

BMJ Open Consumption of analgesics in American football, in the Federal State of Hesse, Germany: protocol of a cross-sectional study

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ABSTRACT

Introduction Considering the rising popularity of American football (AF) in Germany, particularly in the Federal State of Hesse, this study explores the concerning issue of analgesic consumption among players. The study aims to investigate analgesic use patterns and players' awareness of risks, focusing on gender differences, medical care impact, positional intensity, league level and knowledge influence. The study aims to collect data that will contribute to the development of targeted preventive health measures, such as education and sensitising coaches during coaching licence courses and strategies to enhance medication safety in AF.

Methods and analysis The cross-sectional study includes an online questionnaire targeting adult AF players in Hesse, Germany, during the 2024 season. Data collection, from October 2024 to April 2025, will cover dosage, timing, frequency of analgesic use and players' knowledge of risks. The study will also explore the relationship between analgesic use and players' skill levels, medical care availability, player activities and pain profiles. A pretest will ensure the questionnaire's validity. Data analysis encompasses descriptive and logistic regression analyses to study the association between independent variables and analgesic use.

Ethics and dissemination The responsible ethics committee of the faculty of Medicine at the Philipps University Marburg confirmed that no ethics vote was necessary if participants' anonymity and research integrity are maintained. The results will be published in the form of an article and congress presentation. The findings aim to contribute to the development of tailored health measures, fostering a safer and healthier sporting environment for AF players in Germany.

INTRODUCTION

American football (AF) is one of the most popular sports in the USA, Canada, Japan and the United Kingdom.¹ In recent years, the popularity of the sport has grown considerably in Europe and especially in Germany. Currently, there are over 400 AF clubs in Germany, with men, women and youth participating in different leagues. The AF Federation of Germany (AF Verband Deutschland,

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The study investigates analgesic consumption across a diverse range of player characteristics, including gender, league level, player position and intensity of contact, ensuring a comprehensive analysis of the various factors influencing analgesic use among American football players.
- ⇒ The process of online data collection ensures anonymity and ethical rigour, enhancing the credibility of the data collection process and protecting participant confidentiality.
- ⇒ Reliance on self-reports through online surveys may introduce recall bias or inaccuracies, as participants may misremember.
- ⇒ This cross-sectional study captures only a discrete point in time, limiting its ability to assess trends over a period.
- ⇒ The study may disproportionately attract participants with a vested interest in the topic, potentially skewing results and reducing generalisability.

AFVD) is the sixth-largest team sport federation in Germany, with over 70 000 members in the year 2023.^{2,3} Compared to the year 2000 (18 875 registered AF players), the number of members has more than tripled. In total, 66 of the more than 400 clubs in Germany are currently located in Hesse.⁴ From the first division (German Football League, GFL) to the fifth, all possible levels of competition are available to players.

Football is a collision sport, in which players frequently collide with one another at high speed and with great force. For this reason, there is an increased risk of injury, especially in areas such as broken bones, sprains and concussions. Due to the quick change of direction and associated strain on joints, the lower extremities are especially affected.⁵ In addition, the risk of injury also greatly depends on individual factors such as position, fitness level, playing style and warm-up.^{5,6} In addition to the mentioned injuries,

there are also minor ones like contusions, whiplash-associated headaches or mild concussions which are not necessarily obvious. However, these minor injuries can potentially lead to negative effects, such as the consumption of analgesics during practice.⁷

The (mis)use of analgesics is well known in other competitive sports, such as marathons or soccer. In endurance sports like marathon running, the use of analgesics due to the intensity of training and the lengthy, continuous strain during competition comes into play.⁸ This differs from soccer, where the use of analgesics is mainly attributed to the intensity of contact and the performance pressure.⁹ A study from 2024 examining the use of analgesics in amateur football from the coaches' perspective found a significantly lower number of players using analgesics (36.2%) than initially expected. The results of the investigation also show an increase in analgesic drug use with the level of play and state easy access to analgesics for 10% of the players.¹⁰ Despite the physical limitations, the ability to play at the required level is often maintained through the misuse of analgesics.

