

The Mediating Effect of Social Support in Exercise Interventions for Anxiety Reduction

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Abstract: This study systematically analyzes the mechanisms by which exercise interventions alleviate anxiety, emphasizing the synergistic effects of neurophysiological regulation, cognitive restructuring, and social support. Exercise improves physiological stress responses by modulating neurotransmitter levels and HPA axis function, complemented by the optimization of cognitive structures, which enhances individuals' self-efficacy and emotional regulation abilities. Social support, as a key mediating variable, plays an important role in buffering stress and providing psychological resources, significantly enhancing the effectiveness of exercise interventions. Integrating social cognitive theory and social capital theory, this study constructs a multi-level mechanism model, revealing the path relationships of social support in exercise interventions, providing theoretical support for the optimization of psychological intervention strategies. The results indicate that social support not only enriches the pathways of exercise in alleviating anxiety but also has important guiding significance in clinical practice, providing a theoretical basis for achieving personalized and systematic anxiety interventions. Future research could further validate the path model, expand multidisciplinary integration, and provide continuous support for the scientific rigor and precision of mental health interventions.

Keywords: Exercise Intervention; Anxiety Reduction; Social Support; Mechanism Model; Cognitive Restructuring

1. Introduction

Exercise, as a behavioral intervention, has been widely studied for its biopsychological mechanisms, demonstrating its ability to alleviate anxiety symptoms by regulating neurotransmitters, altering neural plasticity, and influencing the endocrine system, thereby promoting neuropsychiatric balance. The effectiveness of exercise intervention lies not only in its physiological regulation but also in its significant improvement of an individual's psychological state and enhanced ability to cope with stress[1].

In the pathogenesis of anxiety disorders, the role of social support has gradually gained attention in theoretical circles. As a socio-psychological resource, social support includes diverse forms such as emotional comfort, information provision, and practical assistance[2,3]. It positively regulates anxiety levels by enhancing an individual's sense of belonging, security, and self-efficacy. The psychosocial model indicates that social support can alleviate negative emotional reactions and enhance psychological resilience, thereby serving as a preemptive intervention before stress triggers surface[4]. Theoretically, the improvement of anxiety through exercise intervention is not a singular physiological or psychological pathway but a complex process of interaction between the two levels. The physiological regulatory effects of exercise, such as the elevation of serotonin and dopamine, can improve emotional regulation ability; while the psychological mechanisms reduce sensitivity to anxiety by enhancing self-efficacy and improving cognitive biases. Social support plays an important mediating role in this process[5]. It not only strengthens an individual's reliance on and adherence to exercise intervention but also enhances the positivity and sustainability of exercise through social identification and belonging, thereby promoting anxiety relief on multiple levels[6].

Based on these theoretical foundations, this study proposes the hypothesis of the mediating role of social support in the relationship between exercise intervention and anxiety improvement, aiming to reveal the underlying mechanisms and pathways, and to provide a theoretical basis for the optimization of future exercise psychology intervention programs. This analytical framework emphasizes the intrinsic multi-dimensional regulatory role of exercise and the critical role of social support as a bridge, aiming to enrich the theoretical system of the intersection of exercise psychology and social

psychology.

2. Mechanism Analysis

The mechanism by which exercise intervention affects anxiety is the result of multidimensional and multi-level interactions, involving a complex combination of physiological adaptation, psychological adjustment, and psychosocial factors.

2.1 Physiological Adaptation Mechanism of Exercise

At the physiological level, exercise buffers stress responses by regulating the neuroendocrine system. Specifically, regular exercise can promote the synthesis and release of neurotransmitters such as serotonin, norepinephrine, and dopamine, which play a key role in regulating emotional states. Studies have indicated that anxiety is closely related to functional disorders of the serotonin pathway. Exercise can restore the balance of neurotransmitters and reduce the severity of anxiety symptoms by improving the function of these pathways. Exercise also regulates the hypothalamic-pituitary-adrenal (HPA) axis. Patients with anxiety disorders often exhibit over-activation of the HPA axis, leading to elevated levels of stress hormones such as cortisol[7]. Continuous stress responses make anxiety difficult to relieve. Exercise intervention can inhibit the abnormal activation of the HPA axis, restore cortisol secretion to normal levels, and improve an individual's ability to respond to stress. This mechanism not only alleviates immediate anxiety but also provides a foundation for long-term psychological stability.

