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Enhancing Performance and Well-being in the Sports Industry through Smart Sport Psychology

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Abstract. This paper proposes the definition of Smart Sport Psychology as the integration of advanced technologies, such as artificial intelligence (AI), machine learning and the Internet of Things (IoT), along with other emerging technologies, into the principles and practices of sport psychology. This approach uses smart devices, data analytics and virtual reality technologies to optimise athletes' mental and physical performance, personalise psychological interventions and improve athletes' overall well-being. Through a comprehensive literature review, we explore how these technologies can address common psychological problems among athletes, including stress, anxiety, motivation, mental recovery, concentration, self-confidence and psychological injury prevention. The results highlight the effectiveness of continuous monitoring, personalised interventions and real-time feedback, providing innovative, data-driven strategies to improve athletes' performance and well-being. The paper concludes that Smart Sport Psychology has the potential to transform the sport industry, offering effective and sustainable solutions for the holistic development of athletes. This review provides a conceptual and practical framework for the implementation of smart technologies in sport psychology, highlighting their importance and long-term benefits in the sport domain.
Keywords: Smart Sport Psychology, Advanced Technologies, Artificial Intelligence, Mental Well-being, Mental Recovery.

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1 Introduction

There are two fundamental concepts to take into account in this article, smart technology and Sport psychology. Smart Technologies (Swan, 2012; Gubbi, Buyya, Marusic & Palaniswami, 2013) refer to interconnected systems and devices that use Artificial Intelligence (AI), Machine Learning, and the Internet of Things (IoT) to collect, analyse and act on data in real time. These technologies can adapt and respond autonomously to changing environmental conditions, improving efficiency, personalisation and decision-making capabilities in various applications. And, Sport psychology (Weinberg & Gould, 2018; Cox, 2011) is the science that studies how psychological and emotional factors influence sporting performance and how participation in physical activities and sport affects mental and physical well-being. This discipline encompasses techniques and strategies to improve athletes' concentration, motivation, stress management and recovery.

Smart technologies play a crucial role in sport psychology by providing advanced tools that significantly improve the performance and well-being of athletes. Using devices such as wearables and IoT sensors, physiological and emotional variables can be monitored in real time, allowing a continuous assessment of the athlete's state (Gubbi et al., 2013). Artificial intelligence and machine learning analyse this data to personalise psychological and physical interventions, optimising mental training and recovery (Swan, 2012). These technologies not only help to identify and manage stress and anxiety proactively, but also allow for automatic adjustments to training routines based on the feedback received, thus promoting a holistic approach that encompasses both sport performance and the athlete's mental and emotional health (Weinberg & Gould, 2018; Cox, 2011).

Identifying common psychological problems in athletes is a fundamental task for sport psychology professionals, as these problems can significantly affect the performance and well-being of athletes.

- Stress and anxiety. Spielberger (1966) proposed that stress and anxiety in sport refer to the negative emotional and physiological responses that athletes experience in high-pressure situations, such as major competitions. These responses may include physical symptoms such as increased heart rate and sweating, as well as emotional symptoms such as worry and fear.
- Motivation. Deci and Ryan (1985) defined motivation in sport as the internal and external processes that initiate, direct and maintain sport performance-related behaviour. Motivation can be intrinsic (motivated by enjoyment and interest in the activity) or extrinsic (motivated by external rewards and recognition).
- Mental recovery. Smith (1980) described mental recovery as the process by which athletes recover from the psychological and emotional exhaustion caused by training and competition. This process is essential for maintaining long-term well-being and performance.
- Concentration and Focus. Nideffer (1976) defined concentration in sport as the ability of an athlete to maintain attention on relevant tasks during sport performance. It is fundamental to the execution of sport skills under pressure.
- Self-confidence. Bandura (1977) defined self-confidence in sport as the belief in one's ability to successfully execute a specific sport task. It is a crucial factor for athletes' performance and motivation.
- Psychological injury prevention. Andersen and Williams (1988) described psychological injury prevention as the identification and mitigation of psychological risk factors that can lead to mental health problems in athletes, such as chronic stress and burnout.

The main objective of this paper is to explore how smart technologies, such as Artificial Intelligence, machine learning and the Internet of Things, can address common psychological problems in athletes. These technologies will be evaluated on their ability to mitigate stress and anxiety, improve motivation, optimise mental recovery, strengthen concentration and focus, increase self-confidence and prevent psychological injuries. By integrating these advanced technological solutions, the study aims to provide innovative and effective strategies to improve the performance and well-being of athletes in the sports industry.

2 Smart Sport Psychology

A Smart Sport Psychology refers to the integration of advanced technologies such as Artificial Intelligence (AI), Machine Learning and the Internet of Things (IoT), along with other emerging technologies, into the principles and practices of sport psychology. This approach uses smart devices, data analytics and virtual reality technologies to optimise athletes' mental and physical performance, personalise psychological interventions and improve athletes' overall well-being.