To date, there is no research on the consumption of analgesics for AF players in Germany. The only studies to examine this problem were held in the USA and are related to the National Football League (NFL). The study by K P Hill *et al* highlights the prescription patterns of pain medication among NFL athletes. According to the study, less than 3% of the pain medication prescribed to players were opioids. This suggests that the majority of NFL players use non-opioid analgesics like NSAIDs (non-steroidal anti-inflammatory drugs) to manage pain. The study concludes that non-opioid analgesics manage pain effectively but nevertheless carry potential health risks, particularly when used chronically or inappropriately.¹¹

There has been growing attention paid to head injuries in AF in Germany since 2015. This occurred as the AFVD became a partner in the campaign 'Protect Your Head'. However, this campaign is considered a preventative measure and has nothing to do with the use of analgesics.² There are studies evaluating the injury risk based on the player's position and the affected body region. However, these studies do not consider the use of analgesics. Therefore, investigating analgesic consumption in relation to players' characteristics could fill a gap in creating a comprehensive risk profile of players, allowing for targeted education on the risks involved.^{6 12 13}

In international sport, certain drugs are banned by the anti-doping rules. These anti-doping guidelines are set out by the National Anti-Doping Agency (NADA) and the international anti-doping organisation, the World Anti-Doping Agency (WADA). As with athletes of other sports disciplines, AF players are obliged to abide by these anti-doping rules. Among others, the list of banned substances contains anabolic steroids, stimulants which can improve performance, narcotic analgesics (opioids), growth hormones and diuretics.¹⁴ Such substances play a smaller role in general sports participation, as the procurement of drugs is strictly regimented.

On the other hand, non-prescription analgesics are easily available, and their use is not limited. The use of non-prescription drugs is common among athletes and the general population, with widespread use of analgesics like ibuprofen, acetylsalicylic acid, paracetamol, metamizole and diclofenac.¹⁵ These substances are not prohibited by the AFVD and, as a result, are not subject to control.¹⁶ While these analgesics are commonly used, especially for general pain relief, there is no data systematically quantifying their use in sports. Nonetheless, there are serious risks with these drugs, especially chronic use, which need to be avoided.^{17 18} Whether such a problem with non-prescription drug use mentioned above exists in Hesse's AF leagues has not yet been researched.

Over-the-counter analgesics are not typically associated with doping violations. However, their unrestricted use may contribute to a gradual normalisation of substance reliance among athletes. Regular consumption of non-prescription analgesics could lower the threshold for using performance-enhancing or prohibited substances. Investigating patterns of analgesic use and their potential connection to doping behaviour is essential for a more comprehensive understanding of this issue. The aim of this study is to grasp and analyse the consumption of analgesics in Hesse's AF leagues by considering potential associations between analgesic use and gender, player position and intensity of contact, the effect of league level and player experience on analgesic consumption and the availability of medical care. Additionally, the study investigates the effects of knowledge about the risks and side effects of analgesics on analgesic consumption. Study results may encourage the awareness of sport-associated risks with taking analgesics. Thus, the study could contribute to preventative health measures in AF and might help to make the sport safer.

MATERIALS AND METHODS

The study uses a cross-sectional design, examining the consumption of analgesics by adult AF players of all genders, located in the Federal State of Hesse, Germany. We will conduct an anonymous online survey of the current situation, which will record the consumption of analgesics during the 2024 season, at the end of the season. The survey uses a newly developed questionnaire which will be pretested via a think-aloud approach with five AF players to fulfil all scientific quality standards for the data collection. The study started in January 2024 and is expected to end with the publication of the data in spring 2026. The collection of data will take place from the end of the 2024 season, starting from October 21, until the beginning of the new 2025 season. Inclusion criteria are age ≥ 18 years, and a minimum participation of one season of play in one of the AF leagues in Hesse. In addition, participants must be members of an AF club in Hesse at the time of the survey. Players who are on additional medications for illness will be asked to provide a list of those medications. This will not necessarily exclude

them from the study. Excluded are players who regularly consume analgesics prescribed by a doctor due to chronic illnesses, as well as participants with allergies to the relevant medications which could reduce or affect the substance in question. Since the study focuses on sports-specific analgesic consumption, the influence of medically required analgesic use could bias the results. The questionnaire was shared online to the club's email addresses; the questionnaire was also distributed via social media.

The questionnaire (online supplemental files 1; 2) asks about the consumption of analgesics and the medical care available. Further attention will be given to the league the players are competing in and the intensity of training, as well as the duration of the training time per week.

