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Review Article

The Effects of Snus Use on the Psycho-Physical Performance of Elite Soccer Players

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Authors' Contribution: A: Study design, B: Data collection, C: Data analysis, D: Manuscript preparation, E: Discussion and conclusion

ABSTRACT

Study aim(s): This paper aims to examine and analyze the impact of Snus use in sports, with a particular focus on football players. It explores the effects of Snus on health and athletic performance, delving into its physiological impact and contributing to discussions on sports ethics. Given the rising use of Snus in football, this study seeks to provide a broader understanding of its influence on physical, psychological, and social aspects.

Methods: This study is a systematic review conducted following the PRISMA model standards. The initial search yielded 2657 papers from PubMed and 654 from Scopus. Through a rigorous elimination process based on PRISMA criteria, the selection was narrowed down to 17 papers from PubMed and 7 from Scopus for analysis.

Results: The reviewed literature indicates that Snus use in sports poses risks to athletes' health, including addiction, cardiovascular disease, and oral health issues. While some players use Snus to enhance concentration and manage stress, studies reveal that it offers no lasting benefits. Additionally, its use may set a harmful example for young athletes. Therefore, sports organizations must promote health awareness and educate athletes about these risks.

Conclusion: Although some athletes use Snus for concentration and stress management, there is no solid evidence of actual performance benefits. Moreover, its use carries serious health risks, including addiction, cardiovascular issues, and oral health damage. In conclusion, more detailed studies are needed to understand its long-term effects. Notably, Snus is banned by WADA.

Keywords: Snus, Nicotine, Football, Psychological Performance, Physical Performance

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INTRODUCTION

In recent years, nicotine use and its related products have grown in popularity, with an increasing variety of forms and consumption methods. This trend is driven by a shift toward alternatives to smoking, which are perceived to offer greater convenience and safety. One example of such a product is Snus, a smokeless nicotine alternative that offers consumption without oxidation, setting it apart from other nicotine delivery methods. Snus is an oral tobacco product typically placed behind the upper lip, resembling a small pouch. It consists of air-dried, minced tobacco mixed with salt and water, and it undergoes rigorous treatment and quality inspection [1]. In the European Union, the sale of Snus is prohibited in all member states except Sweden [1]. Is there a similar legislation regarding Snus in Kosovo?

In the long run, this paper will investigate and analyze the effects of Snus, focusing on its direct impact on gameplay and the performance of athletes on the field. Considering that performance in football requires a great deal of discipline, focus, dedication, and fair play, these factors significantly influence an athlete's overall performance. The impact of Snus on athletes highlights the importance of analyzing its direct connection to performance. It can lead to increased heart rate and blood pressure, pose risks to oral health, raise the likelihood of cancer, and affect cognitive functions, including attention and memory, which may deteriorate over time. Elite athletes often compete in an environment where they seek any potential advantage to enhance their physical performance. Some athletes view Snus as an alternative to improve performance, believing it acts as a "mental and physical booster" due to the nicotine content [2]. Stimulants are banned in competition by the Agency World Anti-Doping (WADA), except for nicotine, which is known to enhance alertness coordination of performance [3]. Nicotine can elevate heart rate and blood pressure while also enhancing the production of anaerobic energy. Since 2013, it has been included in the WADA monitoring program [3]. Smokeless tobacco, including Snus, is widely used, particularly in Scandinavian countries and North America. Surveys indicate a high prevalence of Snus use among athletes in these regions [3].

Several elite athletes believe that using Snus before and during a match helps reduce stress, improve concentration, and enhance both psychological and physical performance. However, the claims made by footballers about Snus's effects are largely anecdotal and lack a strong scientific foundation. Research in this area contributes positively to the expansion of sports science literature, particularly concerning elite soccer players. The existing literature lacks a comprehensive survey examining the effects of Snus on the psychological and physical performance of athletes, despite claims made by many such elite athletes. The proposed method will involve reviewing the literature, conducting descriptive analyses, and updating the findings as necessary. The primary goal of this study is to examine and evaluate the impacts of Snus use in sports, with a particular focus on footballers and its effects on their health and performance. The research aims to analyze the physiological effects of Snus and contribute to discussions surrounding sports ethics. Considering the increased use of Snus in football, this study seeks to provide a comprehensive understanding of its physical, psychological, and social impacts.