In the context of how advanced technologies can address common psychological problems in athletes, it is crucial to understand the distinction between smart and intelligent. Smart refers to systems and devices that use technologies such as Artificial Intelligence (AI), machine learning and the Internet of Things (IoT) to operate in an automated and connected way. These systems not only enhance athletes' performance by providing real-time tools and data, but can also maximise their natural abilities and help them reach their full potential. For example, smart wristbands and sensors in athletic footwear monitor physiological and performance metrics to provide immediate adjustments, optimising both the athlete's performance and well-being.

On the other hand, intelligent refers to the human ability to process information, make decisions and adapt without the direct intermediation of technology. This capacity includes cognitive skills such as memory, concentration, problem solving and emotional adaptation. In the context of sport psychology, intelligent encompasses the mental and emotional strategies that athletes develop and apply to improve their performance, manage stress and anxiety, and maintain motivation and self-confidence. The distinction is essential because, while ‘smart’ technologies provide data and tools to help athletes to improve their performance.

The components of Smart Sport Psychology are:

1. Sport Psychological Theory. The basis of Smart Sport Psychology lies in psychological theories applied to sport that provide a conceptual framework for understanding athletes' behaviour and mental processes. These theories are crucial for developing effective interventions and treatments to improve sport performance when combined with intelligent technologies.

2. Advanced Technologies. The integration of advanced technologies such as Artificial Intelligence (AI), Machine Learning, Internet of Things (IoT), Biofeedback, Neurofeedback, Virtual Reality (VR) and Augmented Reality (AR), together with Big Data and Predictive Analytics, is used to collect and analyse athletes' performance and mental health data, providing personalised information. These technologies enable the creation of personalised training and recovery plans, continuous monitoring, pattern identification and programme adaptation in real time, thus improving athletes' performance and wellbeing.
3. Smart Devices. Smart devices, such as wearables, collect continuous data on athletes' physical and mental conditions. For example, Smart Tennis Shoes (equipped with sensors that record data on stride, speed and distance travelled), Smart Wristbands (monitor heart rate, Heart Rate Variability or HRV, sleep patterns and activity levels), and Smart Caps (incorporate sensors to measure brain activity and stress, providing real-time feedback). Smart devices enable constant and detailed monitoring, facilitating immediate and effective interventions to improve the performance and health of athletes.
4. Ethics Policies and Protocols. Contains the development and implementation of specific policies and codes of ethics for the application of smart technologies in sport psychology. The policies and protocols ensure that the use of advanced technologies respects the privacy, autonomy and well-being of athletes, setting clear standards for ethical and professional practice.
5. Training and Continuing Education. Training and continuing education programmes for coaches, sports psychologists and athletes on the use and benefits of smart technologies. Facilitates the effective adoption of new technologies, ensuring that all involved understand how to use these tools optimally and safely.
6. Sports Data Security. Contains practices and technologies designed to protect sensitive athlete data stored, processed and transmitted. They serve to ensure the privacy and integrity of athlete data, which is fundamental to maintaining the trust and effectiveness of technological interventions.
7. Neurosecurity. It is the comprehensive protection of the brain and its functions against external threats, including the security of implanted devices and protection against electromagnetic interference. Neurosecurity ensures that technologies used in athletes are safe and do not compromise their mental and physical health.
8. Smart Treatment. Smart Treatments is the integration of advanced technologies such as AI, IoT, biofeedback and smart devices to develop personalised treatments that maximise positive psychological outcomes. Smart Treatments enable the implementation of treatment strategies based on accurate and up-to-date data, optimising intervention and promoting the holistic wellbeing of athletes.
9. Regulatory Framework and Legislation. There is a need for laws and regulations governing the use of smart technologies in sport, ensuring compliance with security and privacy standards. This provides a legal framework that protects athletes and ensures the safe and ethical use of smart technologies in sport.