Due to different strain and injury profiles in AF, which strongly depend on the specific player positions and may reflect in the consumption behaviour, we will collect these positions too.¹²

Data analysis will be performed with the current version of IBM SPSS Statistics. We will mainly focus on descriptive statistics to depict the key characteristics of analgesic consumption. Visual inspection of the data distribution will be used to assess normality, as normality tests may not be appropriate for small sample sizes or large samples where deviations from normality could still be considered statistically significant. Following the descriptive analysis, appropriate inferential tests will be conducted. For comparison between two groups, t-tests will be used if normality and homogeneity of variance assumptions are met. If variance homogeneity is violated, the Welch t-test will be applied to adjust for unequal variances. In cases where data are ordinal or non-normally distributed, the Mann-Whitney U test will be considered. To explore associations between multiple predictors and analgesic consumption, a logistic regression analysis will be performed, given the outcome variable is binary. If a continuous or ordinal outcome is analysed, alternative regression models will be used. To reduce the likelihood of a 'type II error', a sample size calculation using G*Power was carried out. This calculation was guided by the traditional benchmarks for effect size and reference data from a previous study on German professional handball players, which proved that 50%–70% of handball players regularly use analgesics during the activities.¹⁹ The calculation assumes that approximately twice as many male players as female players will participate, given the higher number of male athletes in Hesse's AFL organisations. Based on an average effect strength (Cohen's $d=0.5$), a sample size of 236 participants was estimated for the specific hypothesis that male players consume more analgesics than female players. However, power considerations for multiple comparisons and subgroup analysis may necessitate a larger sample. The final statistical analysis plan will be refined based on the distribution of collected data and specific research questions.

Patient and public involvement

Neither the participants nor the public were involved in the design of the study or the data collection process. The first involvement only took place during participation in the online survey. A pretest was carried out beforehand to assess feasibility, but there were no subsequent study participants.

ETHICS AND DISSEMINATION

The ethics committee of the faculty of Medicine at the Philipps University Marburg concluded that there are no ethical or legal concerns regarding this study (reference number 24–107 ANZ).

Anonymity will be ensured by distributing the questionnaires with the support of the AFBV. This means that specific clubs and players who have received the link to the questionnaire cannot be traced. In addition, certain sensitive data such as the club or the specific age will not be gathered, since only respective age groups will be collected. As well, the link will be distributed over social media, which does not provide any possibility for follow-up. This distribution of the link over social media increases the possibility of reaching a majority of the 3490 members in Hesse (2023).⁴ Furthermore, the results will be presented only in an aggregated form, which means that no conclusions about specific persons can be made. The results will be made available to the public in the form of a scientific article and a congress presentation at health services research congresses. In addition, the results will be presented to the AFBV, individual clubs and their members, as well as a brief article in a German football magazine.

Participants were not required to provide direct consent as the survey was voluntary, and their participation was taken as implied consent. By completing the survey, participants acknowledged their agreement to take part in the study.

Strengths and limitations

The study's strength is the detailed examination of analgesic consumption across multiple player characteristics, such as gender, player position, league level and intensity of contact. This allows a more nuanced understanding of the factors influencing the use of analgesics in AF. In addition, the study benefits from a targeted approach, enhancing the reliability and generalisability of the findings within this specific athletic population. Furthermore, the study addresses an important yet understudied issue in the context of AF in Germany. The findings have the potential to raise awareness about the risks of analgesic misuse, contributing to the development of preventative health measures and safer playing conditions for athletes.

The study will come with known limitations. First, the cross-sectional design can only provide a snapshot of analgesic consumption at a single point, limiting the ability to observe changes in behaviour over time. Second, the reliance on self-reported data through an online survey

may introduce recall bias, as participants might not accurately remember or may underreport their analgesic use or do not report it truthfully. Third, while the study aims to include a representative sample of AF players in the Federal State of Hesse, the voluntary nature of participation could result in overrepresentation of individuals more interested in the subject of analgesics, potentially skewing the results.