The key objectives of this topic include analyzing the physiological effects of Snus on footballers, including its influence on concentration and performance capacity; reviewing the factors that encourage its use; and assessing its long-term impact on footballers' well-being, including potential dangers and risks of addiction.

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METHODS

Study model

This study follows a systematic review model based on PRISMA standards. It aims to draw new conclusions regarding the use of Snus and its impact on public health [4]. The search criteria focus on studies published within the last 10 years. The reduction scheme for reviewing the existing literature includes:

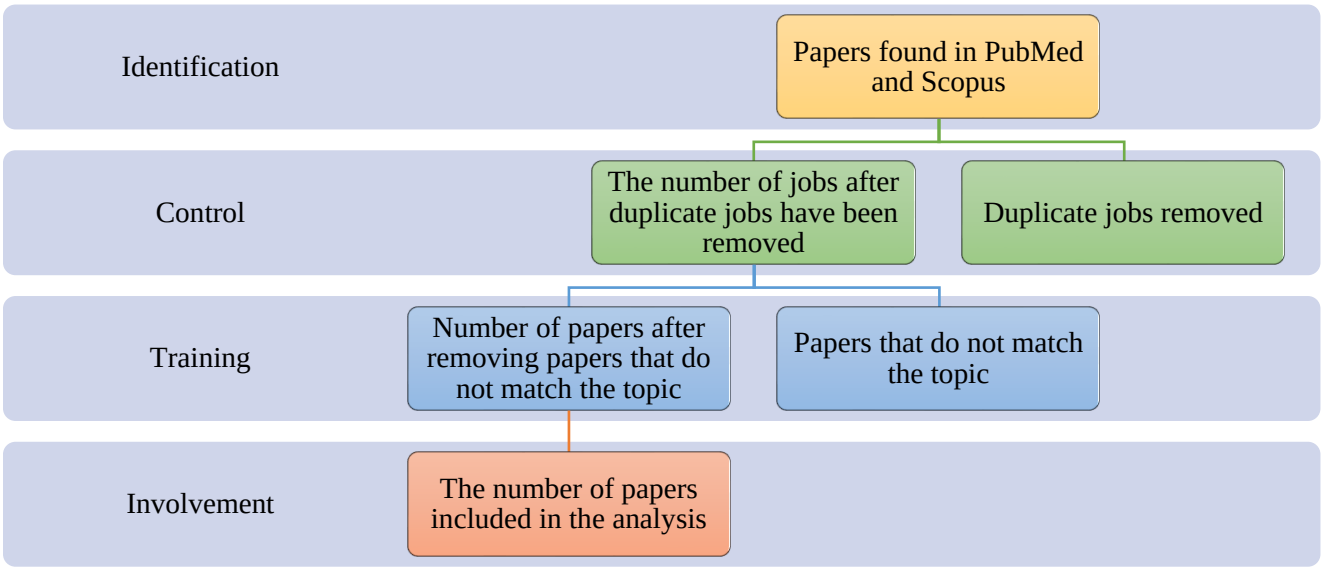

Figure 1. PRISMA Model

Table 1. Studies related to Snus*

Academic Databases	PubMed	Scopus	Total
Studies found	2657	654	3311
Theme adaptations	48	15	63
The studies that provide conclusions on this topic	17	7	24

**No studies related to Snus in football were found on the WOS platform*

Research conducted in PubMed and Scopus reveals that the number of studies addressing this topic is relatively limited, with a total of only 24 publications identified across both platforms. These studies are categorized based on their respective focus areas and are accessible through both PubMed and Scopus databases, highlighting the need for further exploration and research in this field.

FINDINGS

Table 1. PubMed Proceedings

Title	Aim	Conclusion	Source
Snus: A persuasive alternative, but with its own tobacco-related risks.	Evaluation of the health effects related to Snus use and its role as an alternative harm reduction in tobacco consumption.	This review found that the health risks associated with Snus are lower than those with cigarettes. Snus can potentially provide significant harm benefits, particularly in Sweden, where studies have been conducted.	1

