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Psychological health in competitive volleyball players: a systematic review of stress, competitive anxiety, and well-being

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ABSTRACT

Competitive volleyball certainly involves rigorous training schedules and no shortage of competitions, which put heavy psychological demands on players. Still, when one considers the psychological health of volleyball players, little has been done in comparison to the physical and technical performance aspects. This systematic review has two objectives: 1) to summarize research on psychological stress, competitive anxiety, and psychological well-being of competitive volleyball players, and 2) to explore ways of assessment, factors influencing, and intervention of these psychological states. Using the latest version of PRISMA guidelines for conducting systematic reviews, the records retrieved are 721 in total. With the removal of three duplicates, 718 studies were screened. 72 full-text studies were assessed, and finally, 10 studies met the inclusion criteria and were included in qualitative synthesis. Four major themes were identified. First, higher levels of perceived stress and training-load strain were linked to poorer recovery and lower well-being. Second, anxiety related to competition and the period just before the competition was sensitive to changes resulting from psychophysiological measures and neuromodulatory interventions. Third, sleep quality and personal well-being reflected important indicators of injury risk and mental-health status. Fourth, internal motivational resources, social support, and resilience were the factors that strengthened the athletes' capacity to handle stress and anxiety. These results provide support for existing theoretical models of athlete stress and point out the significance of ongoing psychological assessment and tailored mental-health assistance in volleyball programs. Further studies should concentrate on longitudinal and experimental research studying the associations among psychological variables, performance, and athlete well-being.

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Introduction

Playing sports is highly believed to be one of the most important ways to achieve good physical and mental health, while competing in high level or elite sports at the same time, can expose athletes to a number of different worrying factors that may jeopardize their psychological state (Reardon et al., 2019). Based on the most recent and up-to-date consensus statements, it is estimated that elite athletes suffer from symptoms of anxiety, depression, and sleep at such rates that, in most respects, these rates are comparable to the general population and in some aspects even higher (Gouttebarge et al., 2019; Purcell et al., 2019). At the same time, this of athlete welfare has been considered and reframed as a public-health priority and registered internationally, bringing

about in turn the raging calling by international sports bodies for sport-sensitive mental-health policies that are not only in place but also thoroughly integrated in the everyday training work performed by the athletes (Breslin et al., 2019; Henriksen et al., 2020). Among this larger programme, the largest sports teams, because players are facing not just one another but also need to cooperate with each other are capable of generating both collective and individual sources of psychological load, thus placing team sports in contrast with most other lead and sports in tandem.

Volleyball is a prime example of sports that manifest these contradictions. The game entails consecutive maximum vertical jumps, near instantaneous change of direction, and refined perceptual-motor coordination that is further complicated by a competitive calendar that is highly unusual with a very short off-season and pre-season, but a long in-season with many matches (Rebelo et al., 2024). This very tight scheduling not only limits recovery periods, but also increases the overall training demand that the players have to endure, so that managing not only the psychological, but also the physiological load, becomes a factor that influences both performance and well-being (Berriel et al., 2020). The starters being constantly changed, individual mistakes being exposed, and the momentum of a rally changing very quickly, all these aspects together cause an intense surge of emotions in the volleyball players competing at a high level (Shieh et al., 2023).

Psychological relationships of playing volleyball have been increasingly studied. Researchers have highlighted stress perception and recovery variations during competitive microcycles in volleyball players (Duarte et al., 2023), investigated the role of sleep, mood, and injury in volleyball players (Haraldsdottir et al., 2021), and studied the effect of motivation and resilience on athletes' anxiety before competitions (Trigueros et al., 2020). Besides that, the team-based social and psychological benefits experienced by players were a major theme in the qualitative investigation (Suh et al., 2022). At the same time, the technology used for volleyball player monitoring has been enhanced, as wearable inertial sensors and machine-learning workflows have become capable of measuring jump load and associating it with perceived wellness (de Leeuw et al., 2022; Xu et al., 2025).

The recent improvements in methods and technology have broadened the ways to study the stress posed to an athlete. Inertial measurement units and jump-load protocols tested for validity permit external load to be recorded continuously and without disturbing the athlete (Skazalski et al., 2018; Damji et al., 2021; Gielen et al., 2022), at the same time, biomechanical studies of the spike and landing phases have revealed the physical stress factors that co-work with psychological tension and injury risk (Fuchs et al., 2019; Garcia et al., 2022; Seminati et al., 2015). Metrics of performance analysis extracted from game data have also turned into very detailed (Lopez-Serrano et al., 2024). However, the psychological aspects of the work have only partially embraced these instruments, and the emotional effects of load are still relatively unexplored.

The main problem could be the fragmentation of the evidence base. Researchers in volleyball stress, anxiety, and well-being are scattered through e.g., sport-medicine, psychology, sports-technology, and their instruments are very different and they rarely use the same definitions or outcome measures. Therefore, without a clear manual, practitioners cannot know which psychological constructs are the most important, how they can be measured in volleyball, and what is their relationship with recovery, injury, and performance. To date, there has been no systematic review in which these topics have been merged for the particular group of competitive volleyball players.

A second gap is at the theoretical and methodological level. Many of the studies available are cross-sectional, focusing only on one sex, or based on very limited samples that are not very representative, which makes it difficult to draw causal inferences and to generalize the results (Kuttel & Larsen, 2020). Intervention studies are, for the most part, pilot projects and the discipline remains uncertain as to whether psychophysiological, neuromodulatory, or motivational strategies could have a lasting impact even under real, high-pressure competition. The limited use of longitudinal and mechanistic research has resulted in a lack of clarity about the sequence of stress, well-being, sleep, and injury.

The need to address these gaps has become even more pressing because of the professionalisation and globalisation of volleyball, as well as the parallel rise of athlete mental-health awareness. As custodians of the sport move from awareness to structured intervention, they will need evidence-based, volleyball-specific guidance to help them plan screening, monitoring, and support pathways. A systematic review which not only charts the existing evidence but also assesses its quality and points out its limitations is, therefore, both timely and necessary as it lays a basis for targeted primary research and applied practice.

