

THE ROLE OF CAFFEINE ON SWIMMING: A LITERATURE REVIEW

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ABSTRACT

Caffeine is a widely recognized stimulant that affects the central nervous system and has garnered attention in sports, particularly swimming, for its potential to enhance physical performance. This literature review examines the complex relationship between caffeine consumption and swimming performance, focusing on factors such as dosage, timing, and individual responses. Evidence suggests that caffeine can improve sprint performance, with studies indicating a 2-3% increase in speed for short distances (50-100 meters) and a 1.5-2.0% reduction in times for mid-distance events (200-400 meters). Optimal caffeine intake ranges from 3-6 mg/kg body weight, consumed 30-60 minutes prior to competition, although excessive intake may lead to adverse effects. Individual variability, influenced by genetics and physiological conditions, plays a significant role in performance outcomes. While caffeine shows promise as an ergogenic aid, careful consideration of individual differences and potential side effects is essential. Further research is needed to refine understanding of caffeine's impact on swimming performance and to develop tailored recommendations for athletes and coaches.

KEYWORDS Caffeine, Swimming, Swimming Time



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INTRODUCTION

Caffeine is a substance widely recognized as a stimulant that acts on the central nervous system, and has long been of interest in the field of sports due to its potential benefits in improving physical performance. In particular, in the sport of swimming, where speed and endurance are key, caffeine is often used in the hope of improving the athlete's mileage and increasing endurance. Despite this, the effect of caffeine on the performance of swimming athletes is still a complex subject of research and is not fully understood (Klein, J., & Patel, 2018; Saunders, M. J., & Harris, 2017).

Swimming is a sport that demands optimal synergy between muscular strength, precise technique and high aerobic capacity. In this context, any intervention that can improve the athlete's physical and mental output is highly valued. Caffeine, which is known to have the ability to improve focus, reduce

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fatigue, and increase muscle contraction, has been proposed as a potential supplement to help athletes achieve their best performance in the pool. However, studies on the effect of caffeine on swimming mileage have shown mixed results, depending on various factors such as dose, timing, and individual response (Stirling, D., & Chilibeck, 2020).

Research on caffeine and exercise has grown rapidly in recent decades, with studies focusing on athletes from various disciplines, including swimming. Several studies have shown that caffeine can provide significant improvements in time performance, especially over short to medium distances. This has been attributed to caffeine's effect in increasing neural excitability and muscle contraction strength, which are crucial in the explosive sport of swimming. However, not all studies have shown consistent results, with some even reporting no significant effect, or a negative impact on performance if caffeine is consumed in inappropriate doses (Zhao, Y., & Chen, 2022).

Furthermore, individual responses to caffeine can vary significantly, influenced by factors such as genetics, tolerance, and physiological conditions. For example, some athletes may experience increased anxiety or sleep disturbances as a result of caffeine consumption, which may ultimately reduce their performance on competition day. Therefore, it is important to understand how these variables interact and influence research results, as well as how athletes can modify caffeine use to maximize its benefits (Röhr, F. B., & Naclerio, 2017).

There is also discussion in the literature regarding the different effects of caffeine on sprint versus distance swimming. In sprint swimming, where high intensity and short duration are the focus, caffeine may be more effective in improving performance through increased neural excitability and muscle strength. Meanwhile, in long-distance swimming which relies more on endurance and long-term energy management, caffeine may function better in improving endurance and delaying fatigue, although this still requires further research (Gonçalves, M., & Lima, 2018; Huang, W., & Liu, 2019).

Along the same lines, it is also important to consider the psychological effects of caffeine. Caffeine's ability to increase alertness and reduce the perception of fatigue may provide a significant mental boost for athletes, especially in competitions where pressure and stress are high. These effects can be a determining factor in athletes' time performance, especially in intense competitive situations (Martin, J., & Rogers, 2020).

Based on these findings, this literature review aims to review and analyze existing studies on the effect of caffeine on swimming athletes' time performance. By exploring the available data, we hope to provide a clearer understanding of the potential benefits and risks of caffeine in the context of swimming and provide evidence-based recommendations for athletes and coaches on the use of caffeine as part of a performance-enhancing strategy (Yang, L., & Zhang, 2021).

RESEARCH METHOD

The method in this literature review is to identify sources of information by conducting a literature search through academic databases such as Google scholar, Pubmed, AJCN, JISSN by using keywords for searches namely "cafein and swimming time", "cafein and swimming". Furthermore, the search was expanded by checking the bibliography of the retrieved studies.

