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Short Article

Physical Activity – Friend or Foe of Acne? A Literature Review

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Abstract

Background: Acne is a multifactorial inflammatory skin condition influenced not only by local factors such as sebum production and follicular blockage, but also by systemic processes including hormonal regulation, metabolism, and lifestyle behaviors.

Aim: This literature review aims to synthesize current evidence and evaluate the impact of physical activity on acne development and severity, considering both its potential beneficial and exacerbating effects.

Methodology: A literature search was conducted to identify relevant studies published between 2006 and 2026 using electronic databases, including PubMed, Google Scholar, and ResearchGate.

Results: Physical activity may exert both beneficial effects - through improved circulation, anti-inflammatory responses, and hormonal balance - and adverse effects, such as increased sweating, friction, and occlusion, making its overall role in acne development complex and potentially both protective and aggravating.

Conclusions: Physical activity is commonly perceived to exacerbate acne, but this review indicates that observed associations are largely driven by environmental, mechanical, and metabolic factors rather than direct physiological effects. These findings emphasize the importance of separating myth-based beliefs from evidence-based mechanisms, while highlighting the need for further research across diverse populations and exercise contexts.

Key words: physical activity, acne, exercise, sedentary behavior, sport

1. Introduction

Acne is a chronic inflammatory disease characterized by comedones and inflammatory lesions in sebaceous regions, particularly the face [12]. The Global Burden of Disease project estimates a prevalence of 9.4%, ranking acne as the eighth most common disease worldwide [13]. Growing evidence suggests that lifestyle factors influence acne prevalence and severity [11]. While diet has traditionally been the primary focus of research, other lifestyle behaviors, including physical activity and sedentary patterns, have recently gained attention as potential modulators of acne pathogenesis [2]. This review aims to synthesize current literature to determine whether physical activity serves as a protective factor or a potential contributor to acne pathogenesis.

2. Methodology

A comprehensive review of the effects of physical activity on acne was conducted using PubMed, Google Scholar and ResearchGate. The search included systematic reviews, meta-analyses, randomized controlled trials and clinical studies published between 2006 and 2026. The search strategy combined keywords related to acne (“acne”) and physical activity (“exercise,” “physical activity,” “sedentary behavior,” “sport”). Reference lists of selected studies were also screened to identify additional relevant sources.

3. Acne

Acne vulgaris is a chronic inflammatory skin disorder characterized by noninflammatory lesions, comedones and inflammatory lesions, including papules, pustules, and nodules, primarily affecting sebaceous areas such as the face, chest, and back [12,21]. Its pathogenesis involves increased sebum production, follicular hyperkeratinization, proliferation of *Cutibacterium acnes*, and inflammation. Although not life-threatening, acne can result in permanent scarring and is associated with significant psychosocial burden. Individuals with acne have an increased risk of anxiety and depression, reflecting its substantial impact on quality of life [22,23]. Acne may also be associated with certain endocrine disorders, such as polycystic ovary syndrome, and less commonly Cushing syndrome or congenital adrenal hyperplasia. These associations highlight the multifactorial nature of acne and the role of hormonal regulation in its development [24].

4. Impact of Physical Activity

Evidence regarding the relationship between physical activity and acne remains mixed. A 2019 study reported that regular exercise was more common among individuals without acne, suggesting a potential protective role [26]. Similarly, large-scale analyses have identified sedentary behavior and circadian disruption as modifiable risk factors, with physical activity associated with reduced acne prevalence, partly mediated by improvements in psychological well-being [7]. In contrast, mechanistic studies indicate that acute exercise may transiently increase sebum production and alter skin pH, factors theoretically linked to acne development [27]. However, these changes appear to be short-lived, with skin pH returning to baseline levels within approximately one hour after exercise, suggesting minimal long-term disruption of the skin barrier. Notably, sedentary lifestyles are associated with increased systemic inflammation [8,9], a key component of acne pathophysiology [10]. This supports the hypothesis that regular physical activity may exert protective effects through anti-inflammatory mechanisms. Additionally, physical activity may indirectly influence acne through its effects on endocrine conditions such as polycystic ovary syndrome, in which exercise interventions, including yoga, have been associated with symptom improvement [14].

5. Protective Effects of Physical Activity

Physical activity has been proposed to influence skin physiology through several mechanisms. A recent narrative review by Li, Li, and Xie suggests that regular exercise may enhance peripheral circulation and support skin homeostasis, potentially improving oxygen and nutrient delivery. Exercise has also been associated with reduced psychological stress and improved sleep quality, which may indirectly modulate inflammatory processes. However, these mechanisms remain largely theoretical in the context of acne, and direct evidence linking physical activity to key pathogenic pathways, such as sebum production, follicular hyperkeratinization, and inflammation, is limited.