Although several reviews have discussed athlete mental health, they mainly focused on general athletic populations or broad mental-health outcomes without providing volleyball-specific evidence. Existing reviews rarely integrate competitive stress, competitive anxiety, psychological well-being, sleep, recovery, and intervention strategies into a single synthesis specifically for competitive volleyball players. Furthermore, no

previous review has comprehensively evaluated assessment methods, associated factors, intervention effectiveness, and research trends simultaneously. Therefore, this systematic review addresses these important gaps by synthesizing current evidence focused exclusively on competitive volleyball.

In order to organize this synthesis, the review is divided into three research questions. The first one deals with exploring, describing, and measuring the main constructs of the field. It determines the nature of psychological stress, competitive anxiety, and well-being in competitive volleyball and gives researchers and practitioners a well-structured map of measurements.

The second research question is about the identifying factors and correlates of these constructs, explaining how training load, sleep, social and motivational resources, and competitive context influence stress, anxiety, and well-being, and offering by a comprehensive explanation of the factors that practitioners may be able to realistically target.

The third research question is about intervention and application. It aims to find out what types of strategies have been used to alleviate stress and anxiety or to preserve well-being in volleyball players. It also aims to provide a critical evaluation of the effectiveness and practical use of these strategies. Combining these three research questions is the unique aspect of this review, which, as far as the authors know, is the first PRISMA-guided systematic review focused solely on the psychological stress, anxiety, and well-being of competitive volleyball players. The reasearch questions are: (1) RQ1: How are psychological stress, competitive anxiety, and psychological well-being conceptualised and measured among competitive volleyball players?; (2) RQ2: Which training-related, individual, social, and competitive factors are associated with stress, anxiety, and well-being in this population?; (3) RQ3: Which interventions have been evaluated to reduce stress and competitive anxiety or to protect well-being in competitive volleyball players, and how effective are they?

The novelty of this review lies in integrating psychological stress, competitive anxiety, psychological well-being, assessment methods, associated factors, intervention strategies, and methodological trends into a single volleyball-specific evidence synthesis. Unlike previous reviews, this study also evaluates intervention readiness and identifies future research priorities for psychological monitoring in volleyball.

Method

In social and behavioral sciences it is always essential to provide enough information so that other scientists can replicate or use your method. Such information is very important especially when a new method is introduced or an innovative application of an existing method is used. Finally, please refrain from making a sub section in Method.

A systematic literature review (SLR) method was used as it offers a clear, replicable, and protocol-based way of finding, evaluating, and combining all relevant evidence on a specific question while minimizing selection bias compared to narrative reviews. The review execution and documentation were in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) statement as well as its explanation-and-elaboration guidance (Page, McKenzie, et al., 2021; Page, Moher, et al., 2021). These were supplemented by the practical reporting guidelines (Sarkis-Onofre et al., 2021). The PRISMA structure was picked because it has a standardized flow model that makes every screening decision traceable and the final set of documents reproducible.

A comprehensive search string was constructed by combining a population block (volleyball) with an outcome block (stress, anxiety, well-being, and mental health) using Boolean operators and truncation. The asterisk wildcard was used to capture morphological variants (for example, anxiet* for anxiety and anxieties), and the search was performed in the TITLE-ABS-KEY field in order to capture terms present in titles, abstracts, or keywords. The exact string was:

TITLE-ABS-KEY ("volleyball" AND ("stress" OR "anxiet" OR "well-being" OR "wellbeing" OR "psychological" OR "mental health" OR "mood" OR "burnout" OR "coping" OR "resilience"))*

This review protocol was not prospectively registered in PROSPERO because it focused on sport science rather than healthcare intervention. Nevertheless, all review procedures were predefined before literature screening and strictly followed the PRISMA 2020 Statement. There were no language or date limiters inserted in the search string itself; eligibility restrictions (English language, peer-reviewed article, and topical relevance) were imposed only at the screening stage so that the whole database could initially be explored.

Scopus was selected as the main and most reliable bibliographic source for this review because it covers a wide range of sport science, sport medicine, psychology, and engineering journals, which are related to the topic. The metadata file that was obtained served as the source of data for all the record counts and bibliographic

information that are given in this review. The search and export were done in one session only, and the resulting comma-separated values file (n = 721 records) was kept in its original form for later check. No additional databases were used for searching; this limitation that is recognized. Eligibility was defined a priori across six dimensions. The complete inclusion and exclusion criteria are presented in Table 1.

Table 1 <Inclusion and Exclusion Criteria Applied during Study Selection>

Criterion	Inclusion	Exclusion
Language	English-language full text	Non-English documents
Document type	Peer-reviewed journal article	Conference paper, book chapter, editorial, note
Publication period	2018-2025 (inclusive)	Published before 2018
Subject area	Sport psychology, sport medicine, mental health, athlete well-being	Unrelated disciplines with no psychological outcome
Accessibility	Full text retrievable	Abstract-only or inaccessible full text
Relevance	Directly addresses stress, anxiety, or well-being in competitive volleyball players	Volleyball mentioned only incidentally; no relevant psychological outcome

Note. *The publication window (2018-2025) was applied to keep the synthesised evidence contemporary with current training-monitoring and mental-health practice; the included corpus accordingly spans 2020-2025. Relevance was the decisive criterion, since the population block returned many records in which volleyball featured only as one of several sampled sports.*

Selection was carried out in three consecutive steps. To begin with, duplicate entries were detected and removed by matching digital object identifiers and normalized titles. Then, the records that had been deduplicated were checked at title and abstract level for their potential relevance, diminishing the number of records whose topics were nonexistent volleyball or the psychological outcome had not been sufficiently considered. Finally, the rest of the records were subjected to a full-text analysis checking their eligibility with reference to all the six criteria in Table 0. Screening results were documented for each record; hence the funnel could be traced, and the borderline records were retained for the next stage to reduce premature exclusion; ambiguous cases were resolved by the full text's re-reading against the eligibility criteria before a final decision was made.