2.2 Psychological Adjustment Mechanism of Exercise

At the psychological level, the impact of exercise extends to enhancing self-efficacy. Multiple studies have shown that exercise significantly enhances an individual's perception of their abilities. This positive self-evaluation plays an important role in alleviating anxiety. The successful experiences gained during exercise and the improvement of body image promote individuals to establish higher self-efficacy, thereby reducing sensitivity to future anxiety stimuli. Exercise also promotes the generation of positive emotions, enhances an individual's emotional regulation ability, and helps reduce dependence on negative emotions. Exercise intervention can also reduce the cognitive processing load of anxiety by improving cognitive biases and cognitive structures. The positive cognitive and emotional changes caused by exercise help reshape the cognitive assessment of threats and reduce over-sensitivity to potential threats, thereby alleviating anxiety. This process involves adaptive changes in neural circuits, such as the regulation of the functions of the prefrontal cortex and amygdala. By improving the ability of emotion regulation and cognitive control, it helps reduce the frequency and intensity of anxiety.

2.3 Interactive Effects of Exercise Intervention and Psychosocial Factors

In addition to the physiological and psychological adjustment mechanisms at the individual level, the impact of exercise on the psychosocial environment cannot be ignored. Group exercise or organized fitness activities strengthen social identity and belonging, reduce loneliness and social isolation, and enhance psychological resilience[8]. Social interactions in exercise settings not only provide support networks but also improve an individual's sense of social identity, thereby forming a social environment conducive to anxiety relief at the psychological level. In the intersection of multiple mechanisms, the impact of exercise is manifested as a systematic regulation process. A deeper understanding of this mechanism helps reveal the multiple pathways of exercise intervention in anxiety management, providing a scientific basis for public health policies and clinical intervention strategies. By exploring the intrinsic relationship between neuroendocrine regulation, emotional changes, and cognitive reconstruction, we can more accurately grasp the mechanism of exercise in anxiety treatment and promote the individualization and precision of exercise intervention programs. In the future, interdisciplinary research combining neuroscience, psychology, and exercise science will further enrich the theoretical understanding of the mechanism of exercise affecting anxiety and open up diversified intervention pathways.

3. Specific Pathways and Mechanisms of Social Support

3.1 Mediating Pathways of Social Support in Anxiety Regulation

Social support exerts its psychological buffering effect in anxiety regulation through multiple mechanisms. In the process of buffering stress responses, the emotional comfort and informational feedback provided by social support work together to reduce an individual's physiological and psychological reactions when facing stressors. Social support acts as an external resource, activating an individual's sense of psychological security and reducing sensitivity to environmental threats, thereby decreasing the occurrence of anxiety. Specifically, when individuals face stressors, those with good social support networks exhibit lower activation levels of the sympathetic nervous system, and their serum cortisol levels tend to normalize. The psychological mechanism in this process is that the presence of supporters can enhance coping confidence, reduce feelings of fear and helplessness, allow individuals to feel control over the situation, and thereby slow down the intensity of the stress response.

Social support also influences an individual's subjective perception of stress threats by regulating cognitive appraisal processes. When people feel supported by relatives, friends, peers, or social organizations, they will reposition the stressor as a challenge or a temporary predicament, rather than an insurmountable threat. This cognitive restructuring reduces the sense of threat and decreases the frequency and intensity of anxiety. The signaling of social support prompts individuals to believe that they are not alone, that resources and help are available, and that their ability to cope with stress is enhanced, thereby forming positive psychological expectations. As a result, an individual's stress coping strategies shift from emotional reactions to rational analysis and action orientation, significantly reducing the duration and intensity of anxiety.

