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Hormonal Contraceptives and Athletic Outcomes- analysis of potential effects of oral contraceptives on strength, endurance, mood, and overall competitive results

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Abstract

Introduction

Hormonal contraceptives, particularly oral contraceptives (OC), are commonly used by female athletes to regulate menstrual cycles, manage hormonal fluctuations, and prevent unwanted pregnancies. With an increasing number of women competing at elite levels, a central question emerges: can OC use influence key aspects of performance—such as strength, endurance, and mood stability—and thereby affect competitive outcomes?

Materials and Methods

This review is based on recent studies published between 2020 and 2024 that evaluated the effects of oral contraceptives on physical and psychological performance metrics in physically active women. Sources included observational research and randomized controlled trials, focusing on how different hormonal formulations might alter muscle function, aerobic capacity, and mental well-being. Selection criteria centered on English-language papers featuring measures of athletic performance.

Analysis of the Literature

Findings regarding the impact of OC on athletic outcomes remain inconsistent. Some investigators report slight reductions in muscle strength and cardiorespiratory capacity, possibly linked to hormonal shifts or metabolic alterations. Others note minimal or negligible changes, pointing to variables such as training volume, sport-specific demands, and the athlete's inherent physiological profile. Additionally, certain studies underscore potential mood-related benefits, including more stable emotional states that might support training

compliance. These varying conclusions highlight the multifactorial nature of OC use, emphasizing the importance of personalization and monitoring to capture individual responses.

Conclusions

Overall, the relationship between oral contraceptive use and athletic performance is complex and appears to be highly individualized. While some athletes may observe modest shifts in physical or psychological parameters, others remain largely unaffected. Further, well-controlled research is needed to clarify these effects, enabling more targeted guidance for both athletes and healthcare professionals.

Key words: oral contraceptives, hormonal contraception, athletic performance, strength, endurance, mood

Introduction and purpose

Female athletes across both recreational and elite levels frequently rely on oral contraceptives (OC) not only for birth control but also to help regulate menstrual cycles and manage hormonal fluctuations [1,2]. The growing participation of women in a wide range of sports has placed a spotlight on the potential ramifications of such hormonal interventions, particularly in fields where even marginal differences in performance can influence competitive outcomes [3,4]. While some athletes experience benefits such as improved cycle regularity, decreased menstrual discomfort, and reduced anemia risk, others remain wary of possible shifts in muscle mass, cardiorespiratory capacity, and mood that could hinder training and competition [5,6]. Furthermore, subtle physiological changes—such as fluctuations in estrogen, progesterone, and free testosterone levels—may have ramifications for recovery time, injury risk, and overall athletic longevity.

This widespread use of OC has sparked considerable interest among sports scientists, medical professionals, and coaches, prompting questions about how best to tailor exercise programs

and monitor health for women on hormonal contraceptives [7]. Recognizing that athletes differ in their physiological makeup and athletic demands, researchers have begun to investigate whether certain formulations or dosages exert more pronounced effects on strength, endurance, and psychological well-being.

The primary objective of this paper is to present a comprehensive overview of recent research on how oral contraceptives might affect athletic performance metrics [8]. By focusing on the interplay between OC use and various performance indicators—such as neuromuscular strength, aerobic and anaerobic capacity, and mood stability—this review seeks to consolidate existing findings and pinpoint gaps in the current literature. Such insights are vital for guiding evidence-based decision-making, ultimately enabling female athletes to optimize their training, safeguard their health, and excel in competitive environments.

Effect on Strength

Several studies have explored whether oral contraceptive (OC) use influences muscle strength and hypertrophy, given the intricate interplay between sex hormones and anabolic processes [17,18]. Certain findings indicate that women taking OC may exhibit slightly lower levels of free testosterone, which could theoretically limit or slow the rate of strength gains over time [19]. This possibility has led to discussions on whether OC-related hormonal shifts might impede optimal neuromuscular adaptations, particularly in disciplines that rely heavily on maximal force production or power output.

However, a number of publications report negligible or no statistically significant differences in maximal strength measures or muscle protein synthesis rates, suggesting that any hormonal impact could be counterbalanced by consistent resistance training, adequate macronutrient intake—especially protein—and well-structured recovery protocols [20]. Some researchers posit that these findings underscore the adaptability of the musculoskeletal system, which can compensate for hormonal fluctuations through progressive overload and individualized workout regimens.

In addition, variations in the composition and dosage of hormonal contraceptives—such as differing estrogen-progestin ratios—may further shape the extent of any OC-related effects on strength development. Some athletes may be more sensitive to certain formulations,

underscoring the importance of monitoring performance indicators and considering alternative contraceptive options if a particular regimen appears to hinder progress. Consequently, personalized approaches that account for an athlete's specific contraceptive formulation, training status, and dietary habits are recommended to accurately assess changes in strength over the long term. As researchers continue to investigate the nuanced links between hormonal contraception and muscle adaptation, a clearer consensus on best practices for female athletes may emerge [22].