Study selection was conducted by the corresponding author following the predefined eligibility criteria. To reduce selection bias, all screening decisions were documented systematically and rechecked before data extraction. Ambiguous studies were reviewed repeatedly against the inclusion and exclusion criteria until a final decision was reached.

Using the four-domain FICO framework, the methodological quality and topical fit of each full-text candidate were assessed: Focus (whether the research aim was clear and aligned with stress, anxiety, or well-being in volleyball), Information (whether sample description, instruments, and procedures were sufficiently detailed), Context (whether the competitive-volleyball setting and population were relevant), and Outcome (whether psychological outcomes were valid and interpretable). Each domain was marked as either adequate (1) or inadequate (0), producing a total score between 0 and 4. Obtaining a score of at least 3 out of 4 was mandatory for inclusion to make certain that the studies retained had a clear focus, contained enough methodological detail, were set in an appropriate context, and reported outcomes in a way that could be interpreted.

A standardised extraction grid was utilised for each study included to obtain the following: author(s) and year; country of the corresponding institution; study design; sample size, sex, and competitive level; the psychological construct(s) analysed; the instruments or biomarkers used; any intervention or technology implemented; and the main findings. Bibliographic details extracted verbatim from the Scopus export to ensure data integrity, and the fields extracted were used to fill the descriptive tables presented.

In order to support the narrative synthesis, a simple bibliometric analysis was performed using the exported metadata. The number of publications was recorded by year in order to illustrate the time-related development of the volleyball-and-psychology research field, the country of the institution of the first author was used to describe the geographical distribution of the studies, and author keywords along with the extracted constructs were grouped into thematic clusters as a proxy of keyword co-occurrence. Such descriptive analyses aimed at placing the studies included in the review within the larger corpus rather than carrying out inferential bibliometric modeling; performing formal co-citation and co-authorship mapping, e.g. by means of VOSviewer, was outside the scope of the present review.

Since the studies included in the research differed in the design of the methodologies, tools, and results, a thematic synthesis approach was chosen instead of meta-analysis. The findings were coded inductively from the

extracted data, grouped into main themes, and later arranged according to the three research questions. The themes were cross-checked by going back to the original studies to see whether each analytical point was supported by the primary data, and competing or contradictory results were kept and discussed rather than being averaged out. This method keeps the subtlety of a small, diverse evidence base while allowing for integrative conclusions.

The review was written down complying with the PRISMA 2020 checklist, and the flow diagram in Section 4 fully illustrates the study selection process (Page, McKenzie, et al., 2021). All record numbers mentioned in the Abstract, Methods, Results, and flow diagram match each other and were directly taken from the Scopus export. To prevent fabrication of authors, journals, years, or identifiers, bibliographic data for each included and supporting study were checked against the source metadata.

Figure 1 (PRISMA flow diagram) visually summarizes the study-selection process. Following the diagram visually traces the corpus from the 721 records initially identified in Scopus through stages of deduplication, screening of titles and abstracts, and finally assessment of full-text eligibility, resulting in the 10 studies selected for synthesis.

