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Psychological dynamics and swimmers' performance: a literature review

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ABSTRACT

Background: Swimmer performance is not solely determined by physical ability and technical skills but is significantly influenced by psychological dynamics such as mental fatigue, anxiety, self-confidence, stress, motivation, and psychological recovery. Purpose: This literature review aims to examine and synthesize recent quantitative studies (2021–2025) that investigate the influence of psychological factors on swimming performance. Methods: The PRISMA method was used to select 11 studies from a total of 120 academic articles obtained through Google Scholar, PubMed, and Frontiers in Sports and Active Living. Exclusion criteria included conference proceedings, qualitative studies, books, and other literature reviews. Results: Findings reveal that mental fatigue and pre-competition anxiety negatively affect athletes' performance, impacting sleep quality, hormonal balance, and emotional readiness. In contrast, psychological recovery strategies, high motivation, and self-confidence contribute to improved performance, mood, and technical execution. Stress, caused by both internal expectations and external pressure, exacerbates fatigue and reduces focus. Conclusion: These psychological aspects are interrelated and play a crucial role in competitive swimming performance. Psychological skills such as self-talk, visualization, tapering strategies, and emotional regulation are essential for managing mental stressors. Implications and Recommendation: Integrating psychological training into conventional coaching programs is necessary to maintain both physical and mental balance in athletes. Coaches and sports psychologists are advised to conduct regular monitoring of athletes' psychological conditions and implement appropriate psychological interventions. Future research should employ longitudinal and multidimensional designs to better understand the relationship between psychological resilience and athletic achievement.

Keywords: Psychological; Performance; Competition; Swimming; Swimmer

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INTRODUCTION

The performance of swimmers does not rely solely on physical strength and technical skills, but also on complex psychological conditions (Weinberg & Gould, 2019). The interplay between mental state and athletic performance is critical, as various psychological aspects, such as motivation, mental toughness, stress, competitive anxiety, and psychological fatigue, can influence training outcomes and competition results (Raglin, 2001; Cox et al., 2003; Gustafsson et al., 2008; Aleksandra, 2025). Motivation serves as a primary driving force in both training and competition, while mental toughness enables athletes to maintain focus and persist under pressure (Weinberg & Gould, 2019). Throughout this process, athletes also face psychological challenges such as stress, anxiety, and external pressures, which, if not properly managed, may hinder performance (Raglin, 2001; Cox et al., 2003).

Competitive anxiety is among the most common obstacles encountered by athletes. It may manifest cognitively (e.g., fear of failure or excessive self-doubt) or somatically (e.g., increased heart rate and muscle tension), directly affecting performance and concentration (Chortane et al., 2022; Cox et al., 2003). Although moderate levels of anxiety may enhance alertness, excessive anxiety can impair technical execution and mental endurance (Raglin, 2021; Weinberg & Gould, 2019). High levels of stress and psychological burden during intensive training also increase the risk of psychological fatigue and burnout, especially when triggered by factors such as overtraining, injuries, pressure from coaches or parents, and self-imposed expectations (Rice et al., 2016; Katie et al., 2024; Gustafsson et al., 2008). These stressors may result in decreased performance, reduced swimming speed, impaired sleep quality, lower energy levels, and even heightened injury risk (Wang et al., 2023; Rano, Fridén, & Eek, 2019; Clemente-Suárez et al., 2021). External pressures from coaches and parents, along with academic demands for student-athletes, add significant layers of stress (Weinberg & Gould, 2019; Holt, 2017). In addition to burnout, other psychological concerns include eating disorders linked to body image, particularly among female athletes (Schwarz, 2005)—as well as sleep disturbances caused by stress and tight schedules (Weinberg & Gould, 2019; Raglin, 2001). Failure to achieve personal targets may also lead to reduced self-esteem and self-efficacy, exacerbating anxiety and poor performance (Holt, 2017; Weinberg & Gould, 2019).