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Smokeless tobacco: An alternative to smoking tobacco or a pathway to avoid tobacco smoke.	A marketing review and its impact on public health regarding tobacco products in the context of reducing tobacco-related harm.	The trade of tobacco products presents various challenges to public health. The lack of detailed research is a significant issue. It is essential to carefully weigh the benefits and risks, prioritizing public health and safety.	5
An update on the prevalence and risks of using Snus and nicotine substitutes during pregnancy and breastfeeding.	In parallel with the decline in smoking rates, the use of the oral product Snus, has increased among women of reproductive age. This update provides information on the prevalence and features of Snus use, as well as the use of nicotine substitutes during pregnancy and breastfeeding.	Fewer studies were found providing updated information on the prevalence and negative health effects of Snus and nicotine substitutes used by mothers during pregnancy.	6
Is there a relationship between physical activity and Snus use?	This study aims to analyze the link between Snus use and physical activity levels, particularly focusing on sports and training among youth in Switzerland. It seeks to determine whether these relationships are significant when comparing Snus users to smokers or users of other smokeless tobacco studies.	This study confirmed that Snus use is associated with sports and physical activity in Switzerland, where access to Snus is legally restricted. It is important to monitor Snus use within the young, physically active population.	7
Practitioner observations on the role of oral nicotine in elite sports: "With Snus, You Lose."	Emphasizing the growing prevalence of Snus use among athletes, particularly in relation to physical activity and psychological performance, highlights the need for education on the health implications of Snus.	The increasing use of Snus among athletes raises important concerns not only about health but also about performance. Athletes need to receive comprehensive education regarding the negative effects of Snus and other oral tobacco products.	8
Use of Snus in football: Is addiction a new danger?	This review examines the increased use of Snus in professional football, its regulatory status, performance-related effects, and the associated health outcomes.	1. Investigate the motivations behind Snus use among football players. 2.Survey the prevalence and usage patterns of Snus in football. 3.Study the effects of nicotine on athletic performance. 4.Examine the long-term impacts of Snus use on health and fitness. 5.Assess the level of staff knowledge regarding Snus use among athletes. 6.Conduct a long-term survey to track trends and outcomes.	9
Acute effects of Snus on physical performance and perceived drive in amateur footballer players.	Access the impact of Snus on the performance of football players who are non-smokers and non-users of Snus, particularly focusing on its influence on physical performance, heart rate variability, subjective activation, psychological fatigue, and perceived readiness before tests.	This study shows that Snus use does not improve the physical performance of amateur players. It highlights an increase in mental fatigue and reduced readiness, underscoring the need for further research to understand the implications of Snus on athletic performance and the overall well-being of players.	10
Increased exercise performance in athletes who use smokeless tobacco	An investigation into the ergogenic effects of Snus on aerobic performance in athletes, specifically examining the time to exhaustion	This study shows that Snus use does not significantly improve exercise performance, as evidenced by a 13.1% increase in time to exhaustion	11

after long periods of nicotine abstinence.	during prolonged training under conditions of nicotine abstinence and saturation.	after 12 hours of nicotine abstinence. Further research is needed to explore the long-term implications and safety of Snus use for athletes.	
The effects of oral administration of smokeless tobacco on performance sustainability.	The purpose of this study is to investigate the effects of Swedish Snus on the perception of fatigue and time to exhaustion during prolonged aerobic exercise at moderate intensity in athletes.	This study showed that muscular oxygenation and cerebral oxygenation increased significantly with long-term Snus administration during exercise, leading to improved endurance in terms of time to exhaustion. However, it did not affect the perception of fatigue. The results indicated that Snus cannot be considered an ergogenic substance in non-smokers.	12
Nicotine supplementation increases performance stimuli in athletes during archery.	This study examines the effects of nicotine supplementation on cognitive skills, heart rate variability, and performance in athletes, with a focus on the potential benefits of nicotine in improving cognitive function in this sport.	Nicotine enhances the performance of athletes in this sport by improving cognitive function and stimulating the adrenergic sympathetic system.	13
The long-term health effect of switching from cigarettes to Snus.	The purpose of this study is to assess the health effects of switching from cigarettes to Snus, comparing cancer risks and cardiovascular disease among current Snus users who were previously smokers and those who continue to consume tobacco.	In conclusion, the available evidence suggests that individuals who use Snus have a lower risk of cancer and cardiovascular disease compared to those who continue smoking.	14
Use of Snus in football: Is it a new risk for dependence?	The purpose of this study is to explore the growing use of Snus among professional football players in England, examining its regulatory status, performance-related effects, and associated health outcomes. The study also emphasizes Snus's role as a coping mechanism for natural stressors in professional sports.	The spread of Snus use in professional football underscores the need for outreach regarding its health implications and the pressures athletes face in coping with it.	15
Acute effects of Snus on physical performance and perceived exertion in amateur footballers.	The purpose of this study was to investigate the effects of Snus physical performance, heart rate variability, subjective activation, mental fatigue, and perceived readiness in non-smokers and non-users of Snus.	The findings of this study show that Snus does not increase physical performance in amateur players. Snus use was associated with increased mental fatigue and perceived load.	16
Long-term use of Snus and its risk of metabolic syndrome and hip-related conditions.	The purpose of this study is to investigate the relationship between lifelong exposure to Snus and the prevalence of metabolic syndrome and hip-related conditions in older adults.	The health consequences of exposure to Snus from adolescence into adulthood may include an increased risk of metabolic syndrome and hip-related conditions. The cardio-metabolic risks associated with the combined use of Snus and cigarettes require further investigation.	17
Factors influencing the initiation of Snus use among teenagers.	The study examines factors related to the initiation and continued use of Snus among teenagers in Norway. These factors include the perceived value of education to	These findings can aid in the development and targeting of tobacco prevention strategies aimed at young people. The strong association with parental habits highlights the	18