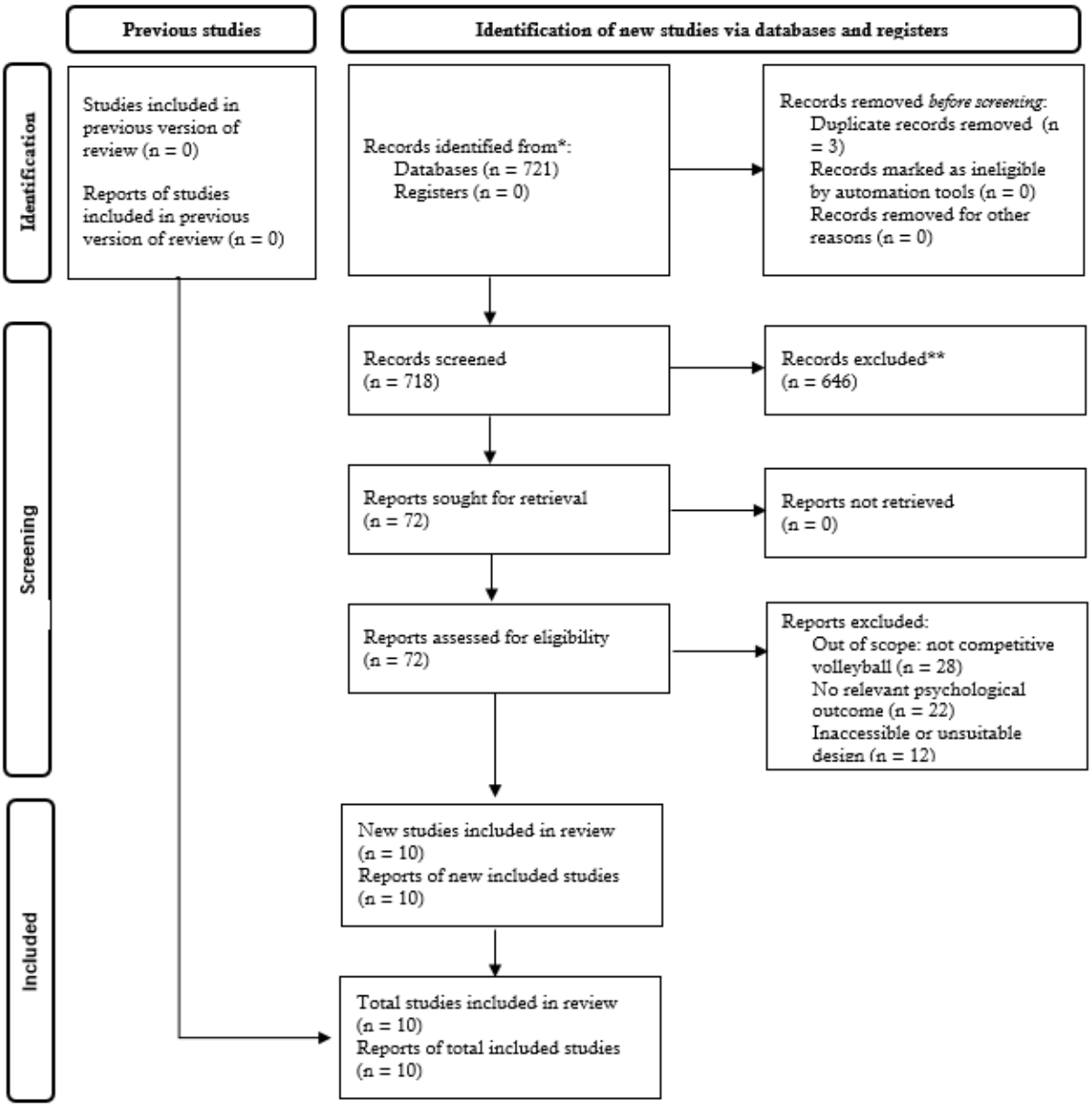

Figure 1 <Flow of Records through Identification, Screening, Eligibility, and Inclusion>

Explanation. Identification yielded 721 Scopus records, from which 3 duplicates were removed, leaving 718 records for screening. Title and abstract screening excluded 646 records that were not volleyball-focused or

reported no psychological outcome. Of the 72 full texts assessed, 62 were excluded - 28 as out of scope, 22 for reporting no relevant psychological outcome, and 12 as inaccessible or of unsuitable design - yielding the final 10 included studies. These counts are identical across the Abstract, Methods, and Results.

Results and Discussions

The Scopus search initially retrieved 721 records. After removing 3 duplicate records, a total of 718 unique records remained for title and abstract screening. Out of these, 646 records were excluded at this stage either because volleyball was not their main subject or they did not report any psychological outcomes, which means 72 records were left for full-text eligibility assessment. Out of these, 62 more records were excluded 28 because they were out of scope (volleyball appearing only incidentally among multiple sports, or non-competitive samples), 22 for reporting no relevant stress, anxiety, or well-being outcome, and 12 as inaccessible or unsuitable design. A final 10 studies satisfied eligibility criteria and the FICO quality threshold and were used for qualitative synthesis. Numerically, these data are consistent with the flow diagram in Figure 2.

Table 2 <Summary of the Ten Included Studies>

Title	Author(s)	Country	Method	Key findings
Training stress, neuromuscular fatigue and well-being in volleyball	Rebelo et al., 2024	Portugal	Systematic review	Training load tracks neuromuscular fatigue and wellbeing; monitoring is central to managing the congested calendar.
Structural modelling of student volleyball athletes' stress and learning anxiety	Li, Y., 2025.	China	Crosssectional SEM	Psychological safety mediates how intimacy and social adjustment lower perceived stress and learning-related anxiety.
Biofeedback training to reduce salivary cortisol and improve mental health	Makaraci et al., 2023.	Turkiye	Pilot intervention	HRV-biofeedback in female players reduced cortisol indicators and supported mental health.
Psychophysiological responses during the championship microcycle	Duarte et al., 2023.	Brazil	Case study	Daily training load shifted recovery, well-being, and the testosterone-tocortisol ratio across the pre-competition microcycle.
Decreased sleep and subjective well-being as predictors of injury	Haraldsdottir et al., 2021.	USA	Prospective cohort	Lower sleep and poorer subjective well-being independently predicted in-season injury in female collegiate players.
Effect of motivation on resilience and anxiety of the athlete	Trigueros et al., 2020.	Spain	Crosssectional path	Self-determined motivation strengthened resilience, which in turn lowered competitive anxiety.
Stress and recovery perception and creatine kinase in the preseason	Berriel et al., 2020.	Brazil	Cohort	Stress-recovery balance, creatine kinase, and jump performance fluctuated with preseason load.
Sleep problems, mental health, and perceived stress in adolescent athletes	Norouzi & Shojaei., 2025.	Iran	Crosssectional	Sleep problems were prevalent and associated with higher perceived stress and poorer mental health.
tDCS on precompetitive cognitive performance and anxiety	Joshi et al., 2025.	India	Randomised controlled trial	Transcranial directcurrent stimulation altered precompetitive anxiety and cognitive performance in collegiate players.
Beach volleyball exergame and state anxiety in adult women	de Oliveira et al., 2024.	Brazil	Controlled crossover	A single beach- volleyball exergame session did not significantly change state anxiety.

Table 2 shows the breadth of the small evidence base: a single systematic review anchors the load-and-well-being theme, two intervention studies (biofeedback and tDCS) test active anxiety- and stress-reduction strategies,

and the remaining observational designs map correlates of stress, anxiety, sleep, and well-being. The diversity of designs and outcomes is why a thematic rather than meta-analytic synthesis was adopted.

The ten included studies were published between 2020 and 2025 and most of them came from Brazil. The studies varied in design and included cross-sectional surveys, prospective cohorts, systematic review, case study, pilot trial, and randomised controlled trial. The samples included adolescent, collegiate, and adult competitive players of both sexes. Table 2 summarises the included studies, and classifies them by design, thematic focus, and intervention. Overall, observational studies dominated the available literature (70%), whereas only three intervention studies were identified. Most studies originated from Brazil and focused primarily on stress monitoring and well-being assessment, highlighting the limited availability of experimental evidence.

