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Physical exercise as a strategy for reducing social anxiety in young adults: a review of the evidence

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Abstract:

Background: Social anxiety disorder constitutes one of the most prevalent anxiety disorders among young adults and is associated with marked impairments in quality of life and social functioning. In recent years, increasing scientific interest has been directed toward non-pharmacological interventions that may complement conventional treatment approaches, particularly physical activity.

Aim: This study aims to evaluate the impact of physical activity on reducing symptoms of social anxiety in young adults and to identify potential underlying mechanisms.

Materials and Methods: A narrative review of the scientific literature was conducted, focusing on studies examining the relationship between physical activity and social anxiety symptoms. Observational and experimental studies, as well as systematic reviews published in peer-reviewed journals, were included.

Results: The literature indicates that regular physical activity may alleviate symptoms of social anxiety. These effects are associated with both psychological mechanisms (e.g., improved self-esteem, social exposure) and biological processes (e.g., neurotransmitter regulation, stress reduction).

Conclusions: Physical activity appears to be a promising adjunctive approach for reducing social anxiety symptoms in young adults. Nevertheless, further research is needed to determine its optimal type and intensity.

Keywords: social anxiety disorder, physical activity, social anxiety, young adults, mental health

1. Introduction

Social anxiety disorder, also referred to as social phobia, is among the most common mental disorders in the young adult population. It is characterised by an intense and persistent fear of social situations in which an individual may be evaluated by others, leading to avoidance of interpersonal interactions and a marked deterioration in social functioning and quality of life (1,2). The onset typically occurs during adolescence or early adulthood, and the course is often chronic. If left untreated, social anxiety disorder may contribute to the development of secondary psychiatric conditions, including depression, substance use disorders and pronounced social isolation (3,4). Therefore, identifying effective adjunctive approaches to support its treatment remains of considerable importance.

In recent years, there has been a growing interest in non-pharmacological approaches to supporting the treatment of anxiety disorders. One of the most extensively studied factors is physical activity, which has a well-documented positive impact on mental health, including the reduction of anxiety and depressive symptoms (5,6). Regular engagement in physical exercise is also associated with improved mood, enhanced self-efficacy and better emotional regulation. The potential mechanisms underlying the effects of physical activity on social anxiety symptoms encompass both biological and psychological factors. From a biological perspective, these include modulation of neurotransmitter systems, such as serotonin and dopamine, as well as a reduction in stress-related hormones, including cortisol (7,8). From a psychological standpoint, physical activity may facilitate gradual exposure to social situations, improve self-esteem and reduce avoidance behaviours (9). These findings are consistent with research published in health-oriented scientific journals, which indicate that various health conditions and their associated symptoms significantly affect psychological functioning and quality of life, emphasising the importance of supportive interventions such as physical activity (10).

Despite the growing body of research in this area, the role of physical activity in reducing symptoms of social anxiety in young adults has not been conclusively established. Findings across studies remain heterogeneous, and the mechanisms underlying the observed effects require further

clarification. The present paper aims to review current evidence on the impact of physical activity on social anxiety symptoms in young adults and to analyse the potential biological and psychological mechanisms that may account for these associations.

2. Materials and Methods

The present study constitutes a narrative review of the scientific literature addressing the impact of physical activity on symptoms of social anxiety in young adults. The analysis was based on publications retrieved from major medical and psychological databases, particularly PubMed and Scopus.

The literature search primarily included publications from 2010 to 2024, with selected earlier studies incorporated for their fundamental relevance to the topic. The search strategy employed keywords such as “social anxiety”, “social anxiety disorder”, “physical activity”, “exercise” and “young adults”, as well as their various combinations. The analysis included observational studies, experimental studies (including randomised controlled trials) and systematic reviews published in peer-reviewed scientific journals. Publications focusing on young adult populations and interventions based on different forms of physical activity were considered, including aerobic training, resistance training and group-based exercise programs.

Inclusion criteria comprised studies examining the association between levels of physical activity and the severity of social anxiety or social phobia symptoms. Review articles without empirical data, non-scientific publications and studies with limited data availability were excluded. Given the narrative nature of the present work, neither a formal methodological quality assessment of the included studies nor a quantitative synthesis of the results conducted was conducted.