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	teenagers, the educational level of their parents, and smoking habits.	significant influence parents have on their children's tobacco use.	
Prevention of Snus use: Attitudes and activities of public dental service in southeastern Norway.	This study aimed to explore the attitudes and activities of dental health professionals in public dental services in Eastern Norway regarding the prevention and cessation of Snus use among teenagers. It places particular focus on addressing the increasing prevalence of Snus use among individuals aged 16 to 24.	The findings reveal that dental health professionals, particularly dentists, recognized the importance of addressing Snus use among teenagers. However, they are not yet sufficiently informed about effective methods to tackle the issue.	19
Drinking patterns, tobacco use, and Snus consumption in Sweden: Implications for public health.	The purpose of this study is to examine the impact of Snus use, focusing on how it influences the increased use of tobacco or even contributes to tobacco cessation. Overall, the study aims to define the general effects of Snus on public health.	Study findings show that Snus has played a crucial role in influencing smoking habits in Sweden, significantly reducing the initiation of smoking. A higher percentage of smokers who switch to Snus successfully quit smoking.	20

The table presents diverse perspectives on the use of Snus in sports, with particular emphasis on its impact on health and athletic performance. Notably, studies examining Snus as an alternative for smoking reduction highlight both health-related and social dimensions that warrant closer scrutiny. While some research explores the potential benefits of Snus in reducing smoking rates, the findings consistently indicate that Snus does not serve as an ergogenic aid and offers no performance-enhancing benefits for athletes. Instead, its use raises important concerns regarding health risks and the potential normalization of addictive behaviors within the athletic community.

Table 3. Scopus Proceedings

Title	Aim	Conclusion	Source
Practitioner observations on the oral use of nicotine in elite sports: Use Snus, You Lose.	This study aims to analyze the increasing use of Snus in various sports and assess its potential benefits.	This review found that the health risks associated with the use of Snus are lower than those related to cigarettes. Snus can potentially provide significant harm reduction benefits, especially in Sweden, where the study was conducted.	21
Nicotine dependence in elite sports.	The study aims to examine fitness levels and nicotine dependence among British football players and analyze how these factors affect their performance.	The use of and addiction to nicotine among athletes pose significant challenges to both performance and health. While nicotine products may seem to offer certain benefits, the lack of comprehensive evidence requires further extensive investigation.	22
An analysis of the use of smokeless tobacco and its effects on athletes' performance and well-being.	The purpose of this study is to examine the effects of Snus on athletes who use it, as well as the increasing use of nicotine in its various forms.	The survey data revealed that regular use of Snus provides greater psychological pleasure and reward compared to casual use. The experimental study also shows that using Snus can lead to early cognitive improvement.	23
Physical activity and Snus: Is there a link?	An analysis of the link between Snus use, fitness levels, and	This study confirmed an association between Snus use and sport or physical	24