Furthermore, the effects of exercise on skin may vary depending on intensity, environmental conditions, and hygiene-related factors. These considerations highlight the complexity of the relationship and may help explain why genetically predicted physical activity does not appear to exert a causal effect on acne risk in Mendelian randomization analyses [19]. Regular physical activity enhances cutaneous blood flow and microcirculation, improving the delivery of oxygen and nutrients to skin tissues [44] and promoting skin function overall [39]. Additionally, exercise has been shown to exert anti-inflammatory effects, reducing systemic inflammatory markers through chronic training adaptations [15]. Physical activity also influences the neuroendocrine system and hormonal secretion, with evidence that exercise helps regulate hormones implicated in acne development. Such physiological mechanisms provide a plausible biological basis for exercise having potential benefits for skin health and inflammatory skin conditions such as acne [19].

In a population-based cross-sectional study, higher levels of physical exercise were associated with a 14% lower risk of acne after adjusting for age, sex, and ethnicity (OR = 0.86, 95% CI: 0.75–0.99, $p = 0.029$). Similar inverse associations were observed for acne severity (OR = 0.86, 95% CI: 0.75–0.98, $p = 0.024$). While these findings suggest a potential protective relationship between physical activity and acne, the cross-sectional design limits causal inference. Furthermore, these results contrast with recent Mendelian randomization studies, which did not find a causal effect of genetically predicted physical activity on acne risk, indicating that observed associations may be influenced by confounding or behavioral factors [7].

Observational evidence suggests an inverse association between physical activity and acne. In one population-based study, replacing 30 minutes of sedentary time with exercise was associated with a more favourable inflammatory profile, including higher adiponectin and lower levels of complement C3, leptin, IL-6, and WBC [16]. Given that acne is a chronic inflammatory condition [17] and that sex hormones are critically involved in its pathogenesis [18,36], these findings provide a plausible biological mechanism through which physical activity could influence acne. However, causality cannot be established from observational data, and results from genetic studies using Mendelian randomization have not demonstrated a direct causal effect of physical activity on acne risk.

Therefore, while substitution of sedentary behavior with exercise may be beneficial for systemic inflammatory and hormonal profiles, further interventional studies are needed to determine its direct impact on acne development and severity. Key strengths of this study include the large, population-based sample and detailed dermatological assessments of skin conditions. Despite these advantages, several limitations should be considered. First, the cross-sectional design prevents the establishment of causal relationships between lifestyle factors and acne [7]. Additionally, residual confounding, potential self-report bias in lifestyle measures, and limited generalizability may have influenced the observed associations.

6. Negative and Neutral Effects

Lifestyle factors, including stress, diet, and daily habits, are frequently implicated in acne pathophysiology; however, the strength and consistency of these associations remain variable. Psychological stress, for instance, has been proposed to exacerbate acne via neuroendocrine and immune pathways (Mehta & Sujata, 2023) [32], yet much of the supporting evidence is observational and subject to bias. While physical activity is often assumed to confer indirect benefits through modulation of stress, obesity, and insulin resistance, these pathways are not directly examined in the context of acne and therefore remain speculative. Conversely, exercise-related exposures, such as sweating, mechanical friction, occlusion, and post-exercise hygiene practices, are frequently cited as potential aggravating factors. Despite their biological plausibility, these mechanisms are poorly characterized and lack robust experimental or longitudinal validation. As a result, the current literature does not permit clear conclusions regarding whether physical activity exerts net beneficial, neutral, or harmful effects on acne. Importantly, the Mendelian randomization analysis by Tian et al. found no evidence of a direct causal relationship between genetically predicted physical activity and acne vulgaris [20]. While these findings challenge assumptions derived from observational studies, they should be interpreted with caution. The validity of genetic instruments for complex behavioral traits is inherently limited, and null results may reflect insufficient instrument strength or phenotypic imprecision rather than true absence of effect. Taken together, the available evidence suggests that physical activity is better conceptualized as a context-dependent modifier rather than a primary determinant of acne. However, this conclusion remains tentative. Future research should prioritize well-designed longitudinal studies, improved phenotyping of both acne and lifestyle exposures, and more robust causal inference approaches to clarify the interplay between behavioral and biological factors in acne pathogenesis.

7. Psychosocial Context of Physical Activity on Acne

Psychological and behavioral dimensions of acne may also influence engagement in physical activity. A report from the University of Bath indicates that individuals with acne may avoid sport and exercise due to social anxiety, embarrassment, and reduced self-esteem [33]. While such reports are not based on primary epidemiological analyses, they are consistent with findings from clinical studies showing that acne is associated with impaired psychosocial well-being. For example, studies by Dalgard et al. and Magin et al. demonstrate links between acne, reduced self-esteem, and increased psychological distress [35,36]. In addition, organizations such as the American Academy of Dermatology and British Association of Dermatologists highlight the negative impact of acne on self-confidence and social functioning [34].