3. Results

3.1 The impact of physical activity on symptoms of social anxiety

Available scientific evidence suggests that regular physical activity may play a significant role in reducing symptoms of anxiety disorders, including social anxiety. Numerous analyses have shown that individuals who engage in consistent physical activity exhibit lower levels of anxiety and better psychosocial functioning compared to those leading sedentary lifestyles (11,12). Cross-sectional and cohort studies indicate an inverse relationship between physical activity levels and the severity of anxiety symptoms, with higher levels of activity associated with reduced social anxiety and fewer avoidance behaviours (13). Similar findings have been reported in the studies involving young adults,

where physical activity has been significantly associated with improved social and emotional functioning (14). Intervention studies further suggest that various forms of physical activity, including aerobic exercise and moderate-intensity training programs, may lead to a meaningful reduction in social anxiety symptoms. Randomised controlled trials have demonstrated that regular physical exercise contributes to decreased anxiety severity and improved quality of life among participants (15,16). The duration and consistency of physical activity also appear to be important factors. Evidence suggests that long-term exercise interventions yield more stable reductions in anxiety symptoms than short-term programs (17). Moreover, even moderate levels of physical activity may confer psychological benefits, which is particularly relevant for young adult populations (18). The social context of physical activity may also play a role as participation in group-based exercise programs can facilitate gradual exposure to social situations, thereby reducing anxiety levels and improving interpersonal skills (19). In contrast, individual exercise may be particularly beneficial for those with higher baseline anxiety, allowing for gradual engagement in physical activity without excessive stress (20).

Despite a substantial body of scientific evidence indicating the beneficial effects of physical activity, the findings across studies are not entirely consistent. Differences in study design, sample size and measurement instruments may contribute to variability in the reported outcomes. Nevertheless, the overall trend suggests that physical activity plays a positive role as a supportive factor in reducing social anxiety symptoms (21).

3.2 Psychological mechanisms

One of the key domains explaining the impact of physical activity on the reduction of social anxiety symptoms involves psychological mechanisms. The literature emphasises that regular physical activity may induce significant changes in cognitive and emotional functioning, which directly influence anxiety levels (22,23).

A particularly important factor is the increase in self-esteem and self-efficacy. Engagement in physical activity, especially through structured and regular training, fosters a sense of personal competence as well as perceived control over one's body and behaviour. In a similar vein, studies have demonstrated that higher levels of self-efficacy are associated with lower social anxiety and reduced avoidance behaviours (24). Another relevant mechanism is exposure to social situations. It is assumed that physical activity, particularly in the form of group classes or team sports, naturally facilitates interpersonal interactions. Therefore, gradual exposure to such contexts may reduce anxiety through habituation processes and through learning that social situations do not pose a genuine threat (25,26). The reduction of avoidance behaviours also plays an important role, as these constitute a core feature of social phobia.

Thus, regular participation in physical activity may disrupt avoidance patterns and encourage progressive increases in social engagement. Consequently, this contributes to improved social functioning and reduced anxiety symptom severity (27).

Furthermore, physical activity contributes to emotion regulation and reduces psychological tension. It has been shown that physically active individuals cope more effectively with stress and demonstrate higher levels of psychological resilience, which may be particularly relevant in the context of anxiety disorders (28). What is more, the impact of physical activity on body image is also noteworthy. Improvements in perceived physical appearance and fitness may enhance self-confidence in social situations, thereby contributing to a reduction in social anxiety symptoms (29).

In summary, psychological mechanisms constitute a key link in explaining the relationship between physical activity and the reduction of social anxiety symptoms. Their multidimensional nature suggests that the effects of physical activity arise not only from direct physiological influences but also from cognitive and emotional processes occurring within the individual.