On the other hand, positive psychology offers a constructive approach to managing athletes' mental conditions. Attributes such as mental toughness, hardiness, optimism, self-esteem, and self-efficacy play important roles in maintaining athletes' psychological resilience amid competitive pressures (Snyder & Lopez, 2005). Positive emotions and mood contribute to consistent training and enhanced motivation (Golby & Sheard, 2004). Psychological strategies grounded in positive psychology have proven effective. For instance, a seven-week psychological training program was shown to improve performance and mental toughness among young athletes (Sheard & Golby, 2006). Techniques such as self-talk and goal setting can enhance performance by increasing focus and self-regulation (Hatzigeorgiadis et al., 2019). Approaches like mindfulness and reframing of negative situations also help prevent burnout and build psychological endurance (De Francisco et al., 2016). In addition to individual factors, a positive mood plays a crucial role in fostering team cohesion. Strong social relationships within a team can enhance satisfaction and collective performance (Carron et al., 2002). Therefore, positive psychology contributes not only to physical and mental readiness but also to social aspects that support team success. Athletes' psychological preparedness, when systematically managed by coaches, becomes a determining factor in both training and competition outcomes (Andrei, 2013). Athletes' abilities to manage emotions, motivation, and concentration directly affect their competitive performance (Stone et al., 2023). Nevertheless, competition-related pressure often disrupts cognitive functioning and reduces motivation, even when physical condition is optimal (Aleksandra, 2025).

Therefore, monitoring psychological conditions during intensive training is essential to prevent overtraining and to maintain a balance between physical and mental loads (Clemente-Suárez et al., 2021). Effective training strategies should integrate both psychological and technical components to optimize outcomes. Consistent with the findings of Meggs & Chen (2019), psychological skills training has been shown to enhance athlete performance, and according to Lin et al. (2021), athletes who are able to manage stress and anxiety demonstrate greater mental stability during competitions. Thus, a

comprehensive understanding of the psychological dynamics, both supportive and hindering, faced by swimmers is crucial in the development of effective training strategies. This literature review aims to provide valuable insights for improving the quality of training and overall performance of swimmers.

METHOD

This study employed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology to evaluate the psychological dynamics affecting swimmers' performance. Inclusion and exclusion criteria were established to minimize research bias. The inclusion criteria involved studies published between 2021 and 2025, where researchers analyzed the effects of training or other related or unrelated factors on swimming performance. The exclusion criteria comprised conference papers, books, qualitative studies, and literature reviews. Data were retrieved from three databases: PubMed, Google Scholar, and Frontiers in Sports and Active Living. The keywords used in the search included psychology, performance, swimming, swimmer, and competition. The literature search was conducted manually and evaluated based on publication year, title relevance, and research methodology. The initial search yielded a total of 120 records. From these, 42 studies were selected for further review, and 24 were excluded due to a lack of correlation with the research objectives. A total of 18 studies remained, which were then assessed based on the inclusion criteria, resulting in 11 studies being included in the final literature review.

RESULTS AND DISCUSSION

Findings

Table 1. Analysis of the reviewed articles

No	Author and Title	Research methods	Instrument	Results
1	Apple, *et al.* (2021) *Physiological and psychological responses to a maximal swimming exercise test in adolescent elite athletes*	Using design*cross-sectional*, a multidisciplinary approach to help detect early signs of overtraining in adolescent athletes. Sample of 31 elite adolescent athletes (n=19 16-year-old males and n=12 15-year-old females)	Hormone Measurement, Lactate Measurement, *Brunel Mood Scale*, And *Perceived Stress Scale*	Lactate: Post-test lactate levels were higher in males than females. Pre-Test LAC: males: 1.01 ± 0.26 mmol/L and females: 0.74 ± 0.23 mmol/L, p-value: 0.0043 (significant). Post-Test LAC: males: 8.19 ± 3.24 mmol/L and females: 5.83 ± 2.48 mmol/L, p-value: 0.0417 (significant). Hormonal: cortisol levels increased significantly in males after exercise. Testosterone levels decreased, indicating a potential risk of overtraining. Cortisol levels (C): males: Cpre (before the test): 0.17 ± 0.13 µg/dL and Cpost (after the test): 0.340 ± 0.278 µg/dL; p value = 0.009 (significant), Cpost30 (30 minutes after the test): 0.426 ± 0.319 µg/dL; p value = 0.003 (significant). Females: Cpre: 0.333 ± 0.30 µg/dL and Cpost: 0.364 ± 0.315 µg/dL; these increases were not significant (p > 0.05). Testosterone (T) Levels: Males: Tpre: 0.006 ± 0.003 µg/dL and Tpost: 0.005 ± 0.002 µg/dL; p value = 0.0164 (significant). T/C ratio: showed a significant decrease from