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	physical activity, with a focus on sports and training among youth in Switzerland. The study aims to assess whether these relationships differ between Snus users, smokers, and users of other forms of smokeless tobacco.	activity in Switzerland, where access to Snus is legally prohibited. Monitoring Snus use among physically active young people is essential.	
The relationship between the type and intensity of sports and tobacco or nicotine use.	An evaluation of the relationship between tobacco/nicotine use and the type and intensity of sports. Approximately 5,414 young Swiss individuals completed a questionnaire on their use of these substances.	In general, young people who engage in sports are less likely to use cigarettes and heated tobacco products but are more likely to use Snus. Additionally, it was observed that the use of Snus is higher among those participating in team sports.	25
The use of Snus among teenagers: A potential risk to oral health.	The purpose of this study is to evaluate the effects of Snus use on oral health among a group of teenagers who consume this substance.	The use of Snus harms oral health and is linked to issues such as bleeding gums and dental problems. Raising awareness at an early age plays a crucial role in reducing Snus use, with education serving as an essential tool for prevention.	26 .
The effect of nicotine on cortical excitability during training: A cross-over study.	The study evaluated the effect of cortical excitability related to aerobic exercise in healthy volunteers.	Studies show that Snus can extend the time to fatigue in dependent users, but it does not result in significant changes in muscular strength. It is suggested that nicotine's influence on cortical excitability is important, but rather research is needed to investigate other factors.	27

Studies analyzing the benefits and consequences of increased Snus use in sports across different contexts have been conducted. An analysis of youth in Switzerland highlighted the effects of fitness, nicotine consumption, and their impact on oral health. Additionally, the effects of aerobic exercise on cortical excitability have helped identify the potential impacts of physical activity. Regarding this, further research is necessary to understand the health implications and performance effects of Snus use.

DISCUSSION

The use of Snus in football raises important questions regarding its influence on sports performance, health, and ethics. This paper will address core aspects related to the role of Snus and the potential risks it poses to footballers. One of the most significant issues discussed is the impact of Snus on the performance of football players.

Snus, classified as a stimulus, is banned in competition by the World Anti-Doping Agency (WADA). However, nicotine-its active ingredient-is known to enhance vigilance and coordination, potentially improving performance [3]. Nicotine, which constitutes a significant percentage of Snus, can increase heart rate and blood pressure while also enhancing the generation of anaerobic energy. Since 2013, nicotine has been included in WADA's monitoring program [3]. Smokeless tobacco products, including Snus, are widely used, particularly in Scandinavian countries and North America. According to surveys, North America shows a high prevalence of Snus usage among athletes [3]. WADA's Prohibited List is based on fulfilling at least two of three criteria:

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the potential to enhance performance, the potential risk to an athlete's health, and a violation of the spirit of sportsmanship [3].

Many football players believe that using Snus enhances concentration, alleviates tension, reduces fatigue, and improves reaction times under pressure. However, existing research indicates that nicotine-containing products, including Snus, do not provide significant performance-enhancing benefits. On the contrary, they may impair both aerobic and anaerobic performance. Studies have shown that Snus use can decrease exercise readiness and contribute to increased mental fatigue [28].

The attached CD at the end of this topic includes footage of athletes from various sports demonstrating the use of different products. Featured athletes include Raheem Sterling, Tammy Abraham, Hakim Ziyech, Zlatan Ibrahimović, Marco Reus, Daniel Sturridge, Leroy Sané, Jamie Vardy, and Victor Lindelöf. The video captures moments where these athletes were observed using Snus or similar products during their training sessions or matches.

However, studies have shown that the use of Snus can lead to long-term negative effects. These include nicotine addiction and significant impacts on the cardiovascular system, as well as other parts of the body. Additionally, there is a strong correlation between Snus consumption and poor oral health. Primary effects include bleeding and an increased risk of tooth decay. Statistics from studies on teenagers reveal a significant correlation between the use of Snus and gum bleeding. However, other factors, such as hygiene practices and varying dietary habits, can also influence this phenomenon [29].

In essence, the use of Snus has a negative impact on oral health and is associated with gum bleeding. This damage can be further exacerbated by poor oral hygiene practices. Many players use Snus as a way to cope with stress, reduce the pressure of the game, and maintain concentration during matches. This phenomenon is publicly acknowledged by other users, with some providing testimonies about the severe health consequences associated with Snus use. These include lung cancer, cardiovascular diseases (such as ischemic heart disease, myocarditis, and strokes), hypertension, diabetes, pancreatic cancer, gum disease, and other oral health issues. There is also concern about dual usage, which includes both smoking and Snus. This phenomenon significantly increases the risk of all the aforementioned diseases.