3.3 Biological mechanisms

In addition to psychological mechanisms, biological processes associated with regular physical activity play a significant role in reducing social anxiety symptoms. The literature indicates that physical exercise influences the functioning of the nervous, endocrine and immune systems, which may contribute to a reduction in anxiety symptom severity (30,31). One of the most frequently described mechanisms is the effect of physical activity on neurotransmitter systems. Regular exercise increases the availability of serotonin, dopamine and noradrenaline, which play key roles in mood regulation and stress responses. These neurochemical changes are comparable to those observed in the pharmacotherapy of anxiety disorders (32,33). Another important mechanism involves the regulation of the hypothalamic–pituitary–adrenal (HPA) axis, which is responsible for the body’s stress response. According to the research studies, physical activity may reduce cortisol levels and improve the organism’s adaptation to stressful situations, which is particularly relevant in the context of anxiety disorders (34). In recent years, increasing attention has also been paid to neuroplasticity-related processes. It is assumed that physical activity promotes the expression of brain-derived neurotrophic factor (BDNF), which influences neuronal function as well as learning and adaptive processes. Enhanced neuroplasticity may support emotion regulation and attenuate anxiety responses (35). Moreover, muscle-derived cytokines, known as myokines, also represent an important area of research. One of the most extensively studied myokines is irisin, which is claimed to exert anti-inflammatory and neuromodulatory effects. It is suggested that irisin may reduce inflammatory processes and improve brain function, thereby indirectly contributing to a reduction of anxiety symptoms (36,39). Physical

activity exerts anti-inflammatory effects through the regulation of pro- and anti-inflammatory cytokines. Chronic low-grade inflammation is increasingly recognised as a factor associated with the development of mental disorders, including anxiety disorders. Accordingly, the reduction of inflammatory activity may represent another mechanism underlying the beneficial effects of physical activity (37,38).

To conclude, the biological mechanisms associated with physical activity are multidimensional and encompass neurochemical, hormonal and immunological changes. Their interplay may lead to a meaningful reduction in social anxiety symptoms as well as an overall improvement in psychological functioning. The mechanisms underlying the correlation between physical activity and reduced social anxiety symptoms are presented in Figure 1.