Table 3 <Classification of Included Studies by Design, Theme, and Intervention>

Author(s)	Country	Research design	Theme/ focus	Technology/ intervention	Outcome
Rebelo et al., 2024	Portugal	Systematic review	Load, fatigue & well-being	Loadmonitoring synthesis	Well-being monitoring framework
Li, Y., 2025.	China	Crosssectional SEM	Stress & learning anxiety	None (survey)	Psychological safety mediation
Makaraci et al., 2023.	Turkiye	Pilot intervention	Stress biomarkers & mental health	HRV biofeedback	Lower cortisol; better mental health
Duarte et al., 2023.	Brazil	Case study	Psychophysiological stress	Salivary hormones; RPE/TQR	Microcycle stress dynamics
Haraldsdottir et al., 2021.	USA	Prospective cohort	Sleep, wellbeing & injury	Daily wellness monitoring	Injury prediction
Trigueros et al., 2020.	Spain	Crosssectional path	Motivation, resilience & anxiety	None (survey)	Resilience lowers anxiety
Berriel et al., 2020.	Brazil	Cohort	Stressrecovery & load	RESTQ-Sport; creatine kinase	Load-recovery balance
Norouzi & Shojaei., 2025.	Iran	Crosssectional	Sleep, stress & mental health	None (survey)	Sleep-stress association
Joshi et al., 2025.	India	Randomised trial	Precompetitive anxiety	Transcranial DC stimulation	Anxiety & cognition change
de Oliveira et al., 2024.	Brazil	Controlled crossover	State anxiety	Exergame (beach volleyball)	No stateanxiety change

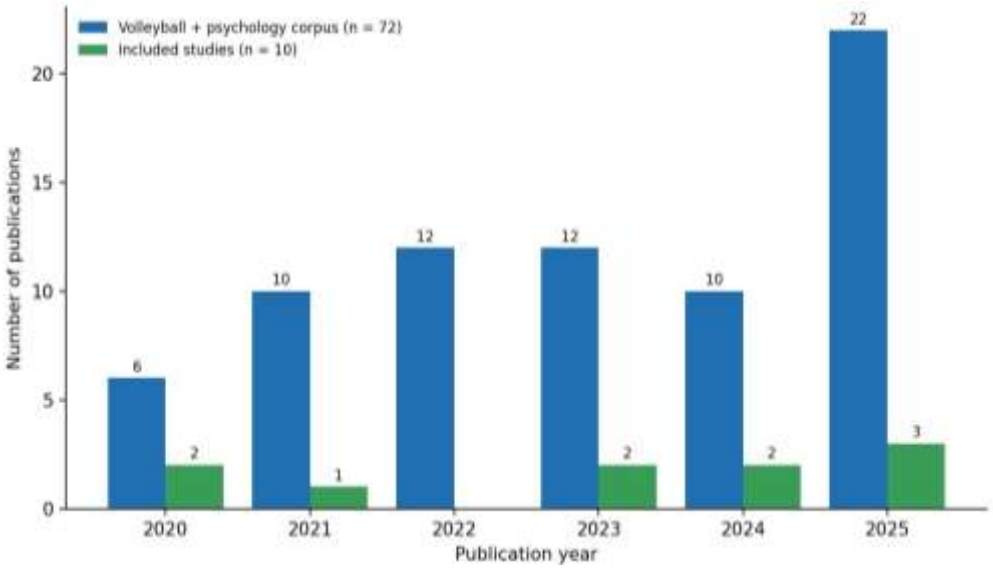

Figure 2 <Annual Publication Trend of the Volleyball-and-Psychology Corpus and the Included Studies (2020-2025)>

Table 3 makes the methodological landscape explicit. Observational designs dominate (six of ten), with only three active interventions and one systematic review. Monitoring technologies - salivary biomarkers, daily wellness questionnaires, and heart-rate-variability biofeedback - appear repeatedly, signalling that the field is data-rich on load but comparatively thin on randomised psychological interventions.

Figure 2 shows that Publications addressing psychological constructs in volleyball rose across the window, peaking in 2025 (22 of 72 corpus records). The included studies (green) are distributed across the period, confirming that the synthesised evidence reflects both early and very recent work rather than a single cohort of papers.

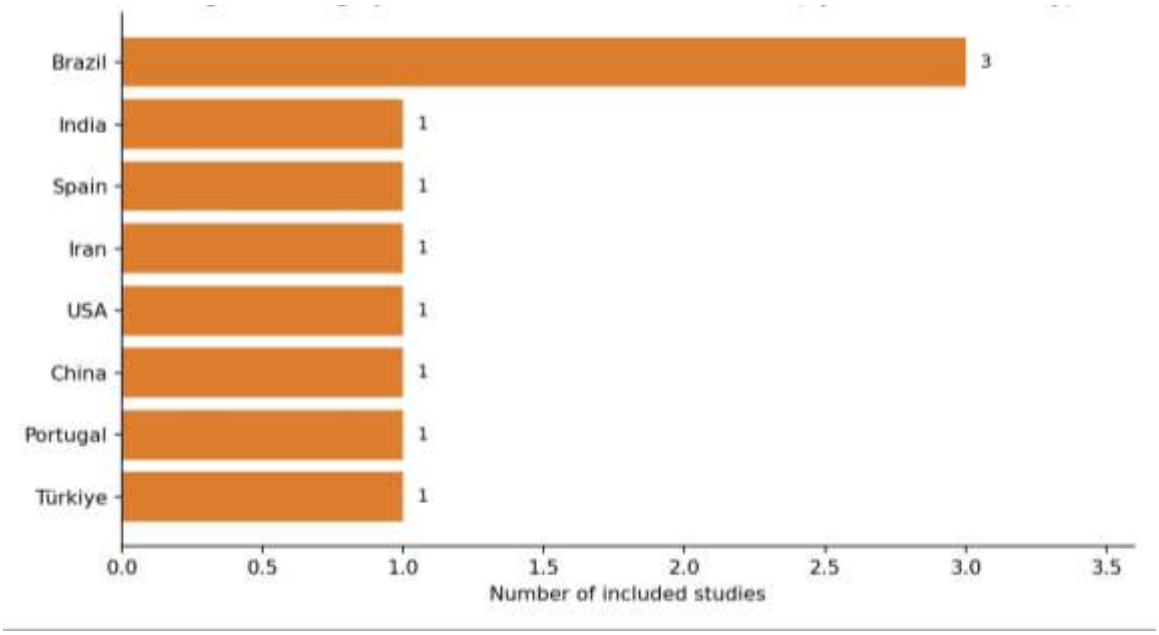

Figure 3 <Geographic distribution of the included studies by first-author country>

Brazil contributed three of the ten included studies, with single contributions from Turkiye, Portugal, China, the USA, Spain, Iran, and India. The spread is international but thin per country, underlining the absence of large coordinated programmes and the value of multi-site collaboration in future work.