Effect on Endurance

Endurance capabilities are paramount for athletes who specialize in distance-based sports such as running, cycling, and triathlon, where sustained cardiovascular output often dictates success [22]. A subset of studies suggests that women using oral contraceptives (OC) may experience slight decrements in maximal oxygen uptake (VO_2max), positing that hormonal changes could influence factors like red blood cell production or substrate utilization, ultimately altering aerobic capacity [23,24]. In particular, fluctuations in estrogen and progesterone might modulate erythropoiesis or vascular function, thereby affecting oxygen delivery to working muscles.

Conversely, other investigations find no meaningful differences in endurance performance between OC users and their naturally menstruating counterparts, highlighting that individual responses can be shaped by diverse factors such as training volume, body composition, and genetic predisposition [25]. Certain athletes may even adapt training regimens to compensate for potential hormonal shifts, underscoring the importance of personalized exercise prescriptions. Intriguingly, some evidence suggests that meticulously planned training cycles—especially those incorporating periodized intensity and calculated rest phases—can mitigate or negate the small adverse effects occasionally reported in OC users. These strategies may include targeted nutritional interventions (e.g., iron supplementation), additional recovery modalities, or modified workout intensities based on perceived exertion [26].

Nonetheless, pinpointing definitive causal mechanisms remains challenging. Sample sizes often vary, and many confounding variables—from dietary patterns and sleep quality to environmental conditions like altitude—can influence endurance metrics. This highlights the need for larger, more controlled investigations that systematically account for these factors,

enabling clearer conclusions about the interplay between hormonal contraceptives and long-duration athletic performance.

Effect on Mood

Psychological well-being is pivotal for optimal athletic performance, influencing key domains such as motivation, focus, and stress resilience [27]. Reports indicate that some women using OC may experience mood disturbances, irritability, or mild depressive symptoms, potentially undermining training consistency or competition preparedness [28,29]. In contrast, other athletes report a stabilizing effect on emotional fluctuations, particularly those who previously experienced pronounced premenstrual syndrome (PMS) or dysmenorrhea [30]. These disparate outcomes may reflect unique hormonal sensitivities, lifestyle factors, or the specific type of oral contraceptive used [31]. Consequently, thorough monitoring of psychological status, coupled with open communication between athletes, coaches, and medical professionals, can facilitate timely interventions—such as adjusting training regimens or considering alternative contraceptive methods—to maintain overall well-being and performance.

Overall Competitive Performance

When examining overall competitive outcomes—encompassing strength, endurance, and mental readiness—current literature remains inconclusive. While certain research suggests that minor physiological or mood-related changes associated with OC may not substantially affect competitive results, especially in athletes who closely regulate their training and recovery, others contend that even small deviations in performance markers can prove consequential at elite levels. Additionally, the long-term ramifications of sustained hormonal manipulation are not fully understood, with some experts advocating extended follow-up studies spanning multiple athletic seasons. Such work could better clarify the cumulative effects of OC on performance and guide more nuanced recommendations. Ultimately, a personalized, evidence-based approach—encompassing regular assessments, collaboration between healthcare providers and coaching staff, and open dialogue with the athlete—remains paramount for maximizing both health and performance [32].

Conclusions

Oral contraceptives (OC) appear to exert heterogeneous effects on strength, endurance, mood, and overall competitive success among female athletes. The degree to which these parameters are influenced varies considerably, likely stemming from multiple factors such as the specific hormonal formulation, the athlete's individual physiology and susceptibility, as well as methodological differences across studies. Some women may observe minor declines or improvements in certain performance indicators, whereas others report no perceptible changes in either physical abilities or psychological well-being. This inconsistency highlights the complexity of isolating hormonal influences from other confounding variables, such as training intensity, nutritional status, and genetic predispositions.

To date, the available research points to the need for large-scale, well-controlled investigations that would allow for stratification of athletes by discipline, competitive level, and type of contraceptive used. Such studies could shed further light on dose-related effects, long-term consequences, and potential interactions with other performance-modifying factors. Findings from these efforts would enable more refined guidance for female athletes and sports medicine professionals who must often weigh the benefits of menstrual regulation and pregnancy prevention against the possibility of subtle shifts in performance capacity.

Ultimately, individualized assessment remains paramount. Coaches, healthcare providers, and athletes themselves should maintain ongoing dialogue to monitor any physiological or psychological changes, ensuring that training regimens and recovery protocols are optimally adapted. By adopting a personalized and evidence-based approach, women can make informed decisions about OC use that best support both their health and their athletic ambitions.

Disclosures

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