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REFERENCES

- American Football International. Countries where football is popular, except for the US [American Football International]. Available: <https://www.americanfootballinternational.com/countries-where-football-is-popular-with-the-exception-of-the-us/> [Accessed 06 Jan 2024].
- AFVD. American football verband Deutschland e.V. 2021. Available: <https://www.afvd.de/> [Accessed 4 Jan 2024].
- Sportbund. Bestandserhebung 2023. 2023. Available: https://cdn.dosb.de/user_upload/www.dosb.de/uber_uns/Bestandserhebung/Bestandserhebung_2023.pdf [Accessed 06 Jan 2024].
- AFVH. American football verband hessen e.V. 2023. Available: <https://www.afvh.de/> [Accessed 28 Dec 2023].
- Baker HP, Pirkle S, Cahill M, et al. The Injury Rate in National Football League Players Increased Following Cancellation of Preseason Games Because of COVID-19. *Arthrosc Sports Med Rehabil* 2021;3:e1147–54.
- Geßlein M, Frodl A, Millrose M, et al. Wie gefährlich ist American Football im deutschen Amateurbereich? Eine positionsbezogene Verletzungsanalyse über vier Spielzeiten. *Unfallchirurg* 2020;123:473–8.
- Oberthaler G, Grubinger B, Kreitmayer V. Mild Traumatic Brain Injury im Sport. *Sports Orthopaedics and Traumatology Sport-Orthopädie - Sport-Traumatologie* 2016;32:183–7.
- Brune K, Niederweis U, Kaufmann A, et al. Analgetikamissbrauch bei Marathonläufern: Jeder Zweite nimmt vor dem Start ein Schmerzmittel. *Mmw-Fortschritte Der Medizin*; 2009.
- Tscholl P, Feddermann N, Junge A, et al. The use and abuse of painkillers in international soccer: data from 6 FIFA tournaments for female and youth players. *Am J Sports Med* 2009;37:260–5.
- Kopf A, Kruttsch W, Szymanski D, et al. Investigating Painkiller Use in Amateur Football: A Coach's Perspective. *J Pers Med* 2024;14:1003.
- Hill, Kevin P. MD, MHS1,2; Kroenke, Kurt MD, MACP3; Wasserman, Erin B. PhD4; Mack, Christina PhD, MSPH4; Ling, Geoffrey S.F. MD, PhD5,6; Mayer, Thom MD6; Solomon, Gary S. PhD7,8; Sills, Allen MD, FACS7,8.. Pain Medication Data from the 2021 and 2022 National Football League Prescription Drug Monitoring Program. *Current Sports Medicine Reports* 23(10):p 348–351, October 2024. | DOI: 10.1249/JSR.0000000000001200. 2021. Available: https://journals.lww.com/acsm-csmr/abstract/2024/10000/pain_medication_data_from_the_2021_and_2022.5.aspx [Accessed 14 Jan 2025].
- Bundesinstitut für Sportwissenschaft (BISP). American football - Spielerinnen und Spieler im Sportunfallgeschehen. Available: [https://www.bisp-sht.de/SHT/DE/Service/Service_Leiste/Sportarten/AmericanFootball.html#:~:text=eine%20Spielerin%20tackled%20oder%20getackled%20wird%20\(65%25%20zu%2035%25\).&text=Die%20Wahrscheinlichkeit%2C%20ein%20leichtes%20Sch%C3%A4del,ist%20abh%C3%A4ngig%20von%20der%20Spielposition](https://www.bisp-sht.de/SHT/DE/Service/Service_Leiste/Sportarten/AmericanFootball.html#:~:text=eine%20Spielerin%20tackled%20oder%20getackled%20wird%20(65%25%20zu%2035%25).&text=Die%20Wahrscheinlichkeit%2C%20ein%20leichtes%20Sch%C3%A4del,ist%20abh%C3%A4ngig%20von%20der%20Spielposition) [Accessed 06 Jan 2024].
- Beyer F, Höller A, Rommel E. Wie gefährlich ist American Football im deutschen Amateurbereich? Eine positionsbezogene Verletzungsanalyse über vier Spielzeiten [Schädel-Hirn-Trauma. Springer Medizin]. Available: <https://www.springermedizin.de/de/schaedel-hirn-trauma/schaedel-hirn-trauma/wie-gefaehrlich-ist-american-football-im-deutschen-amateurbereich/17382862#CR2> [Accessed 27 May 2024].
- World Anti-Doping Agency (WADA). 2025 prohibited list. 2024. Available: https://www.wadaama.org/sites/default/files/202409/2025list_en_final_clean_12_september_2024.pdf [Accessed 2025].
- Bundesministerium für Gesundheit. Abschlussbericht des Robert Koch-Instituts zum epidemiologischen Suchtsurvey 2019/2020. Available: https://www.bundesgesundheitsministerium.de/fileadmin/Dateien/5_Publikationen/Drogen_und_Sucht/Berichte/Abschlussbericht-RKI-I.pdf [Accessed 06 Jan 2024].
- Gemeinsam gegen Doping. Die beispilliste zulässigen Medikamente 2023. 2023. Available: <https://www.gemeinsam-gegen-doping.de/mediacenter/broschueren> [Accessed 20 Oct 2023].
- Lambert GP, Boylan M, Laventure JP. Effect of aspirin and ibuprofen on GI permeability during exercise. *Int J Sports Med* 2007;28:722–6.
- Scott PA, Kingsley GH, Scott DL. Non-steroidal anti-inflammatory drugs and cardiac failure: meta-analyses of observational studies and randomised controlled trials. *Eur J Heart Fail* 2008;10:1102–7.
- John JM, Bursik J, Burgstahler C, et al. Prevalence of sport-related analgesic use in German elite handball Players. *Dtsch Z Sportmed* 2023;74:168–74.