Within a social network, the buffering effect of the psychological support an individual receives lies in its rich social resources and diverse support functions. The structural rationality and quality of support within this network have a profound impact on the regulation of anxiety levels. Broad and close-knit social networks can provide multi-dimensional resources, including emotional comfort, cognitive guidance, and practical help, forming a resilient psychological resource base[9]. This network can provide timely and effective coping support when individuals experience stressful events, allowing individuals to feel a sense of belonging and social identity, thereby enhancing psychological resilience. Information dissemination within the social network, especially when facing anxiety-related negative information, can guide individuals to form positive emotions through positive interventions, slowing down the deterioration of anxiety.

At the same time, supportive interactions within the social network provide individuals with a platform for emotional expression and regulation, reducing feelings of loneliness and social isolation, and helping to maintain a positive psychological state. Many studies have shown that individuals with highly connected support networks are better able to utilize social resources for emotional regulation, enhancing the controllability of emotions by receiving comfort and advice from others. Mutual aid and a sense of identity in social networks also stimulate an individual's sense of belonging, reducing negative emotions caused by extreme isolation, thereby maintaining inner stability when facing stress and uncertainty.

3.2 Synergy Between Social Support and Exercise Intervention

Social support in exercise intervention extends beyond providing emotional and cognitive buffering; it shares an inseparable synergistic relationship with exercise adherence and persistence. Ample social support can significantly enhance an individual's sense of reliance on and belonging to an exercise program, thereby increasing exercise adherence rates. When individuals face difficulties and challenges during exercise, understanding and encouragement from relatives, friends, peers, or exercise communities form a positive feedback mechanism, strengthening their determination and reducing the likelihood of abandoning the program prematurely. Research indicates a positive correlation between exercise adherence and the frequency and quality of social support. Social support increases an individual's identification with and belonging to exercise, stimulating internal motivation and prompting them to maintain the continuity of exercise behavior over a longer period.

Social support also provides a continuous source of motivation for exercise intervention by establishing a stable support network, which helps maintain and consolidate exercise habits. Timely feedback, joint participation, habitual encouragement, and attention from supporters create a shared social contract that enhances the intrinsic value recognition of exercise behavior. This sense of

identification not only drives individuals to adhere to exercise in the short term but also provides them with psychological support to cope with setbacks and fluctuations in motivation[10]. Over time, an individual's exercise adherence gradually shifts from external incentives to internal motivation. Social support plays a crucial role in this transition, laying the foundation for the formation of lasting exercise habits.

In the process of exercise intervention, social interaction has a significant effect on promoting psychological adaptation and behavioral persistence. By creating a positive and supportive group atmosphere, individuals experience a sense of belonging and social identity, which enhances their psychological resilience. In dynamic social interactions, individuals can enhance their understanding of the benefits of exercise through communication and resonance while reducing anxiety and worry during exercise. Social interaction also promotes emotional expression and regulation, allowing individuals to receive emotional support and comfort when faced with exercise obstacles or frustrations, thereby reducing excessive fluctuations in emotional responses.

Furthermore, collaborative social interaction helps strengthen the external motivation for behavioral persistence. Mutual companionship, setting common goals, and sharing achievements create a social environment with a strong sense of identity. This environment encourages individuals to experience a sense of accomplishment and satisfaction in the process of pursuing exercise goals, enhancing their willingness to invest in exercise. At the same time, the experience of facing challenges together enhances trust and cooperation among group members, making exercise behavior an integration of self-identity and social identity. This not only improves an individual's rate of behavioral persistence but also subconsciously reinforces the habit of integrating exercise into daily life.