There is also danger in combining caffeine and nicotine, as their simultaneous use can lead to significant physiological and psychological effects. The combination of caffeine can lead to several effects, including an increased heart rate and blood pressure. These effects can be particularly concerning for individuals with cardiovascular problems [30]. Increased cognitive performance – according to other studies, the combination of caffeine can improve attention, focus, and cognitive performance more effectively than when substances are used alone [31]. Anxiety – The stimulating effects of these substances can also lead to increased anxiety and worry [32]. Addiction – The use of both substances can lead to addiction, and using them together may increase the potential for dependency [33]. Sleep problems – Consuming these substances, especially later in the day, can lead to sleep instability or disorders [34].

Based on the aforementioned studies, the combination of nicotine and caffeine can cause a range of effects. Users need to be aware of these interactions and the potential consequences.

High expectations regarding performance, fatigue from intense training, and external pressure, such as public expectations, are significant stress factors affecting the psychological health of football players. These pressures contribute to an increase in stress and mental health issues among footballers. As a result, some football players may resort to various substances to manage their mood and cope with the emotional strain they experience. Stressful factors and

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high-performance expectations often lead athletes to use substances, such as nicotine, to manage their emotions and improve concentration (Table 3). Nicotine may offer temporary relief from stress, but its effects on the body are complex and can lead to negative consequences, especially for athletes. While it can help reduce anxiety and increase alertness, nicotine can also disrupt sleep, which in turn negatively impacts performance. Additionally, nicotine can suppress appetite or alter energy consumption, potentially leading to weight loss or increased energy expenditure. These changes can disturb the body's balance, further impacting athletic performance. The cumulative effects of nicotine use can interfere with an athlete's overall well-being and hinder their ability to perform at their best. The effects of nicotinic, including those from Snus, may offer temporary relief in coping with stress, but they also pose challenges to the body, such as sleep disturbance, appetite loss, and energy imbalance. These factors can worsen both performance and overall health in athletes (Tables 2 and 3).

Some of the key health risks associated with the use of Snus in athletes are directly related to periodontal diseases, cardiovascular dysfunction, and an increased risk of mortality. Nicotine is a mono-stimulant that is quickly absorbed into the body and can lead to addiction by binding to nicotinic acetylcholine receptors in the brain. This interaction stimulates the release of neurotransmitters such as epinephrine, norepinephrine, acetylcholine, dopamine, and serotonin, producing a psychostimulant effect. At higher doses, nicotine enhances the effects of serotonin, which can lead to both "calming" and "depressive" sensations. These effects, along with nicotine's ability to stimulate the release of other neurotransmitters, contribute to its high addictive potential and influence mood and behavior [35].

CONCLUSION

Finally, the use of Snus in football, as well as in other sports, raises significant health concerns and risks related to health performance.

While some gamers claim that Snus helps with concentration and calmness, existing literature suggests that products containing nicotine do not offer lasting benefits for sports performance and may have harmful long-term effects. The danger of relying on nicotine is a significant issue, as this substance stimulates the nervous system and can lead to various health problems, including cardiovascular diseases and oral health concerns, such as gum bleeding and tooth decay. The use of Snus by professional players can create a negative model for young people, promoting a culture that accepts the product as a way to cope with game pressure and stress. Therefore, it is essential for coaches, clubs, and sports organizations to be aware of the risks associated with Snus use and to develop strategies that promote the health of athletes. This will help reduce the negative impact of this product and foster a healthier sports environment.

Continued studies are essential to fully understand the impact of Snus on sports performance and health, making it crucial to monitor this growing phenomenon in the world of sports. Snus is banned by the World Anti-Doping Agency (WADA) and poses significant health risks to players. Meanwhile, claims suggesting that Snus can improve mental and physical performance remain unproven scientifically and are not supported by sufficient evidence in practical contexts, such as match results or concrete improvements on the field. In the absence of verified studies and analysis, the effects of Snus in performance enhancement remain speculative and lack visible support in sports performance outcomes. In conclusion, detailed researches are needed to evaluate the effects of Snus on the health and performance of athletes, especially considering that its use is banned by WADA. These surveys should include pioneering experiments that analyze the long-term influence of

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Snus on both the physical and mental aspects of athletes, including their performance under real competition conditions. Moreover, it is important to conduct longitudinal studies that monitor the health of athletes who use this product, in order to identify any potential negative effects, such as sleep disorders, addiction, or mental health impacts. Additionally, a comparative analysis between those who use Snus and those who don't should be included to better understand the differences in performance and health. These types of studies will help form a stronger scientific foundation to evaluate whether Snus offers any valid benefits or if it poses unnecessary risks to athletes.

CONFLICT OF INTERESTS

No potential conflict of interest was reported by the authors.