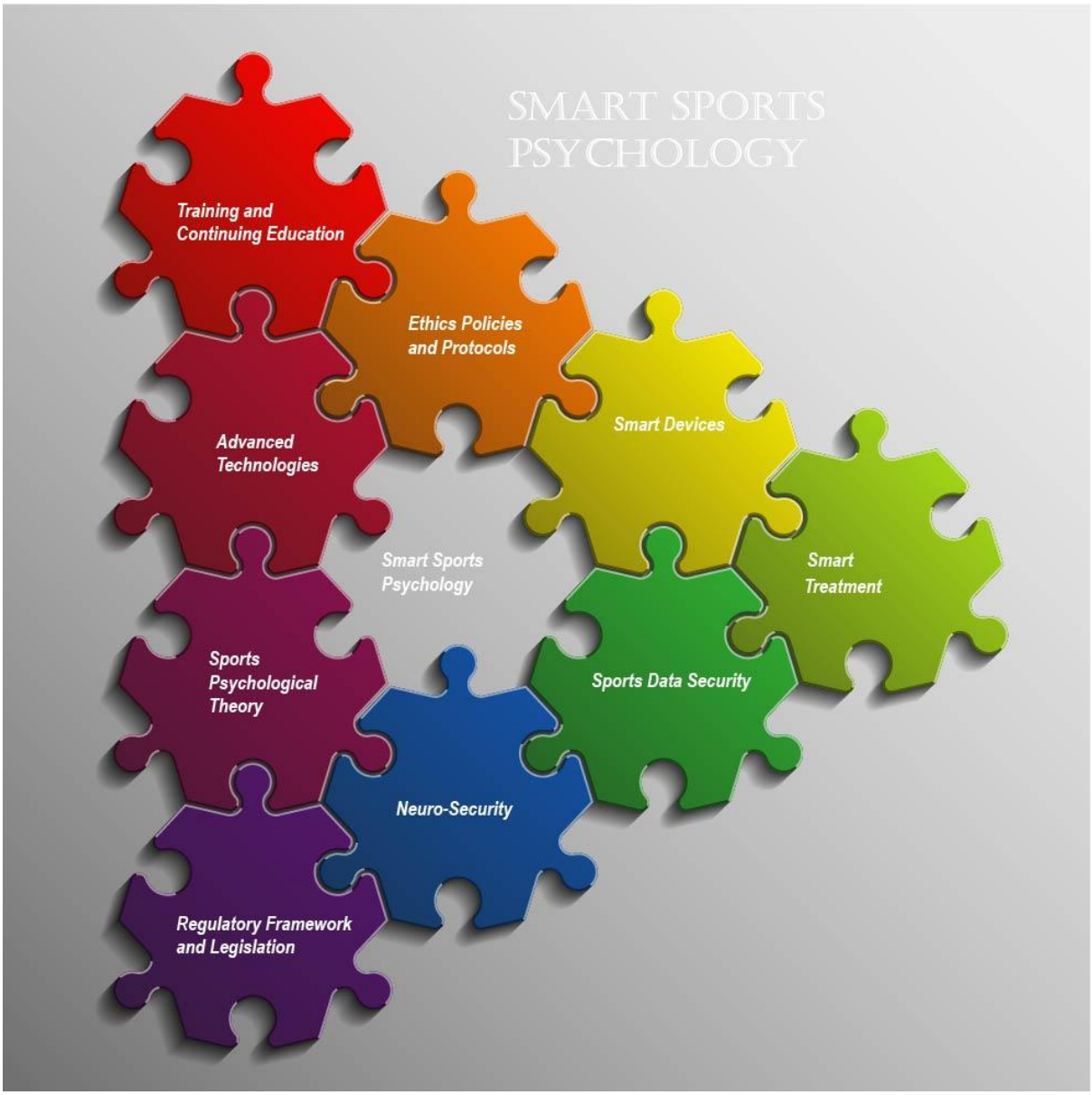

Fig. 1. Puzzle of Smart Sport Psychology.

Smart Sport Psychology offers innovative solutions to address critical psychological problems in the sports industry. By integrating advanced technologies, both athlete performance and overall well-being can be improved, which in turn benefits sport organisations through increased competitiveness, fan satisfaction and sustainable commercial success.

One significant aspect of promoting mental wellness in athletes involves the critical role of coaches. Research indicates that coaches can influence athletes' mental health by implementing strategies that reduce stressors and promote mental well-being, thereby positively impacting performance outcomes. Bissett et al. highlight how educating coaches on mental health promotion can enhance team dynamics and athlete resilience, suggesting that organizational efforts should prioritize mental health alongside performance metrics (Bissett et al., 2020). This perspective is reinforced by Purcell et al., who advocate for an early intervention framework that recognizes the equivalence of mental and physical health needs in athletes, underscoring the importance of building supportive cultures (Purcell et al., 2019). Moreover, recognizing barriers to mental health treatment is

vital in fostering a supportive environment for athletes. Geiger et al. underscore that the acceptance of e-mental health interventions among elite athletes can be maximized through flexible delivery modes that consider athletes' travel schedules, emphasizing early detection and self-management strategies (Geiger et al., 2024). This is particularly relevant as the integration of technology in sports, such as teletherapy and mobile applications, has shown to enhance accessibility to mental health resources (Li et al., 2023).