				pre-FT (*field test*) to post-FT (p = 0.0004). Estradiol (E) levels: Female: Epre: 0.0003 ± 0.0001 µg/dL and Epost: 0.0004 ± 0.0001 µg/dL (p = 0.1062) were not significant. Heart rate recovery: *Heart rate recovery* (HRR60) is faster in women than men. HRR60 for Women: 40.58 ± 14.50 bpm. HRR60 for Men: 29.22 ± 7.4 bpm. p-value: 0.008. Psychology: The questionnaire results showed a significant difference in confusion scores between males and females, with females having higher scores. Confusion Score (Bconf): Female: 61.00 ± 12.93 Male: 51.63 ± 7.80 p-value: 0.017.
2	Aouani, *et al.* (2024). *Effect of intensity training block on anxiety state and performance in competitive swimmers*	Design *randomized controlled trial* (RCT) to evaluate the effects of a 2-week intensive training block (HIT) on psychological state and swimming performance. Sample of 22 male competitive swimmers. Experimental/HIT group (n = 11), Control group (n = 11)	CSAI-2R questionnaire	Cognitive Anxiety: Significant improvement in the HIT group (F = 14.9; p < 0.001; d = 0.62). The control group showed no significant change in cognitive anxiety. Somatic Anxiety: There was a significant difference in somatic anxiety between the HIT and control groups (F = 5.37; p = 0.031). Somatic anxiety increased significantly in the HIT group, while the control group did not experience any significant change. Self-confidence: Self-confidence decreased significantly in the HIT group (p = 0.020), with a decrease of approximately 8.96%. The control group showed a decrease, but not significant. Swimming Performance: There was a significant improvement in swimming performance in both groups (HIT and control): The HIT group increased by 1.28% (p < 0.001). The control group increased by 0.96% (p = 0.002). RPE (Rating of Perceived Exertion) was significantly affected by time, group, and the interaction between the two (F = 25.3; p < 0.001). In the HIT group, RPE increased significantly (p < 0.01), indicating that swimmers perceived a harder effort. While RPE decreased in the control group (p = 0.015).

3	Aouani, *et al.* (2024). *Optimizing performance and mood state in competitive swimmers through tapering strategies*	Types of research: Experimental, using the methodrandomized controlled trial (RCT). PCompetitive male swimmers n=24 aged between 16 and 17 years.	*Profile of Mood State* (POMS)	1. The results showed that a two-week tapering period with a gradual reduction in training volume significantly improved mood and swimming performance in competitive swimmers. Tapering resulted in a significant decrease in total mood disturbance (TMD) and improved swimming performance by 3.5%. In addition, there was a significant correlation between changes in TMD and swimming performance, indicating that improved mood can contribute to improved performance. 2. Experimental Group.Mood improvement: tension decreased by 47.8%, depression: decreased by 39.0%, Anger: decreased by 20.8%, fatigue decreased by 40.8%, confusion: decreased by 23.4%, vigor: increased by 42.6%. Total Mood Disturbance (TMD)decreased by 14.4% ($p < 0.001$).Swimming Performance: Increased 3.5% in the 50 m freestyle test ($p = 0.020$). 3. Control Group.Mood Enhancement: vigor increased by 4.2%, anger decreased by 7.0%.Total Mood Disturbance (TMD): No significant change, only decreased by 2.19% ($p = 0.391$).Swimming Performance: There was no significant change, only decreased by 1.37% ($p = 0.275$).
4	Bretonneau, *et al.* (2024). *Effect of the pre-taper level of fatigue on the taper-induced changes in performance in elite swimmers*	Quantitative, longitudinal research design. Elite swimmers n=26 were divided into two groups based on fatigue level: acute fatigue (AF) group and functional overreaching (F-OR) group.	Physiological Profile: Heart Rate Monitor: Polar Unite. Core Temperature Measurement: (*e-Celsius Performance*). Psychological Profile: *Profile of Mood States (POMS), Connor-Davidson Resilience Scale (CD-RISC).* Sleep Profile: Questionnaire*Pittsburgh Sleep Quality Index* (PSQI). Scale*Epworth Sleepiness*: *Headband*Connected (*dreams* 1) *Accelerometer* (ActiGraph wGT3X-BT)	There were significant changes in resting and recovery heart rates between the acute fatigue (AF) and functional overreaching (F-OR) groups. Scores from the POMS questionnaire showed significant differences in mood states, with the AF group performing better in vigor and lower in fatigue. The results of force measurements showed significant differences between the two groups, with the AF group performing better. The F-OR group showed lower total sleep time and higher sleep fragmentation index, indicating poorer sleep quality compared to AF.