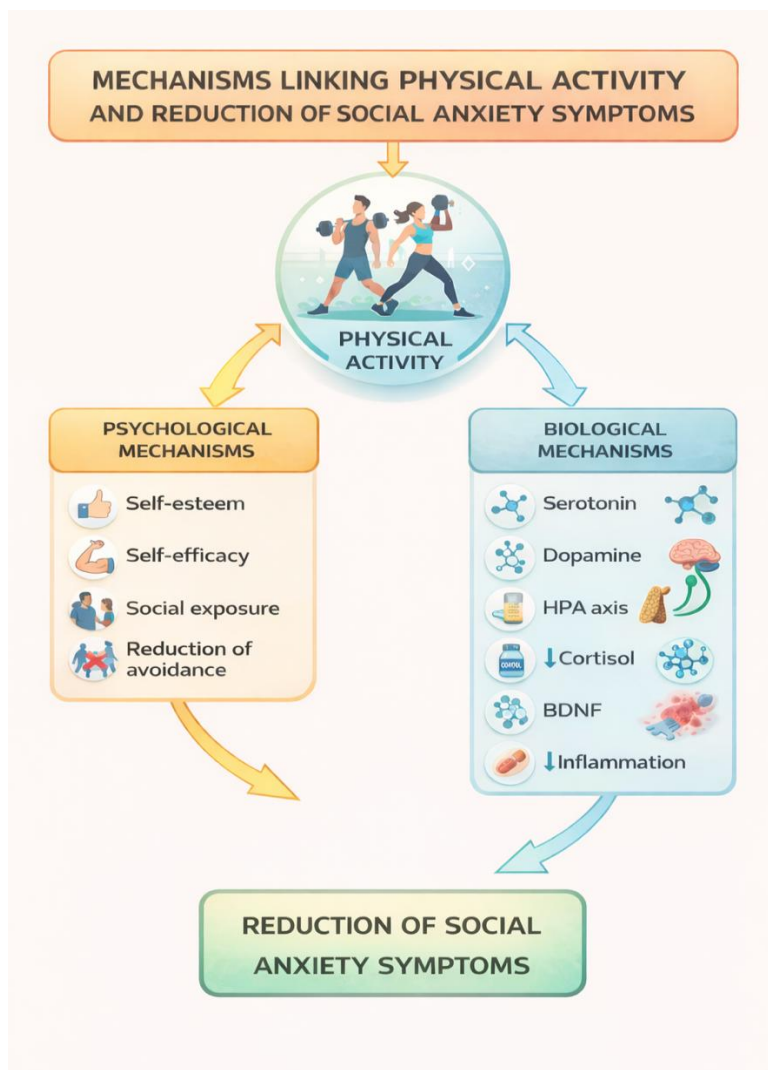


Figure 1. Mechanisms linking physical activity to reduction of social anxiety symptoms in young adults, including both psychological (e.g., self-esteem, self-efficacy, social exposure) and biological (e.g., neurotransmitter regulation, HPA axis modulation, anti-inflammatory effects) pathways.

3.4 Type of physical activity and therapeutic effects

It is claimed that the type of physical activity undertaken may play a significant role in the effectiveness of reducing social anxiety symptoms. Accordingly, the literature suggests that different forms of physical exercise may influence mental health in various ways, both through underlying mechanisms and achieved outcomes (40). The most frequently studied form of physical activity is aerobic exercise, including such activities as running, cycling and swimming. Research indicates that regular moderate-intensity aerobic exercise is effective in reducing anxiety symptoms and improving mood (41). These effects are associated with enhanced physical fitness, regulation of the nervous system and increased production of neurotransmitters. What is more, resistance (strength) training also demonstrates beneficial effects on mental health. It is suggested through the research that resistance exercises may reduce anxiety symptoms by enhancing perceived control and improving body image (42). In some cases, its effectiveness appears comparable to that of aerobic training. Furthermore, the organizational form of physical activity is also an important factor. Group-based exercise may promote the development of social competencies and reduce anxiety through natural exposure to interpersonal situations. In contrast, individual physical activity may be more appropriate for individuals with higher levels of social anxiety, particularly at the initial stages of exercise engagement (43). Exercise intensity is another relevant variable. Studies indicate that moderate-intensity physical activity is most consistently associated with optimal reductions in anxiety symptoms. In contrast, excessively intense exercise may lead to physiological overload and heightened stress responses (44).

Summarising, all the aforementioned factors, i.e. the type, format and intensity of physical activity are important determinants of its therapeutic effects. The most beneficial outcomes appear to be associated with regular, moderate-intensity physical activity tailored to the individual's capabilities and preferences.

3.5 Study limitations

Despite the growing body of research on the impact of physical activity on social anxiety symptoms, the available literature is characterised by certain methodological limitations that should be considered when interpreting the findings.

One of the main limitations highlighted by the studies under scrutiny is the small sample size. It has been noted that the small participant groups may restrict the generalizability of the findings and affect their statistical reliability (45). Moreover, some studies lack appropriate control groups, which complicates the unambiguous assessment of intervention effectiveness. Another important issue is

methodological heterogeneity. Differences in diagnostic tools, intervention duration and types of physical activity make it difficult to directly compare results across studies (46). In particular, the lack of standardized measures for social anxiety symptoms may contribute to inconsistencies in findings. A further limitation is that many studies rely on self-report measures, such as questionnaires and psychological scales. Although widely used, these tools may be subject to subjective bias and the external factors (47). Additionally, most available studies are short-term in nature, which limits the ability to assess the long-term effects of physical activity in the context of anxiety disorders. There is a lack of longitudinal studies that would allow a more detailed and robust evaluation of the durability of observed effects. It should also be noted that relatively few studies focus exclusively on social anxiety disorder. In many cases, broader anxiety disorders are analysed, which may limit the direct applicability of findings to the specific characteristics of social anxiety (48).

In the conclusion, it should be noted that, despite substantial evidence indicating the beneficial effects of physical activity, there remains a need for further research with more standardised methodologies. Studies incorporating optimal parameters and evidence-based clinical guidelines would allow for a more precise determination of the role of physical activity in reducing social anxiety symptoms.