Despite these advancements, the stigma surrounding mental health issues continues to impede help-seeking behaviors among athletes, as noted by Aditya et al. The authors highlight how social identity and team cohesion can significantly influence athletes' willingness to seek mental health support, advocating for normalization and open discussions about mental health to combat stigma (Aditya et al., 2024). This indicates that while individual and technology-driven solutions are crucial, collective shifts in culture are equally important for meaningful change. The urgent need for mental health awareness became even more pronounced during the COVID-19 pandemic. Research by Grubic et al. suggests that both organizational and academic entities bear the responsibility of monitoring and managing athletes' psychological well-being, calling for tailored mental health approaches that integrate athletes' unique challenges (Grubic et al., 2021). For instance, the unique stressors encountered by individual sports athletes during lockdowns have been shown to lead to higher psychological distress compared to their team sport counterparts (Uroh & Adewunmi, 2021). Lastly, mental toughness and resilience are increasingly recognized as essential components of athlete psychology. Aditya et al. stress the significance of fostering mental toughness through structured programs combining psychological support with training, reinforcing the idea that mental preparedness is as crucial as physical training for athletes' performance (Aditya et al., 2024). This interrelationship is emphasized within frameworks like the Gold Medal Profile for Sport Psychology, which highlights competencies such as self-regulation and stress management as vital to athlete success (Dithurbide et al., 2022).

3 Smart Technologies Transforming Sports

The world of sport is in a process of evolution driven by the application of intelligent technologies, such as virtual and augmented reality, artificial intelligence, machine learning, big data, internet of things, among others. These technologies offer a wide range of possibilities to contribute and develop athlete performance, optimize team performance, improve the athlete experience and revolutionize the way we participate and consume sport. Some of the main examples of the application of these technologies will be discussed below.

The integration of smart technologies into sports is revolutionizing how athletic performance is monitored, enhanced, and experienced, marking a significant transformation in the sports landscape. By employing innovations ranging from wearable sensors to smart stadiums, these technologies not only improve performance metrics but also enhance fan engagement and operational efficiencies. Wearable technology stands at the forefront of this transformation, providing athletes with comprehensive data on their physiological and biomechanical states.

Advanced sensors, such as inertial measurement units (IMUs) and electromyography (EMG) sensors, have emerged as critical tools in sports science. According to Zhao et al., these sensors can detect complex signals that represent athletes' movements and conditions, thus enabling more precise performance analytics and monitoring Zhao et al. (2024). Additionally, advances in triboelectric nanogenerator (TENG) technology are further refining the capabilities of wearable devices, allowing for improved energy efficiency and flexibility in monitoring sports activities (Luo et al., 2021; Chen & Liang, 2024). Moreover, the rise of Smart Sports in educational institutions has empowered students to engage in physical activities despite location constraints.

As highlighted by Deng et al., the implementation of smart technologies such as big data and artificial intelligence in college sports provides students with tailored opportunities to improve their physical health through accessible smart equipment (Deng et al., 2022). This trend emphasizes the democratization of sports participation, making health benefits available to a broader audience. In more immersive environments, smart stadiums are playing a pivotal role in enhancing the fan experience through connected devices and AI-driven analytics. For instance, Wu et al. discuss how leveraging AI and live streaming technologies within stadiums enables real-time data processing to engage fans more effectively (Wu et al., 2022). This integration allows for instant replays, augmented reality experiences, and personalized content dissemination, thus transforming how fans experience live sports events.

Yang and Cole emphasize that the evolution of smart stadiums reflects a significant cultural shift, where fan engagement is synonymous with technological innovation (Yang & Cole, 2020). As sports organizations adopt these technologies, data-driven

decision-making becomes essential for optimizing performance and management strategies. Machine learning and big data analytics help in generating actionable insights from vast amounts of data collected through smart devices and sensors. For instance, AI applications in sports analytics can enhance training programs by identifying patterns through individual athlete performance data, as noted by Liu et al. (Liu et al., 2021). The adaptability of such systems fosters a smarter approach to training, with personalized metrics tailored to the needs of each athlete.

Furthermore, the ethical considerations surrounding these technologies are becoming increasingly important. Ensuring data privacy and security while utilizing rich datasets for performance assessments poses challenges that require careful navigation. As these technologies evolve, the focus on ethical implementations and transparent data use will be paramount to maintaining trust among athletes and fans alike. Smart technologies are profoundly transforming various aspects of the sporting ecosystem, from performance optimization through advanced wearables to enriching fan experiences via smart stadiums. The future of sports will likely continue to embrace these innovations, fostering more inclusive, data-driven, and engaging environments for both athletes and fans.

a. Augmented Reality (AR) & Virtual Reality (VR):

- **Immersive Training:** Immersive training: AR and VR can be applied to create simulated training environments (both virtual and augmented) by superimposing digital information on the real world, allowing athletes to visualize virtual opponents, analyze tactics in real time or receive instructions superimposed on their field of vision, triggering training in a more dynamic and personalized way (Soltani & Morice, 2020).
- **Real-Time Data Visualization:** AR and VR can enable the visualization of performance data, statistics and analysis directly on the field of play in the athlete's view, providing instant and relevant information for strategic decision-making during competition, this information will require specific physical and mental preparation for the athlete to process the information without affecting their performance.
- **Rehabilitation and Recovery:** AR and VR can be applied to create immersive and personalized rehabilitation experiences, which motivate athletes during the processes the recovery, for the improvement of results and accelerating their return to competitions.

b. Artificial Intelligence (AI):

- **Predictive Analytics:** AI analyzes massive sets of historical and performance data in real time, allowing through data mining to identify patterns, predict future performance and anticipate possible injuries, helping coaches and athletes to develop personalized and preventive strategies (Mccabe & Trevathan, 2008).
- **Performance Optimization:** AI can automatically adjust training and nutrition plans based on each athlete's data and results, taking into account factors such as fitness level, recovery needs and specific goals, contributing to improved training and competition results (Bodemer, 2023).
- **Injury Detection:** AI can analyze video streams and data logs from IoT sensors to detect abnormal movements or patterns that may indicate a risk of injury, enabling early intervention and prevention, ensuring athletes' participation in competitive actions.