5	Chortane *et al.* (2022). *Effect of high-volume training on psychological state and performance in competitive swimmers*	*Experimental Approach*, design *randomized controlled trial* (RCT). Male competitive swimmers n=28. group*HVT High-volume training group:* n = *14,* age = *16.4 ± 0.31* year. Performing high volume training, including aerobics, HIIT, and HIT, for a total distance of 132.40 km and control group n = *14,* age = *16.1 ± 0.30* year. Standard training program with a total distance of 117.80 km.	Psychological status: CSAI-2R questionnaire to assess somatic anxiety, cognitive anxiety, and self-confidence. Swimming Performance: Tested with time records in the 50 m freestyle.	Psychological Conditions. Somatic Anxiety: Significantly increased from 15.00 to 20.12 ($p < 0.001$, ES = 3.38). Cognitive Anxiety: Increased from 10.91 to 15.91 ($p < 0.001$, ES = 3.26).Self Confidence: Decreased from 14.27 to 11.64 ($p < 0.001$, ES = 2.39). The control group did not show significant changes in psychological aspects. Swimming Performance: There was no significant difference in performance between the two groups ($0.222 < p < 0.269$). High volume training has a negative impact on psychological conditions, with increased anxiety and decreased self-confidence. Four weeks of training is not enough to improve swimming performance.
6	Clemente-Suárez, *et al.* (2021). *Effect of high-volume training on psychological state and performance in competitive swimmers*	Correlation and regression analysis methods. Trained swimmers n: 20, 9 females and 11 males, aged 18.1 years, with an average training experience of 6.5 years. Participants underwent two types of performance tests: a 50 m swimming test (anaerobic) and a 5 × 200 m increment test (aerobic).	Psychological measures: RESTQ-76 Sport questionnaire to assess stress and recovery states. Physiological measurements: heart rate variability (HRV) test to evaluate the state of the autonomic nervous system.	There was a significant correlation between aerobic performance and parameters related to parasympathetic modulation measured through heart rate variability (HRV): LF/HF: $r = -0.806$, $p < 0.001$, NN50: $r = 0.937$, $p < 0.001$. Anaerobic performance correlates with psychological aspects: *low stress*: $r = 0.526$, $p = 0.025$. *High Fatigue*: $r = -0.506$, $p = 0.032$. Anaerobic performance is more related to psychological aspects (low stress and high fatigue perception), while aerobic performance is more related to physiological aspects (high parasympathetic modulation).
7	Grayness, *et al.* (2025) *Perceived recovery-stress states and sleep in pre- and post-menarche elite youth swimmers*	Observational research, research designlongitudinal. Aelite young female swimmers n=20 (M = 12.90 ± 1.68 years). Divided into two groups: pre-menarche (n = 11) and post-menarche (n = 9). Data analysis using*mixed effects models* (MEM).	*Short Recovery and Stress Scale (SRSS), Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS),* And *Athletes Sleep Behavior Questionnaire (ASBQ). Actigraphy* (using an actigraphy bracelet to objectively measure sleep parameters for 20 days).	Difference Between Stress and Recovery: athlete*post-menarche* shows a lower value in *Lack of Activation*in the morning ($p < 0.01$) and the value*Overall Stress* at night ($p < 0.05$) compared to athletes*pre-menarche*. This shows that athletes*post-menarche*experience better recovery states and lower stress at certain times. Sleep parameters: no significant differences were found in sleep parameters between the two groups. However, both groups showed sleep duration below recommendations for adolescents, indicating the need for interventions to improve sleep quality. Sleep Quality: score fromPittsburgh Sleep Quality Index (PSQI) showed that both groups experienced poor sleep quality, with PSQI scores of more than five (Mpre = 7.45, Mpost = 8.22). Sleep Behavior: pre-menarcheal athletes showed better sleep behaviors than post-menarcheal (M = 34.09 vs. M = 38.78 on the ASBQ). Menstrual Symptoms: the mean Menstrual Symptom Index (MSi) score was 8.43, with symptoms such as