3.3 Theoretical Model Construction of Mechanism of Action

In path analysis, social support is regarded as a core mediating channel running through exercise intervention and psychological adjustment. Exercise intervention directly promotes the reduction of anxiety levels by regulating neuropsychological mechanisms, while also relying on the involvement of social support to enhance individual's psychological adaptability. The specific path is: exercise behavior stimulates the individual's positive psychological state, prompting them to actively seek and accept social support resources; and social support, through cognitive regulation, emotional support, and behavioral motivation, further strengthens exercise adherence and psychological effects, thereby playing a mediating role in promoting anxiety relief. This path analysis framework not only reveals the progressive causal relationship behind the data, but also helps to guide intervention practice, for example, by optimizing the social support structure to enhance the effect of exercise intervention.

In constructing the theoretical model, the integrated application of social cognitive theory and social capital theory provides profound theoretical support for revealing the complex mechanisms of action. Social cognitive theory emphasizes the individual's active construction process of the environment, the behavior of others, and their own cognition. Social interaction and support in exercise are regarded as important factors affecting cognitive assessment. Social support can shape an individual's cognitive framework, for example, enhancing the sense of control and belonging in situations, reducing biases in the perception of threats, and thereby alleviating anxiety. In exercise intervention, this mechanism makes the improvement of individual's self-efficacy more specific and operable, thereby enhancing the ability to cope with future stress.

Social capital theory emphasizes the influence of the accessibility, quality, and structure of resources in social networks on individual behavior and psychological state. Its core is that the accumulation and utilization of social capital can expand the channels for obtaining support resources, improve the efficiency of social connection, and form a resilient social support network. In the context of exercise intervention, social capital not only promotes the effective utilization of social resources by individuals, but also strengthens social identity and belonging. This theoretical framework regards social capital as a basic resource, providing structural guarantees for social interaction in exercise, enabling trust, cooperation, and common goals among members to be realized, thereby alleviating anxiety and promoting sustained adherence to behavior at the psychological level.

In integrated application, the path analysis model will take the physiological and psychological effects of exercise intervention as a prerequisite, and social cognition and social capital as two theoretical foundations, forming a multi-level and dynamic mechanism system. The physiological changes and psychological adjustments promoted by exercise are complementary to the process of cognitive restructuring in social cognition, and open up rich support channels through social capital,

realizing the synergistic effect of "cognition-behavior-resources". The innovation of this model lies in integrating the theories of social cognition and social capital into the framework of exercise intervention, which helps to comprehensively understand the complex paths and multiple levels of social support in anxiety regulation, and provides theoretical support and practical guidance for intervention design. Future deepening of the path relationship and moderating factors in the model will further enrich the theoretical system of exercise psychology intervention, which will be conducive to achieving more personalized and systematic intervention strategies.

4. Conclusion

This study systematically explored the multi-level mechanisms of exercise intervention in improving anxiety, emphasizing the synergistic effects of neuroendocrine regulation, cognitive restructuring, and social support. Exercise improves physiological responses by regulating neurotransmitters and the HPA axis, effectively alleviating anxiety symptoms. Simultaneously, exercise enhances individuals' self-efficacy and emotional regulation abilities, promoting the optimization of cognitive structures. Building on this foundation, social support, as a critical mediating variable, significantly strengthens the effect of exercise intervention by buffering stress responses and providing psychological resources. The rationally constructed theoretical model, combining social-cognitive and social capital theories, reveals the pathway and structural system of social support in exercise intervention, providing a theoretical basis for understanding its complex role in psychological adjustment. Overall, social support not only enriches the mechanisms by which exercise alleviates anxiety but also provides practical guidance for intervention implementation, with the potential to promote the optimization and development of personalized, systematic psychological intervention strategies. In the future, multi-dimensional, multi-scale interdisciplinary research can further validate the model pathways and expand the theoretical depth of interventions, providing solid theoretical support for the precision of mental health intervention strategies.

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