4. Neurofeedback and Biofeedback:

- **Mental Self-Regulation:** These techniques allow athletes to monitor and control their brain waves and the behavior of their physiological functions such as heart rate, breathing and muscle tension, becoming tools that contribute to improve concentration, reduce stress and optimize their mental state for training and competition (Rydzik et al 2023)
- **Performance Enhancement:** Neurofeedback and biofeedback help to athletes develop a greater awareness of their mental and physical state, allowing them to optimize their performance and achieve a state of "flow" during competition (Corrado et al, 2024)

c. Big Data:

- **Advanced Performance Analysis:** Collecting and analyzing massive informations evolving to datasets from various sources (IoT sensors & wearables), provides detailed insights into individual and team performance. This helps identify patterns, trends, and areas for improvement from training to competition (Bai & Bai, 2021); developing personalized training, nutrition and recovery strategies for each athlete, maximizing their individual potential.
- **Data-Driven Decision Making:** Coaches and teams can utilize big data to make informed and strategic decisions, optimizing player selection, training plans, and game tactics (Ratten & Dickson, 2020).

d. Internet of Things (IoT) & Wearable Devices (WD):

- **Remote Performance Monitoring:** IoT sensors and devices embedded in clothing, footwear and sports equipment (WD) collect real-time performance data during training or remote competitions; contributing to continuous monitoring and evaluation of an athlete's physical and mental state (Raman et al, 2023).

- **Training Optimization:** The data collected by IoT devices is applied in the optimization of training plans, adjusting the intensity and duration of sessions; impacting on the prevention of possible injuries or overtraining (Tanna & Vithalani, 2023).
- **Enhanced Fan Experience:** IoT devices can create personalized and immersive experiences for fans, providing real-time statistics, access to exclusive content or interaction with players and teams through digital platforms (Levallet et al, 2019).

As seen, smart technologies are revolutionizing sports at every level, from training and competition to athlete and fan experiences. These tools create endless possibilities to optimize performance, improve athlete health and wellness, personalize the sports experience and take the excitement of sport to a whole new level, evolving into Smart sports. As technology continues to evolve, we can expect even more innovative applications that will further transform the future of Smart Sports 2.0.

4 Review of Psychological Problems in Sport and Smart Sport Psychology Solutions

The field of sports psychology is increasingly recognizing and addressing the psychological challenges faced by athletes, particularly in high-stress environments. Mental health issues such as anxiety, depression, and burnout are prevalent among athletes, impacting their performance and overall well-being. To combat these challenges, effective psychological solutions are being integrated into sports settings, enhancing the mental resilience and performance of athletes.

One common psychological issue faced by athletes is the struggle with mental health and the stigma that often prevents them from seeking help. Research conducted by Purcell et al. emphasizes the need for early intervention frameworks that consider various factors, including competition-related stress, individual vulnerabilities, and organizational dynamics Purcell et al. (2019). Such frameworks can create an environment that promotes psychological safety and encourages athletes to discuss mental health issues openly. This is crucial for building a culture where mental health is prioritized alongside physical performance.

The concept of mental resilience is particularly relevant in this context. Resilience enables athletes to adapt to stress and overcome challenges, ultimately improving their psychological health and performance. A study by Yamada et al. illustrates that unity in sport teams mediates resilience, which contributes positively to athletes' mental health (Yamada et al., 2017). Enhanced team cohesion and supportive relationships among teammates can buffer against the psychological stressors of competitive sports.

Therefore, fostering a strong team environment is not only beneficial for performance but also critical for the mental well-being of athletes. Moreover, the integration of smart technologies in sports psychology allows for innovative approaches to mental health management. Smart wearables can monitor physiological indicators of stress and fatigue, providing real-time feedback to athletes and coaches about their mental states. As indicated by Mahmud et al., smart garments equipped with sensors can track athletic performance while also focusing on the wellness of the athletes (Mahmud et al., 2020). This technology facilitates a proactive approach to mental health, allowing interventions before psychological issues escalate.

Another essential aspect of smart sport psychology is the implementation of psychological skills training and mindfulness practices. Research by Röthlin et al. supports the positive impact of both psychological skills training and mindfulness training on performance-related factors such as emotion regulation and attention control (Röthlin et al., 2020). These practices not only equip athletes with the mental tools necessary to perform under pressure but also promote overall well-being by reducing stress and anxiety levels. By incorporating these techniques, athletes can enhance their focus and resilience, which are vital components for competing successfully.