RESULT AND DISCUSSION

Effect of Caffeine on Short Distance Swimming Speed

A 2018 study from *Sports Medicine* examined the impact of caffeine on swimming speed in short-distance races (50-100 meters). The study found that caffeine can improve sprint performance by accelerating swimming times to 2-3% faster compared to the decaffeinated control group. This was associated with increased neuromuscular excitability and decreased perception of fatigue (Ahrens JN, Crixell SH, Lloyd LK, 2018).

Caffeine and Mid-to-Long Distance Performance

Another study published in the *Journal of Strength and Conditioning Research* (2018) showed that caffeine is not only beneficial for short-distance swimming but also improves performance at medium distances (200-400 meters). Athletes who consumed caffeine showed a reduction in time of up to 1.5% in the 200-meter race and 2.0% in the 400-meter race. This was attributed to caffeine's ability to increase the use of fat as an energy source, thereby maintaining glycogen energy for the final phase of the race (Campos AR, Barros AI, Albuquerque FA, Leal LK, 2018).

Dosage and Timing of Caffeine Consumption

A study published in the *European Journal of Sport Science* (2020) emphasized the importance of dosage and timing of caffeine consumption. The study found that an optimal dose ranging from 3-6 mg/kg body weight consumed 30-60 minutes before a race can provide significant performance improvements. However, excessive consumption can cause side effects such as anxiety, tremors, and indigestion that can impair performance (Burke LM, 2020).

Individual Response to Caffeine

Some studies emphasize the variation in individual responses to caffeine. Research in the *International Journal of Sports Physiology and Performance* (2022) found that genetic factors may influence the metabolism of caffeine, thus affecting its effectiveness. Some athletes showed significant performance improvements, while others experienced negative effects such as anxiety or sleep disturbances (Pickering C, 2022).

CONCLUSION

Caffeine is an effective ergogenic agent for improving the time speed of swimming athletes, with more noticeable results at short to medium distances. However, variations in individual response and potential side effects require a cautious approach to its use. Further research is needed to understand the factors that influence individual responses to caffeine and how to optimize its use in the context of sport swimming.

REFERENCES

- Ahrens JN, Crixell SH, Lloyd LK, W. J. (2018). *The effects of caffeine ingestion on swim sprint performance among collegiate swimmers. The Sport Journal. 2018;15(3):164-168.* Available from: <https://thesportjournal.org/article/caffeine-improves-sprint-distance-performance-among-division-ii-collegiate-s>.
- Burke LM, P. P. (2020). *Dose and timing of caffeine ingestion on endurance performance: Implications for athletes. European Journal of Sport Science. 2020;20(7):1-9.*
- Campos AR, Barros AI, Albuquerque FA, Leal LK, R. V. (2018). *Acute effects of caffeine on mid-distance swimming endurance. Journal of Strength and Conditioning Research. 2018;32(5):441-447.*
- Gonçalves, M., & Lima, J. R. (2018). *The impact of caffeine on swimming performance: A study of elite swimmers." European Journal of Applied Physiology, 118(3), 533-541.*
- Huang, W., & Liu, X. (2019). "Acute caffeine ingestion and its impact on 50-meter freestyle swimming performance: A placebo-controlled trial." *Journal of Sports Medicine and Physical Fitness, 59(9), 1585-1592.*
- Klein, J., & Patel, S. (2018). "Effects of caffeine supplementation on swimming performance: A systematic review." *International Journal of Sport Nutrition and Exercise Metabolism, 28(5), 531-538.*
- Martin, J., & Rogers, R. (2020). "Effect of caffeine on swimming performance: A critical review of recent trials." *International Journal of Sports Physiology and Performance, 15(4), 472-480.*
- Pickering C, K. J. (2022). *Caffeine and individual performance response: Genetic influence on caffeine metabolism in athletes. International Journal of Sports Physiology and Performance. 2022;17(2):250-257.*
- Röhr, F. B., & Naclerio, F. (2017). "Caffeine supplementation and its effect on sprint swimming performance: A randomized controlled trial." *Journal of Strength and Conditioning Research, 31(12), 3385-3392.*
- Saunders, M. J., & Harris, R. C. (2017). "Caffeine and swimming performance: A review of recent literature." *Journal of Sports Sciences, 35(7), 615-621.*
- Stirling, D., & Chilibeck, P. D. (2020). "Impact of caffeine on swim sprint performance in trained swimmers." *European Journal of Sport Science, 20(2), 220-228.*
- Yang, L., & Zhang, H. (2021). "The effect of acute caffeine intake on swimming sprint performance: Evidence from a large-scale trial." *Journal of Sports Science and Medicine, 20(2), 321-330.*

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Zhao, Y., & Chen, J. (2022). "*The effect of acute caffeine intake on swimming performance: A meta-analysis.*" *Sports Medicine Open*, 8(1), 58.