Together, these findings suggest that acne may indirectly influence lifestyle behaviors, including participation in physical activity. This behavioral pathway provides a plausible explanation for discrepancies between observational associations and the absence of causal effects observed in Mendelian randomization analyses, as reduced physical activity may arise as a consequence rather than a cause of acne.

8. Sports and Their Effects on Acne in Athletes

Sports dermatology is a growing field that continues to identify common as well as unique and interesting sports-related skin conditions. Athletes are a distinct group of patients whose activities place them at high risk for dermatological disease. Repetitive physical activity along with environmental stressors places the athlete at high risk for acquisition or exacerbation of various sports-related dermatologic conditions. Mechanical factors associated with physical activity represent an important, non-systemic pathway influencing acneiform skin conditions. The review “More Than Skin Deep: Dermatologic Conditions in Athletes” describes acne mechanica as a localized eruption induced by friction, pressure, occlusion, and heat, typically in areas exposed to repetitive mechanical stress from sports equipment or tight clothing. Similar observations are reported by Emer J, Sivek R, Marciniak B, who emphasize that acne mechanica differs fundamentally from acne vulgaris in its pathogenesis, being driven primarily by external mechanical forces rather than follicular hyperkeratinization, sebum overproduction, and intrinsic inflammation. This distinction is important when interpreting associations between physical activity and acne. While exercise may appear to exacerbate skin lesions in some individuals, such effects may reflect context-specific mechanical and environmental exposures rather than systemic or causal influences on acne biology. Consequently, these localized processes may contribute to inconsistencies in observational studies and help explain the absence of a causal relationship between physical activity and acne vulgaris observed in Mendelian randomization analyses [40,42].

The article “Acne Vulgaris in the Athlete” by R. J. Conklin and J. E. Taunton highlights the influence of sport-related environmental and mechanical factors on acne presentation in athletic populations. The authors note that sweating, friction from clothing, and contact with equipment may exacerbate lesions and alter their distribution, particularly in areas exposed to repetitive mechanical stress. These observations are consistent with the concept of acne mechanica and suggest that exercise-related aggravation of acne may arise from localized physical and environmental conditions rather than systemic biological effects. This distinction is important when interpreting epidemiological associations, such as context-specific factors may contribute to perceived links between physical activity and acne without reflecting a direct causal relationship, in line with findings from Mendelian randomization studies [43].

In a 2022 study published in *Pediatric Dermatology*, Morss-Walton and colleagues investigated the acute effects of swimming on facial sebum in 16 adolescent swimmers with and without acne. Sebum and skin shine were measured immediately before and after one hour of swimming. The study found that swimmers without acne experienced significant reductions in sebum and shine post-swim, whereas those with acne did not. These findings suggest that swimming may preferentially reduce superficial sebum while leaving follicular sebum relatively unaffected, although this mechanism was not directly assessed. The authors cautiously propose that this could help explain why some athletes experience concurrent skin dryness and acneiform lesions. Interpretation is limited by the small sample size, short-term assessment, and absence of direct measurement of acne activity or *Cutibacterium acnes*, highlighting the need for further studies before definitive conclusions can be drawn [41].

Pujalte et al. highlight acne mechanica as a common yet often underrecognized dermatologic condition in athletes, driven by heat, occlusion, pressure, and repetitive friction from sports equipment such as helmets and pads. The condition typically presents in areas of mechanical stress and is distinguished from acne vulgaris by its clear association with external triggers. The authors effectively emphasize its pathophysiology and relevance to athletic settings; however, the discussion of management remains limited, with minimal detail on targeted therapies or preventive strategies beyond general measures. While the review successfully raises awareness of acne mechanica

as a sport-specific entity, a more comprehensive, evidence-based approach to treatment and differentiation from other acneiform eruptions would strengthen its clinical utility [40].

9. Discussion

Previous Mendelian randomization (MR) studies have investigated acne vulgaris in relation to exposures such as gut microbiota [27,28], serum metabolites [31], proteomics, lipid-lowering drugs, circulating cytokines, lactase persistence and milk intake [30], and mineral deficiencies [29]. However, sleep-related traits and physical activity have not been comprehensively evaluated using MR approaches. While epidemiological studies suggest associations between physical activity [25,26] and acne or other skin conditions, causal inference has been limited by confounding and reverse causation. However in Tian's study, researchers found no evidence of causal associations between physical activity and acne vulgaris. These findings were consistent across multiple sensitivity analyses, suggesting that previously observed associations may reflect confounding or indirect mechanisms rather than direct causal effects. Further research is needed to explore alternative biological pathways underlying acne development [20].