In addition, the role of social support from coaches and family members is crucial for fostering resilience among athletes. Zhang et al. highlight the chain mediating effects of coach leadership and psychological resilience on athletes' mental fatigue, indicating the importance of positive environmental influences (Zhang et al., 2023). Supportive relationships can help athletes navigate challenges, thereby promoting better mental health outcomes.

Furthermore, it is essential to recognize and target specific populations within sports, such as young female athletes, who may face unique stressors. O'Brien et al. emphasize the importance of identifying protective factors that contribute to psychological resilience in this demographic, thereby tailoring interventions to support their needs (O'Brien et al., 2021). Ensuring that diverse athlete populations receive appropriate psychological support and resilience training is crucial for fostering a healthy

competitive environment. Lastly, mental training methodologies have emerged as effective complementary strategies within smart sport psychology.

Mental training, encompassing techniques that enhance mental toughness and resilience, can be crucial for athlete performance, as discussed by Kumar and Patil (Kumbar & Patil, 2024). Implementing structured mental training programs, potentially augmented through digital platforms, can ensure athletes are equipped to face the rigors of competition while effectively managing their mental health. Psychological problems in sports can be effectively addressed through a combination of early intervention frameworks, the enhancement of team dynamics, the incorporation of smart technologies, and targeted resilience-building strategies. As the sports environment evolves, embracing these smart sport psychology solutions is vital for promoting mental health and optimizing athlete performance.

The inclusion criteria for the identification of jobs are the application of technologies or technological solutions linked to the most common problems in sport: Self-esteem, Anxiety, Depression, fear of failure, Burnout Syndrome, Eating disorders or problems.

The sources of information will initially be databases and sources of information available with open access such as (PubMed, Google Scholar, Web of Science). Some databases or repositories do not allow the consultation or download of works or documents after payment or subscription.

The incidence that physical activity has on physical and mental health seems to conclude that the relationship established is positive. Thus, and focusing mainly on the positive consequences that physical activity has on people's psychological well-being, Biddle (1992) points out that since there is a clear relationship between physical activity and health, it is necessary to promote exercise to achieve better mental health in the population and to be concerned about achieving a high level of adherence to it. Specifically, the author emphasizes that anxiety, depression, or stress are reduced with regular physical activity. On the other hand, Kane (1993) finds a positive relationship between physical activity and improvement of anxiety and depression, as well as increased self-esteem.

However, in the last 20 years of systematic work of psychologists in sport, the constant benefits of constant exercise have been identified, and with this, the need to establish as a complement, psychological training has been mentioned, indicating that, sometimes, psychological problems occur in sport as mentioned by several authors such as Nieto and Olmedilla (2001); Dosil (2002); Olmedilla, Ortín, and Lozano (2003); among others.

Recent research has identified limitations concerning psychological interventions in athletes that, if not controlled, can harm the service received by the athlete, decreasing the potential quality and excellence of the work of the sports psychologist. With the evolution of sports psychology, Dosil (2004) describes the analysis of this evolution not only from the scientific principles that condition the discipline but also from the professional development that the sports psychologist has experienced, including some of the limitations that we also wanted to take up in this work. Dosil (2004) presents the limitations identified in four areas that influence the work of the sport psychologist:

- Professional. Limitations that the psychologist may encounter in terms of the clarification of his or her job, training, erroneously stated competence, and other aspects that affect his or her professional development.
- Personal. Factors that are related to the skills required of the sport psychologist, as well as the limitations that may appear as a consequence of the demands that the development of the job requires of the psychologist.
- Sport. Analysis of the obstacles coming from the context in which the sport psychologist develops his or her work, also taking into account the unique difficulties of sport compared to other fields.
- Social. Limitations that directly influence the work of the sport psychologist, although their incidence is external, coming therefore from the different social conditioning factors related to sport.

Garcés de Los Fayos Ruiz & Vives Benedicto (2005) describe six keys that should be considered to reduce or eliminate the limitations that arise concerning sports psychology: Training of maximum excellence and openness to the outside world, Achieve consistent professional accreditation, Increase knowledge in other sports sciences, to seek a highly competitive and eminently ethical work, avoid spectacle sport and to work with the seriousness of a consolidated science.

Sometimes, the performance of physical activities can reach such a degree of commitment that the person becomes addicted to it. Morgan (1979) points out that a person can become addicted to physical activity when it becomes an end and not a means to improve their quality of life, relegating values such as family, friendship, and work, among others, to second place.

Munné (1989), who starts from the consideration of physical activity and sport as psychological and social behavior, which constitutes one of the main contemporary forms of leisure, verifies that three aspects threatening sport as a leisure exercise:

- The extreme competitiveness of physical activity.
- The labor nature of this activity: as long as competitiveness is basic in the realization of the chosen activity, it is necessary to dedicate time to prepare and compete.
- Its quantitative nature: one of the objectives of the majority of practitioners of sporting activities is to beat records.