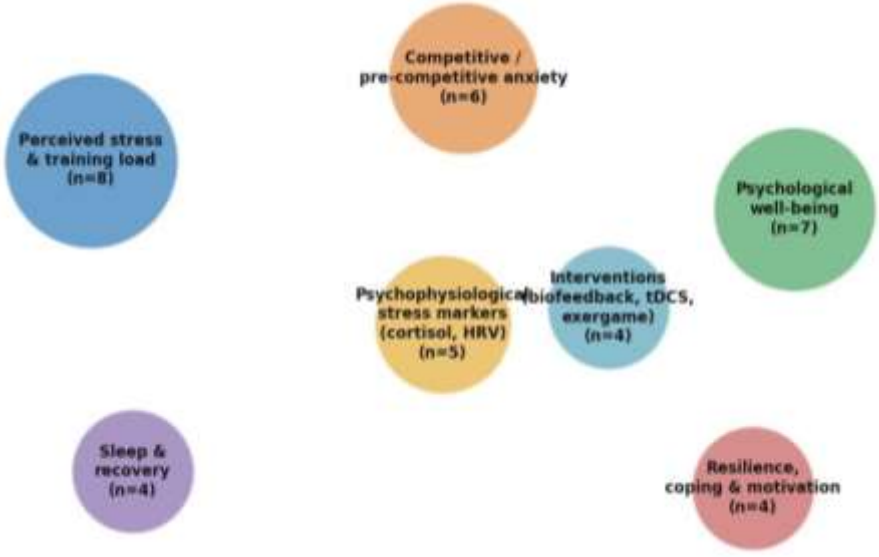

Figure 4 <Thematic clusters across the included studies (bubble size proportional to study coverage)>

Perceived stress and training load, psychological well-being, and competitive anxiety form the densest clusters, with sleep and recovery, resilience and motivation, psychophysiological markers, and discrete

interventions forming smaller but distinct nodes. The clustering motivates the three-part thematic synthesis that follows.

The researchers were in line with psychological stress, competitive anxiety, and well-being by using various self-report measures and physiological signs; nevertheless, the selection of the instrument mostly differed according to the main focus of the study. Perceived stress and recovery were most frequently measured with athlete-specific questionnaires such as RESTQ-Sport and daily wellness scales (Berriel et al., 2020; Haraldsdottir et al., 2021), whereas anxiety was assessed through state and trait anxiety inventories and learning-related anxiety scales (Trigueros et al., 2020; Li, 2025). Well-being, on the other hand, was commonly viewed as a mixture of subjective mood, fatigue, soreness, and sleep, which were being tracked on a daily basis throughout the season or microcycle (Duarte et al., 2023; Haraldsdottir et al., 2021).

One feature that shows volleyball studies stand out is their openness in combining psychological self-report with biological stress indicators. Salivary cortisol, the testosterone-to-cortisol ratio, heart rate variability, and creatine kinase were used many times as objective measures to perceived stress (Duarte et al., 2023; Makaraci et al., 2023; Berriel et al., 2020). Their psychophysiological focus brings volleyball research closer in line with the general athlete monitoring practice, where external load measured by inertial sensors is very often combined with internal-load and wellness indicators (de Leeuw et al., 2022; Gielen et al., 2022; Skazalski et al., 2018). Using both subjective and objective means is a good thing as far as construct validity is concerned, but it also creates a diversity that makes it difficult to do cross-study comparison.

When considering this altogether, it is clear that the instruments used to measure RQ1 conditions are abundant in the volleyball context but are scattered and disorganized. In fact, there is no single instrument recognized by all to measure stress, anxiety, or well-being in volleyball, and even the same psychological attribute is very often measured in various timeframes from a single one-off cross-sectional survey (Norouzi & Shojaei, 2025) to daily season-long monitoring (Haraldsdottir et al., 2021). This raises a certain implication for practitioners who may want to consider a layered measurement strategy that might combine a validated inventory of anxiety, a brief daily scale for wellness and where possible, an accessible biomarker like heart rate variability, that together capture the multidimensional nature of psychological load most accurately in this particular population.

The factors that contribute to stress, anxiety, and well-being in volleyball were identified as four main sources that also interact with each other: training load, sleep, social and motivational resources, and competitive context. Training load was considered the main factor by Rebelo et al. (2024) who found evidence that the accumulation of load is related to neuromuscular fatigue and to a decline in well-being. Furthermore, Berriel et al. (2020) and Duarte et al. (2023) have shown that the state of stress-recovery and hormonal indicators of stress change in a regular pattern according to the workload density of preseason and precompetition. In this way, the busy volleyball calendar acts as a structural stressor, which monitoring needs to keep track of regularly.

From a physiological perspective, excessive training load activates prolonged neuroendocrine stress responses characterized by elevated cortisol secretion, impaired autonomic balance, and reduced recovery capacity. Psychologically, continuous exposure to intensive training and congested competition schedules may exceed athletes' coping resources, thereby increasing emotional exhaustion, perceived stress, and anxiety. These mechanisms explain why studies consistently reported reductions in psychological well-being following periods of accumulated workload. This interpretation is consistent with the stress–recovery framework, which proposes that psychological adaptation depends on maintaining an appropriate balance between training demands and recovery opportunities. Therefore, monitoring external workload alone is insufficient; coaches should simultaneously monitor athletes' psychological responses using validated wellness questionnaires and physiological indicators to identify maladaptation before performance declines become evident.