REFERENCES

1. Clarke E, Thompson K, Weaver S, Thompson J, O'Connell G. Snus: a compelling harm reduction alternative to cigarettes. *Harm Reduct J*. 2019 Nov 27;16(1):62. doi: 10.1186/s12954-019-0335-1. PMID: 31775744; PMCID: PMC6882181.
2. Kasper AM, Close GL. Practitioner observations on oral fitness and nicotine in elite sports: Your Snus, you lose. *Eur J Sport Sci*. 2021 Dec;21(12):1693-8. doi: 10.1080/17461391.2020.1859621.
3. World Anti-Doping Agency. Effects of Snus administration on sport performance [Internet]. Available from: https://www.WADA-ama.org/en/resources/scientific-research/effects-Snus-administration-sport-performance.
4. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Moher D. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Int J Surg*. 2021; 88:105906.
5. Melikian AA, Hoffmann D. Smokeless tobacco: one order about the drinking tobacco or a road far smoke of the tobacco. *Tobacco Control*. 2009;18(4):252-258. doi:10.1136/tc.2008.026206. ISSN 0964-4563 (Print), 1468-3318 (Online).
6. Kreyberg I, Nordhagen LS, Bains K, Alexander J, Becher R, Carlsen KH, Glavin K, Carlsen KCL. An update about prevalence and the risk of therapy substitute of Snus and nicotine during pregnancy and breastfeeding. *Tobacco Induced Diseases*. 2019;17(1):40. doi:10.1186/s12971-019-0223-0. ISSN 1294-4556 (Print), 1999-3430 (Online).
7. Henninger S, Fischer R, Cornuz J, Studer J, Gmel G. Physical activity and Snus: Is there a relationship between them? *J Sports Med Phys Fitness*. 2015;55(5):421-428. ISSN 0022-4707 (Print), 1827-1928 (Online).
8. Kasper AM, Close GL. Practitioner observations on the fitness of oral nicotine in elite sports: You Snus, you lose. *J Sports Sci Med*. 2015;14(3):471-477. ISSN 1303-2968.
9. Read D, Carter S, Hopley P, Chamari K, Taylor L. Use of Snus in football: Danger of a new addiction? *Sports Med*. 2024;54(1):133-140. doi:10.1007/s40279-023-01783-9. ISSN 0112-6534 (Print), 1439-1009 (Online).
10. Morente-Sánchez J, Zandonai T, Mateo-March M, Sanabria D, Sánchez-Muñoz C, Chiamulera C, Zabala M. Effect of acute Snus use on the physical performance and perceived load in amateur footballers. *J Sports Sci*. 2015;33(4):379-385.

doi:10.1080/02640414.2014.951221. ISSN 0264-0414 (Print), 1466-447X (Online).