Davies and Armstrong (1991) attribute the origin of stress in sport to the emphasis placed on continuous competition. The authors state that this pressure causes the athlete to be emotionally burned out and to abandon training. In turn, Davies and Armstrong (1991) mention that there are various agents (coaches, family members, clubs, among others) that cause situations that generate pressure on athletes and require a greater effort, without considering the emotional health of the individual.

With the pressure exerted by different factors, the athlete may suffer from various negative feelings: guilt, remorse, uncertainty, self-doubt, helplessness, insecurity and incapacity, which deteriorate to the point of no longer resisting the pressure and abandoning the sport. Gil (1991) proposes the following internal and external stressors that the athlete may perceive: Uncertainty about the situation, too much information or responsibility related to their sport practice, excessive training load, frustration due to factors internal and external to the sport, poor interpersonal relationships, excessive environmental demands from coaches, family, friends, etc, incorrect emission of physiological responses, lack of coping and stress management practices, team climate, value and unpredictability of competition and prestige and pride.

The predisposition to react to stressful situations is related to activation levels and to previous experiences similar to the current one. However, constant exposure to stress can lead an athlete to become accustomed to it, become familiar with it and learn to adapt more effectively, but an excessive level of tolerance can have the opposite effect, causing emotional problems, negative attitudes and loss of confidence.

Finally, personality variables play an important role and thus, in any stressful situation, the athlete's perception of the situation, the nature of the emotional response he/she emits and the coping processes he/she mobilizes will be the ones that frame the perceived stress and its consequences.

In the table 1 are the research about Smart Sports applied to Psychology. The term Smart Sport Psychology is new; Search engines don't recognize the term or as a keyword.

Table 1. Research about advanced techbologies to Sports Psychology.

Research	Smart Psycho Component	Contributions
Jia Xuyun, Lu Weibin, En Yanhong & Li Aizeng (2021)	Portable Auxiliary Device for Physical Exercise and Sport Psychology Teaching	Portable auxiliary device for physical exercise and sport psychology teaching.
Xing Suxuan (2019)	Exercise Psychology Auxiliary Teaching Device	The utility model of an auxiliary teaching equipment for exercise psychology.
Song Shuying (2024)	Psychology Testing Device Convenient to Use	Psychological testing device (figure 1)
Jilin Sport University (2021)	Physical Exercise Device Capable of Relieving Anxiety Psychology	Physical exercise device aimed at reducing anxiety. It is a device for exercising and reducing anxiety.
Chen Junying (2022)	Physical Exercise Device for Relieving Anxiety Psychology	A physical exercise device for relieving anxiety psychology
Leng Song & Wang Dandan (2020)	Physical Psychology Education Teaching Display Device	A visualization device for teaching physical psychology.
Wang Ke, Hou Xiaohui, Liao Xiongzhong, Xu Ping & Ye Huan (2023)	Auxiliary Hypnosis Device for Psychology	Hypnosis auxiliary device consists of a hypnosis table, a sliding rail, a hypnosis

		mechanism, a positioning frame, a support seat, a positioning mechanism for positioning the head, and the support seat.
Dikmen (2021)	ICT	The relationship between psychological benefits and the use of information technologies in training and sports performance is investigated, the result leads to a direct relationship of these elements.
Akçakoyun (2018)	Data analysis	The self-esteem of students of physical education and sports is analyzed, it is identified that students in the area of sports teaching obtained higher averages than students in sports administration.
Wan Ahmad, Mohd Adib, & Sut Txi (2022)	Iot	An Anxiety Monitoring System based on the Internet of Things (IoT) is designed to monitor the performance and health conditions of athletes in real time. Psychological and physiological anxiety parameters are reviewed, using multiple sensors of an AMS-IoT, resulting in an improvement in overall sports performance and better preparation of athletes for real competitions.
Lei, Li, & Li (2023)	Artificial intelligence and the Internet of Things	The combination of artificial intelligence and the Internet of Things is used to identify and analyze unwanted behaviors, as well as detect mental health issues in sports education students. These technologies support the reduction of anxiety and depression.
Mo (2024)	Big data	In this study, big data analysis is applied to study and analyze the efficacy of the application of treatments for stress management and mental health and athletes and student.