Training load was considered the main factor by Rebelo et al. (2024) who found evidence that the accumulation of load is related to neuromuscular fatigue and to a decline in well-being. Furthermore, Berriel et al. (2020) and Duarte et al. (2023) have shown that the state of stress-recovery and hormonal indicators of stress change in a regular pattern according to the workload density of preseason and precompetition. In this way, the busy volleyball calendar acts as a structural stressor, which monitoring needs to keep track of regularly.

Sleep played a key mediating role. Haraldsdottir et al. (2021) found that not only reduced sleep but also poorer subjective well-being predicted injuries during the season of female collegiate athletes. Norouzi and Shojaei (2025), on the other hand, reported that sleep problems were very common among adolescent athletes and that they were linked with increased levels of perceived stress and deteriorated mental health. These data show sleep as a consequence of psychological load but also as a cause of injury and distress, thus creating a cycle in which poor recovery and poor mental health mutually strengthen one another.

Social and motivational resources served as protective factors. Trigueros et al. (2020) found that motivation based on one's own determination enhanced resilience thus lowering competitive anxiety, whereas Li (2025) showed psychological safety as a mediator between the positive effects of intimacy and social adjustment on stress, and anxiety related to learning. Consistent with these findings, the larger body of research provides supportive coaching, team resilience, and basic psychological-need satisfaction as major factors that influence athletes under pressure (Adilogullari et al., 2025; Elsborg et al., 2023; Van Yperen, 2025; Suh et al., 2022). The competition, as a source of stress, could be, for example, championship microcycles, pre-competition periods, and non-sport duties of student-athletes all of these three stressors have been documented to consistently cause stress and anxiety (Duarte et al., 2023; Li, 2025), however, psychological benefits of competition are still portrayed in qualitative studies (Greene, 2025; Suh et al., 2022).

Active strategies aimed at stress, anxiety, and the stress response's physiological substrate were tested by three of the included studies. Makaraci et al. (2023) provided a multi-session heart-rate-variability biofeedback programme to top-level female players and noted that the reductions in salivary cortisol levels were accompanied with the mental-health improvements and thus biofeedback can change the endocrine and autonomic stress response. Joshi et al. (2025), in a randomised controlled trial, administered transcranial direct-current stimulation prior to a national-level competition and found outcomes on pre-competitive anxiety and cognitive performance, thus broadening intervention tools to neuromodulation.

Some interventions did not achieve their intended effect. For instance, de Oliveira et al. (2024) reported that a single beach volleyball exergame session was unable to significantly change state anxiety in adult women which is in line with the previous finding that exergame mode did not affect anxiety response (de Oliveira et al., 2021). A comparison of the biofeedback multi-session and the single-session exergame indicates that dose and chronicity are significant factors: short, one-off exposures to state anxiety appear insufficient to cause change, on the other hand, prolonged, carefully individualized programmes are more likely to succeed. This trend aligns with the general evidence that psychological interventions in sport need repetitive practice to produce long-lasting effects.

Readiness levels of these interventions are not distributed uniformly across the board. Thanks to its low-risk nature and potential for scaling as well as compatibility with already existing monitoring infrastructure, biofeedback emerges as a decent option for volleyball support programs in the short term; additional autonomic-regulation along with biofeedback supports this approach strongly (Makaraci & Makaraci, 2025). Even though neuromodulation shows the most potential, it is still highly experimental and requires a lot of resources. One can draw from the related literature that mindfulness and related psychological-skills training (Cao et al., 2024; Aspen & Jooste, 2025) can be both effective and viable options which can be brought directly to and tested on volleyball players. The main takeaway from RQ3 is that there are interventions in the field which have scientific backing and thus worth trying, but there is a lack of sufficiently powered, replicated trials that would make practice guidance possible.

The methodologies of the studies making up the corpus primarily consist of observational types. Six of the ten articles were cross-sectional or cohort studies, one was a case study, and only three studies included some sort of experimental manipulation, out of which only one was a randomized trial (Joshi et al., 2025). This pattern is consistent with the broader athlete mental health literature, where descriptive epidemiology research has significantly outnumbered intervention studies (Gouttebarge et al., 2019; Purcell et al., 2019). Most studies being cross-sectional limits the ability to make causal inferences, especially about the sequence over time of load, sleep, well-being, and injury.

The change in methods in the area is, of course, still traceable. Initial studies that have been topically incorporated mainly used perception questionnaires and biological discrete markers (Berriel et al., 2020; Trigueros et al., 2020), but the most recent research makes use of structural-equation modelling of mechanisms in mediation (Li, 2025), randomised neuromodulation (Joshi et al., 2025), and continuous monitoring frameworks (Rebelo et al., 2024). Simultaneously development of sensor-based load monitoring and machine-learning analytics (de Leeuw et al., 2022; Xu et al., 2025) provides an almost untapped way of connecting objectively measured external load to psychological outcomes in the similar analytical process.

One of the biggest obstacles in the research is still the variety and small number of sample sizes. Some pilot trials have reached single-digit samples only (Makaraci et al., 2023), some studies with one team are case studies only (Duarte et al., 2023), and cohort sizes remain small (Haraldsdottir et al., 2021) which limits accuracy and generalisation. Sex imbalance is a very striking issue too: a number of studies have used samples of females or males only, thus leaving stress and anxiety in a sex-differentiated manner still poorly characterised. Overall, these points together moderate the force of the findings that may be made and instigate the research agenda outlined below.