11. Zandonai T, Tam E, Bruseghini P, Capelli C, Baraldo M, Chiamulera C. Increased performance of exercise in athletes who use smokeless tobacco after long abstinence from nicotine. *Eur J Appl Physiol*. 2019;119(5):1057-1065. doi:10.1007/s00421-019-04133-2. ISSN 1439-6319 (Print), 1439-6327 (Online).
12. Zandonai T, Tam E, Bruseghini P, Pizzolato F, Franceschi L, Baraldo M, Capelli C, Cesari P, Chiamulera C. Effects of oral administration of smokeless tobacco on sustainability performance. *Scand J Med Sci Sports*. 2018;28(12):2126-2135. doi:10.1111/sms.13212. ISSN 0905-7188 (Print), 1600-0838 (Online).
13. Hung B-L, Chen L-J, Chen Y-Y, Ou J-B, Fang S-H. Nicotine supplementation increases stimulus performance in archery athletes. *J Sports Sci Med*. 2021;20(2):285-291. ISSN 1303-2968.
14. Lee PN. Effect on health from switching from cigarettes to Snus—a review. *BMC Public Health*. 2013;13(1):410. doi:10.1186/1471-2458-13-410. ISSN 1471-2458 (Print), 1471-2458 (Online).
15. Ansteinsson V, Mdala I, Becher R, Grøtvedt L, Kopperud SE, Valen HR. Factors related to the initiation of Snus use in teenagers. *Scand J Public Health*. 2023;51(1):22-29. doi:10.1177/14034948221103948. ISSN 1403-4948 (Print), 1651-1905 (Online).
16. Morente-Sánchez J, Zandonai T, Mateo-March M, Sanabria D, Sánchez-Muñoz C, Chiamulera C, Zabala Díaz M. Effect of acute Snus intake on physical performance and perceived load in amateur footballers. *PubMed*; 2015. Available from: https://PubMed.ncbi.nlm.nih.gov/
17. Byhamre ML, Gustafsson PE, Jansson JH, Wennberg M, Hammarström A, Wennberg P. Long-term use of Snus in life and the risk of metabolic syndrome and its components. *Scand J Public Health*. 2017;45(8):733-740. doi:10.1177/1403494817712415. PMID: 28597835.
18. Ansteinsson V, Mdala I, Becher R, Grøtvedt L, Kopperud SE, Valen HR. Factors related to the initiation and use of Snus among adolescents in Norway. *Scand J Public Health*. 2021;49(1):44-52. doi:10.1177/14034948211062311.
19. Tanner T, Valen HR, Grøtvedt L, Kopperud SE, Becher R, Karlsen LS, Ansteinsson V. Prevention of Snus use: Attitudes and activities in public dental services in Southeastern Norway. *BMC Oral Health*. 2019;19(1):60. doi:10.1186/s12903-019-0765-6. ISSN 1472-6831 (Print), 1472-6831 (Online).
20. Ramström L, Borland R, Wickman T. Smoking patterns and fitness to Snus in Sweden: Implications for public health. *Tob Control*. 2016;25(5):540-545. doi:10.1136/tobaccocontrol-2015-052621. ISSN 0964-4563 (Print), 1468-3318 (Online).
21. Kasper AM, Close GL. Practitioner observations on the oral use of nicotine in elite sports: you Snus, you lose. *Scopus*; 2020. Available from: https://www.scopus.com/
22. Read D, Cope E, Taylor L. Dependence by nicotine in sports elite. *Scopus*; 2023. Available from: https://www.scopus.com/.
23. Zandonai T, Chiamulera C, Mancabelli A, Falconieri D, Diana M. An analysis about the use of smokeless tobacco and its effects on athletes. *Scopus*; 2018. Available from: https://www.scopus.com/.
24. Henninger S, Fischer R, Cornuz J, Studer J, Gmel G. Physical activity and Snus: is it a link? *Scopus, PubMed*; 2015. Available from: https://www.scopus.com/.
25. Gossin M, Gmel G, Studer J, Saubade M, Clair C. The connection between the type, intensity, sport, and tobacco use or nicotine. *Scopus*; 2020. Available from: https://www.scopus.com/.
26. Németh O, Sipos L, Mátrai P, Szathmári-Mészáros N, Iványi D, Simon F, Kivovics M, Pénzes D, Mijiritsky E. The use of Snus in teenagers: an oral

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health risk. *Scopus*; 2024. Available from: https://www.scopus.com/.

27. Zandonai T, Pizzolato F, Tam E, Bruseghini P, Chiamulera C, Cesari P. The effect of nicotine on excitability cortical during training: a cross-over study. *Scopus*; 2020. Available from: https://www.scopus.com/.
28. Morente-Sánchez J, Zandonai T, Mateo-March M, Sanabria D, Sánchez-Muñoz C, Chiamulera C, et al. Acute effects of Snus on physical performance and perceived drive-in amateur footballers. *Scand J Med Sci Sports.* 2015 Aug;25(4).
29. Sieber AL, Jeyakumar J, Bornstein MM, Ramseier CA. Swedish snuff (Snus) and its effects on oral health: An update. *Swiss Dent J.* 2016;126(9):799-805. Available from: https://www.swissdentaljournal.org/article/view/5140.
30. Schmitt J, et al. Caffeine and nicotine interactions: effects on cardiovascular parameters. *J Cardiovasc Pharmacol.* 2005.
31. Smith HJ, Rogers PJ. Caffeine, blood pressure, and cardiovascular disease. *Eur J Clin Nutr.* 2000.
32. Zvolensky MJ, Eissenberg T. Cigarette smoking and anxiety: a review of the literature. *Psychol Bull.* 2011.
33. Tindle HA, et al. Caffeine and nicotine: two key players in tobacco addiction. *Subst Abuse.* 2009.
34. Drake C, Wright KP. Caffeine, sleep, and daytime sleepiness. *Sleep Med Clin.* 2011.11.
35. Benowitz NL. Nicotine addiction. *N Engl J Med.* 2010 Jun 17;362(24):2295-303.

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