. However, it's important to balance exercise timing to avoid overstimulation [46]. Some of the evidences based of human factors assessment leads to triggers many neurological pathways and mechanisms in lowering the stress and increasing REM sleep. Physical activity triggers a variety of neurological pathways that positively affect brain function and overall neural health. These pathways involve complex interactions between the brain, spinal cord, and peripheral nervous system [47]. Physical activity triggers a variety of neurological pathways that positively affect brain function and overall neural health. These pathways involve complex interactions between the brain, spinal cord, and peripheral nervous system [48]. Exercise triggers neurogenesis, especially in the hippocampus, a brain region involved in memory and learning. This happens through BDNF and other neurotrophic factors like Insulin-like Growth Factor 1

(IGF-1), which is released during physical activity. BDNF and other neurotrophic factors facilitate Long-Term Potentiation (LTP), a mechanism that strengthens the connections between neurons, improving memory formation and retention ^[49]. Physical activity, particularly intense exercise, stimulates the release of endorphins, natural opioids produced by the brain. Endorphins interact with opioid receptors in the brain to reduce pain perception and induce feelings of pleasure and euphoria, often referred to as the "runner's high. Exercise also triggers the release of endocannabinoids, neurotransmitters that bind to cannabinoid receptors in the brain. This pathway is involved in regulating mood, pain sensation, and stress ^[50]. Endocannabinoids contribute to the calming and euphoric effects experienced during and after exercise. Exercise stimulates the dopaminergic system, increasing the release of dopamine, a neurotransmitter associated with reward, motivation, and pleasure. This pathway enhances mood and reinforces the motivation to continue exercising, leading to a positive feedback loop ^[51]. Physical activity, particularly aerobic exercise, increases the production and release of serotonin, a neurotransmitter that regulates mood, anxiety, and sleep. Increased serotonin levels improve mood and reduce symptoms of depression and anxiety ^[52]. The serotonin pathway activated by exercise has effects similar to antidepressants, promoting a balanced mood and emotional well-being. This is why exercise is often recommended as a treatment for mild to moderate depression. Physical activity influences the HPA axis, which controls the body's response to stress ^[53]. Exercise helps regulate the release of cortisol, the body's primary stress hormone. Regular physical activity helps lower baseline cortisol levels, reducing chronic stress and improving the body's ability to handle stressors ^[54]. A well-regulated HPA axis results in lower anxiety levels and better overall mental health. Over time, exercise enhances the brain's ability to cope with stress by improving the regulation of cortisol and other stress-related hormones ^[55]. Physical activity increases the release of GABA, the brain's primary inhibitory neurotransmitter, which calms neuronal activity and reduces anxiety ^[56]. This helps balance the brain's excitatory and inhibitory functions, leading to relaxation and reduced stress. Exercise also stimulates the release of glutamate, the brain's major excitatory neurotransmitter ^[57]. Glutamate is involved in learning and memory, as it strengthens synaptic connections between neurons. The balance between glutamate and GABA is critical for maintaining cognitive function and emotional balance. Physical activity stimulates the spinal cord to send signals from the brain to muscles, improving the efficiency of motor neuron responses ^[58]. This leads to faster and more coordinated muscle movements, especially during repetitive or high-intensity activities. Lastly, Exercise enhances the body's reflexes by strengthening the neural circuits that mediate automatic responses. Faster reflexes improve balance, coordination, and injury prevention ^[59].

Conclusion

Physical activity engages multiple neurological pathways, enhancing brain function, cognitive abilities, mood regulation, and stress management. Exercise stimulates neurogenesis, promotes synaptic plasticity, and strengthens motor control circuits, leading to long-term benefits for mental and physical health. The type of exercise you engage

in can affect your dream content, intensity, and recall by influencing the different stages of sleep. Aerobic and endurance exercises promote more REM sleep, leading to vivid dreaming, while strength training and high-intensity exercises improve deep sleep, indirectly affecting dream patterns. Mind-body practices like yoga encourage mindfulness and may lead to more lucid or positive dreams.

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