Discussion

The summary shows that psychological stress, competitive anxiety, and well-being in volleyball seem to be highly dependent on training load and recovery management, supported by motivational and social resources, and to some extent can be changed by a long-term psychophysiological treatment. The strongest evidence is the cycle of load, sleep, well-being, and injury, where accumulated stress harms recovery and well-being and increases the risk of injury (Haraldsdottir et al., 2021; Norouzi & Shojaei, 2025; Rebelo et al., 2024). These findings are highly consistent with previous consensus statements and systematic reviews on athlete mental health, which emphasize that psychological stress results from the interaction between training demands, inadequate recovery, and insufficient coping resources rather than from isolated physical stressors (Reardon et al., 2019; Gouttebarge et al., 2019; Purcell et al., 2019). However, competitive volleyball presents unique psychological challenges because athletes are repeatedly exposed to congested competition schedules, high jump frequency, rapid transitions between attack and defense, and continuous performance evaluation during matches. These sport-specific demands may amplify psychological stress beyond that reported in many other team sports. Consequently, psychological monitoring should be integrated into routine training-load management rather than being considered only after psychological symptoms become apparent.

Such a pattern of findings is consistent with transactional models of stress, where the level of strain is a function of the extent to which situational demands exceed an athlete's perceived resources, and with self-determination theory which suggests that well-being is safeguarded by autonomous motivation and fulfilling one's psychological needs (Trigueros et al., 2020; Li, 2025; Van Yperen, 2025). The demonstration that psychological safety is a mediator of the influence of social factors on stress not only opens up these theories to the team-sport setting but also points to the relational nature of individual stress.

The results suggest that coaching and support staff should be regularly checking the players' well-being and sleep that are low-burden apart from the physical load and accommodating easy interventions like heart-rate-variability biofeedback, and focusing on the motivational climate of the team as well as its psychological safety (Makaraci et al., 2023; Henriksen et al., 2020; Breslin et al., 2019). Data from monitoring should be coupled with explicit escalation paths to qualified mental-health support in order for them to be actionable.

Some general mental-health reviews and consensus statements among athletes report a similar rate of anxiety and sleep problems and the need for sport-embedded support (Reardon et al., 2019; Kuttel & Larsen, 2020; Purcell et al., 2019). This paper agrees with these findings and adds more detail related to volleyball, mainly how central the busy schedule is and how prominent the psychophysiological monitoring is.

The clearest tension came from the question of intervention effectiveness: extended biofeedback and neuromodulation resulted in effects on stress and anxiety (Makaraci et al., 2023; Joshi et al., 2025), whereas one single exergame session did not (de Oliveira et al., 2024; de Oliveira et al., 2021). The most reasonable way to reconcile is a dose-response explanation whereby lasting change needs repeated, tailored exposure rather than single stimulation.

At least three clear gaps emerge: a lack of longitudinal studies that can sufficiently demonstrate the order of events among load, sleep, well-being, and injury; a shortage of sufficiently large, replicated trial interventions aimed specifically at volleyball; and the limited inclusion of samples that are both balanced in sex and adolescent, which would help to delineate developmental and sex-specific patterns.

Three limitations must be recognized. Firstly, the search was limited to only one database (Scopus), therefore studies that were eligible but only indexed in other databases might have been overlooked. Secondly, the screening and data extraction were done without a formally reported second reviewer, and this may cause subjectivity in the selection process. Thirdly, by focusing on a narrowly defined included set (ten studies), the authors of this article maximized relevance but reduced the extent of the primary evidence synthesized, as the broader literature was used mainly for contextual support rather than primary synthesis.

Future research should first implement season-long longitudinal monitoring that combines sensor-based external load with psychological and sleep outcomes (de Leeuw et al., 2022; Xu et al., 2025). Second, it should conduct multi-site randomized trials of accessible interventions such as biofeedback and mindfulness with enough power and follow-up (Makaraci et al., 2023; Cao et al., 2024). Third, it should enroll balanced-sex, developmentally diverse samples to identify differential vulnerability and personalize support accordingly.

To conclude, RQ1 finds that the measurement landscape is complex and diverse without any standardization. It mostly combines the self-report anxiety and well-being scales with the physiological stress markers. RQ2 is answered through the four interacting factors training load, sleep, social and motivational resources, and the competitive context. Sleep plays a key mediating role here. RQ3 is answered via the plausible

yet under-replicated interventions, where continuous biofeedback and neuromodulation significantly outperform the one-session exposure.

Conclusions

Our systematic review combined results from 10 studies on psychological stress, anxiety performance, and well-being among competitive volleyball players. Three main conclusions were reached which integrated all the results of the studies. First, in regards to measurement, researchers frequently combine self-report relaxation and anxiety measures along with physiological stress markers such as cortisol and heart rate variability. However, the researchers also pointed out that there is no standardized volleyball-specific protocol. Therefore, it is suggested that a layered measurement strategy should be implemented. Second, in terms of determining the factors, stress, anxiety, and well-being are influenced by four interrelated factors physical load, sleep, social, and motivational resources as well as competitive situations. They showed that sleep was the crucial factor mediating the link of psychological load with injury and mental health outcomes. Lastly, for intervention, the long-term use of psychophysiological methods such as biofeedback and neuromodulation are likely effective. On the other hand, exposure to a brief single session is not enough to change one's anxiety state. The main role of this article is to compile scattered, multidisciplinary research into the first focused review for competitive volleyball. It really is an opportunity for practitioners to learn an evidence-based reason for integrating regular well-being and sleep monitoring, biofeedback based support that is easily accessible, and motivational climate attention within volleyball programs. The authors also suggest that all these practices should always be paired with a clear pathway to qualified mental health care. Nonetheless, human judgments are always at a risk of being influenced by various factors, and these conclusions are limited by the fact that the evidence base is small, heterogeneous, and mostly cross-sectional. They are also limited by the single-database search scope. Therefore, more longitudinal, sex-balanced, multisite studies are needed that combine objective load monitoring and psychological outcomes. In addition, adequately powered and replicated intervention trials are required so that these promising findings can be translated into reliable, generalizable recommendations for the mental health protection of volleyball players. Overall, this review demonstrates that psychological health has become an essential component of volleyball performance rather than merely an accompanying factor. Integrating psychological monitoring into routine athlete management may improve performance consistency, reduce injury risk, and enhance long-term athlete well-being. Consequently, future volleyball programs should incorporate evidence-based psychological assessment alongside physical performance monitoring.

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