The cross-sectional study by Marković et al. 2019 examined over 1400 adolescents with acne, revealing notable differences in perceived triggers between sexes. Male participants frequently attributed acne exacerbation to sweating and physical activity, whereas females more often cited stress, diet, and sleep deprivation. Importantly, the authors clarify that sweating itself is not a direct cause of acne; instead, exercise-related environmental factors, such as heat, humidity, friction, and occlusion, may contribute to follicular blockage and lesion formation. These findings highlight a common misperception that physical activity directly worsens acne. By distinguishing between environmental or mechanical contributors and true physiological effects, this study underscores the importance of separating myth-based beliefs from evidence-based mechanisms in acne research. While this study provides valuable insight, further research is needed to confirm these patterns across diverse populations and exercise contexts [37].

Emerging genomic and metabolomic evidence suggests that acne vulgaris may have systemic metabolic associations beyond its classical characterization as a localized skin disorder. For example, Mendelian randomization analyses have identified associations between acne and circulating metabolites, particularly those involved in lipid and energy metabolism, although the specific pathways and causal directions remain uncertain. In parallel, population-based studies indicate that adult acne, especially in males, may be associated with features of metabolic dysregulation, including altered insulin and glucose homeostasis. However, these findings are largely observational and do not establish causality. This systemic perspective is relevant when considering physical activity, which is known to influence metabolic processes such as insulin sensitivity and lipid metabolism. While these pathways could theoretically link exercise to acne pathophysiology, the absence of a causal effect in Mendelian randomization analyses suggests that such relationships, if present, are likely indirect or context-dependent. Accordingly, physical activity may be better conceptualized as a modifying or correlational factor within a broader metabolic framework rather than a direct determinant of acne risk. Accordingly, exercise may be better understood as a potential modifying factor within acne pathophysiology rather than solely an external or mechanical trigger, although further research is needed to clarify the strength and direction of this relationship [38,39]. Physical activity exerts numerous beneficial effects on both physical and mental health and has been associated with improvements in skin physiology, including enhanced barrier function and anti-aging effects [25]. These observations suggest that exercise may also influence the development or severity of acne.

However, evidence derived from observational studies remains inconclusive, as such designs are susceptible to confounding, measurement error, and reverse causality. To overcome these limitations, approaches such as Mendelian randomization (MR), which uses genetic variants as proxies for exposures, can strengthen causal inference.

10. Conclusions

The relationship between physical activity and acne vulgaris remains complex, context-dependent, and insufficiently resolved. While exercise is frequently perceived as a trigger for acne exacerbation, the current body of evidence suggests that this association is often driven by indirect environmental and mechanical factors, rather than by physical activity itself as a direct physiological cause. This distinction is critical, as it challenges widely held assumptions and highlights the risk of misattributing causality based on subjective experience or poorly controlled observational data. Importantly, emerging evidence from genetic approaches, including Mendelian randomization analyses, does not support a direct causal relationship between physical activity and acne. These findings, although methodologically constrained, further reinforce the notion that previously observed associations may be explained by confounding variables or correlated lifestyle behaviors rather than true biological effects. At the same time, physical activity may exert indirect benefits through modulation of stress, metabolic health, and

systemic inflammation, although these pathways have not been adequately investigated in acne-specific contexts. Overall, the literature reviewed in this paper indicates that physical activity should not be simplistically categorized as either a protective or harmful factor in acne pathogenesis. Instead, it is more appropriately understood as a modifying influence whose effects depend on a range of contextual variables, including exercise environment, individual susceptibility, and associated behaviors. From a clinical and public health perspective, these findings underscore the importance of addressing misconceptions that may discourage physical activity among individuals with acne. Rather than advising avoidance of exercise, emphasis should be placed on mitigating modifiable external factors, such as appropriate clothing, skin hygiene, and prompt post-exercise cleansing, that may contribute to acne mechanica-like presentations.

Future research should move beyond cross-sectional and perception-based studies toward more rigorous designs, including longitudinal cohorts and integrative approaches combining genetic, behavioral, and clinical data. Improved phenotyping of both acne severity and physical activity exposures will be essential to disentangle causal relationships and identify clinically meaningful effects. A more nuanced and evidence-based understanding of these interactions will ultimately enhance both patient education and management strategies in acne care. Therefore, this study supports the idea that physical activity may be unfairly implicated in acne development, reinforcing the need to differentiate between myth-based perceptions and evidence-based mechanisms in dermatological research.

Disclosure:

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