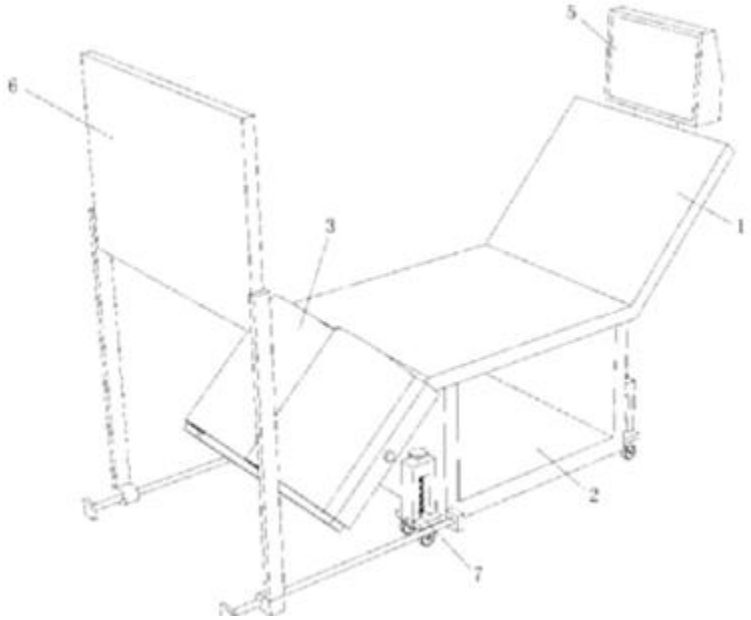

Fig. 2. Psychology Testing Device Convenient to Use (Song Shuying, 2024).

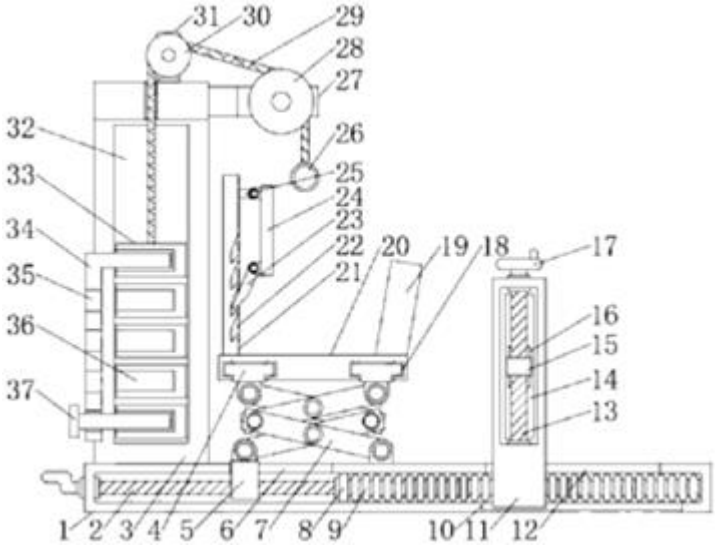

Fig. 3. Physical Exercise Device Capable of Relieving Anxiety Psychology (Jilin Sport University, 2021)

5 Conclusions

Smart Sport Psychology leverages advanced technologies to provide a holistic and personalised approach to athlete training and wellbeing. By integrating smart devices, AI, VR, biofeedback and other emerging technologies, accurate and effective interventions can be developed that improve muscle memory, prevent depression, increase self-esteem, optimise training, reduce stress and prevent injuries. This approach not only maximises sports performance, but also ensures the holistic wellbeing of athletes, enabling them to reach their full potential in a sustainable and safe manner.

Smart Sport Psychology represents an innovative approach that combines traditional psychological theories with advanced technologies to improve the performance and well-being of athletes. As these technologies evolve, a wide field of research is opening up to explore new applications and optimise current strategies. In the following, proposals for future research are presented that address both current findings and existing limitations, considering the potential of metaverse, hypnotism, haptic technology, augmented reality and neurosafety.

The integration of the metaverse into sports training offers an innovative platform for the simulation of complex scenarios. This approach would allow athletes to practice and visualise movements in an immersive and highly realistic environment, improving muscle memory, coordination and decision-making in high-pressure situations. An experimental study with control and treatment groups is proposed, where athletes participate in sessions in both the metaverse and traditional physical environments. Measurement of performance and well-being variables before and after the interventions would help to assess the impact of training in the metaverse.

Haptic technology, which provides tactile feedback, could significantly improve training and recovery for athletes. This technology allows athletes to refine their movements and accelerate physical rehabilitation. A cohort study of athletes using haptic devices during their training and recovery processes can compare performance and recovery outcomes with those following traditional methods. This research could provide valuable data on the effectiveness of haptic technology in sport.
Augmented reality (AR) can provide real-time data visualisation during training sessions, enabling immediate adjustments and improved decision making. We propose to investigate how immediate visualisation of performance metrics influences movement accuracy and speed of decision making. Implementation of AR in training sessions, followed by qualitative and quantitative evaluations, may offer insights into the utility and effectiveness of this technology.

With the increased use of implantable devices and advanced technologies, it is crucial to ensure that these tools do not compromise the mental and physical health of athletes. We propose to study the neurological safety of athletes using these technologies, identifying potential risks and developing safety protocols. Case studies and longitudinal studies with athletes using implantable technologies, assessing their mental and neurological health through clinical tests and questionnaires, can provide essential data to ensure the safety and efficacy of these innovations.

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