4. Discussion

The detailed literature review presented above indicates that physical activity may play a significant role in reducing social anxiety symptoms among young adults. The majority of available studies suggest that regular physical exercise is associated with lower anxiety levels and improved psychosocial functioning, as demonstrated in both observational and interventional research (11,15).

The obtained findings are consistent with the previous analyses of anxiety disorders in general, which have demonstrated the beneficial effects of physical activity on the reduction of anxiety symptoms and improvement in life quality (5,6). It is therefore assumed that the mechanisms underlying the effects of physical activity may be of a universal nature and not limited to a single type of mental disorder. Furthermore, similar observations have been reported in interdisciplinary health research, highlighting that both physical and psychological factors should be considered in the prevention and management of disorders affecting quality of life (10).

An important aspect in interpreting the results is the multifactorial nature of the mechanisms underlying the observed effects. As demonstrated in the present work, both psychological mechanisms, such as increased self-esteem, enhanced self-efficacy and reduced avoidance behaviours, and biological mechanisms, including regulation of neurotransmitters, the HPA axis and inflammatory processes, are significant factors in the process of reducing social anxiety symptoms (32,34,37).

Of particular note is the fact that physical activity may serve as a natural form of exposure to social situations. In contrast to classical therapeutic approaches, such as cognitive-behavioural therapy, exposure within the context of physical activity occurs in a less formalized and often more acceptable manner for patients. Hence, physical activity may enhance engagement and, consequently, improve the effectiveness of the intervention (25,26).

The results of the analysed studies also suggest that not only the fact of engaging in physical activity is important, but also its type, intensity and social context. Namely, moderate, regular physical activity appears to be the most beneficial, whereas excessive intensity may lead to opposite effects associated with increased stress levels (44). Furthermore, group-based activity may additionally support the development of social competencies, although in the initial stages of intervention, individual exercise may be more appropriate for individuals with high levels of anxiety (43).

Despite considerable evidence indicating the positive effects of physical activity, caution is warranted when interpreting the findings. As noted in the limitations section, the available studies exhibit substantial methodological heterogeneity, hindering direct comparison of results and the identification of optimal intervention formats (46). Additionally, the limited number of studies specifically focusing on social anxiety disorder highlights the need for further research in this area (48).

An important direction for future research should involve the conduct of long-term randomized controlled trials, which would allow for a more precise determination of the effects of different forms of physical activity on social anxiety symptoms. It is also particularly important to account for individual differences among participants, including baseline anxiety levels, preferences for physical activity and psychosocial factors.

In summary, it is claimed that the physical activity represents a promising adjunct to standard treatments for social anxiety disorder. Its multidimensional impact on psychological and biological functioning makes it a valuable component of therapeutic approaches. However, further research is needed to fully understand its role and optimise its application in clinical practice.

5. Conclusions

The conducted analysis allows to formulate several key conclusions regarding the correlation between physical activity and mental health in the context of social anxiety. Therefore it is assumed that:

1. Regular physical activity may reduce social anxiety symptoms of young adults, exerting a positive effect on psychological and social functioning.

2. The mechanisms underlying the observed effects are multifactorial and include both psychological (increased self-esteem, reduced avoidance behaviours and increased social exposure) and biological factors (regulation of neurotransmitters, the HPA axis, and inflammatory processes).
3. The most favourable effects are observed with regular, moderate-intensity physical activity tailored to the individual's abilities and preferences.
4. Physical activity may constitute a valuable adjunct to standard treatments for anxiety disorders, including social anxiety disorder.
5. Further research is necessary, particularly long-term randomized controlled trials, to more precisely determine the optimal forms, intensity and duration of physical activity interventions.

Ultimately, integrating physical activity into treatment holds a potential to significantly improve the clinical outcomes for those struggling with the symptoms of social anxiety.

Disclosure

Conceptualization: Anna Knapik

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Declaration of AI use

While preparing this manuscript, the authors used ChatGPT to perform linguistic editing, including corrections of grammar, syntax and spelling and to provide better readability. After using this tool, the authors thoroughly reviewed and edited the content as needed and accept full responsibility for the substantive content of the publication.

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