				nausea and difficulty concentrating being most frequently reported, but with low frequency. Conclusion. Statusmenarcheinfluences stress response and recovery in young female swimmers, with post-menarcheal athletes showingunfavorable conditions. Although there were no differences in sleep parameters, these results underscore the importance ofunderstanding of menstrual health and the need recovery strategyand improved sleep quality.
8	Kumar, *et al*. (2024). *Psychological profiles of swimmers vs para swimmers: A comparative analysis*	Quantitative, comparative research design, sampling technique using*random sampling*. A total of 104 participants, consisting of 52 swimmers and 52 para swimmers, with a balanced gender distribution (26 males and 26 females in each group). Participants' ages ranged from 18 to 30 years.	*Will to Win*measured by Prof. Anand Kumar's standard questionnaire. *Mental Toughness*measured by a questionnaire from Sheard, Golby & Van Wersch (2009). *Sports Competition Anxiety*measured by the SCAT questionnaire by Rainer Martens (1990).*Aggression*measured by*Buss-Perry Aggression Questionnaire* (BPAQ).	Psychological Score: Swimmer: Will to Win: 9.21, Aggression: 81.36, Mental Toughness: 31.76, Anxiety: 19.80. Perenang Para: Will to Win: 8.62, Aggression: 74.12, Mental Toughness: 37.00, Anxiety: 16.85. T-test Analysis: The T-test results showed that swimmers had: significantly higher Will to Win and Aggression than para swimmers. Lower Mental Toughness. Higher Anxiety levels than para swimmers. Conclusion: Swimmers demonstratemotivation to competeand high aggression, while para swimmers have better mental resilience and lower levels of anxiety.
9	Wang, *et al.* (2023). *Seasonal changes in physiological and psychological parameters of stress in collegiate swimmers*	Quantitative, longitudinal design, where data were collected at three different time points namely post-season (April), end of season (June), pre-season (October). Swimmers*National Collegiate Athletic Association* Division I n=15 (8 men and 7 women).	WURSS-21 (*Wisconsin Upper Respiratory Symptom Survey*), AD-ACL (*Activation-Deactivation Adjective Check List*), BRANCH (*Daily Analysis of Life Demands of Athletes*), PSQI (*Pittsburgh Sleep Quality Index*).	Swimming Performance: swimmers show their best performance when*fase of-season*, with higher swimming speeds compared to the pre-season and post-season phases. Male swimmers had faster average speeds (0.13 m/s) and used fewer strokes per*fase of-season*compared to the post-season phase. Female swimmers also showed higher speeds in the off-season phase compared to the pre-season and post-season phases, and used fewer strokes. Physiological Parameters: The lowest heart rate (HR) and lactate (La-) concentration were recorded in the pre-season phase, indicating better physiological adaptation. During the in-season phase, swimming speed decreased and sources and symptoms of stress increased. Relationship between Stress and Performance: Increased DALDA score (*Daily Analysis of Life Demands of Athletes*) is associated with increased upper respiratory tract disease and decreased swimming speed. Higher DALDA scores were also associated with less energetic states and increased tension.
10	Zhou, *et al.* (2024). *The influence of*	Longitudinal research design combining quantitative and qualitative	*Skala Trait Anxiety Inventory*(T-AI) in*Mental Readiness Form*-3 (MRF-3) in measuring anxiety levels. Qualitative measurement	The results of this study indicate that there is no significant difference in the levels of trait anxiety and competitive anxiety between male and female swimmers, with a p value > 0.05.

	competitive anxiety of Chinese elite swimmers	approachesto gain a more comprehensive understanding of competitive anxiety in elite swimmers.Swimmers from the Chinese national swimming team n=20 participating in the 2023 Fukuoka World Championships and Hangzhou Asian Games.Quantitative data was analyzed using statistical methods, while qualitative data was analyzed to identify emerging themes and patterns.	with semi-structured interviews.	Although male swimmers showed higher anxiety and self-confidence on average than female swimmers, this difference was not significant enough to be recognized statistically. Meanwhile, further analysis revealed that there were significant differences in the levels of competitive anxiety among athletes at various stages of preparation, with a p value < 0.01. Specifically, cognitive anxiety peaked near the World Championships, while somatic anxiety increased during the intensive training period. In addition, the analysis showed a significant positive relationship between trait anxiety and competitive anxiety, indicating that athletes with higher levels of trait anxiety tend to experience greater competitive anxiety. These findings emphasize the importance of developing focused psychological intervention programs to help athletes manage their anxiety, thereby improving their performance in competition.
11	Zhan, Y., & Xue, W. (2022). *Influence of swimming athletes sport psychological fatigue on sports performance.*	Research designmultiple linear regression analysisto explore the influence of psychological fatigue on pre-competition emotions and satisfaction with training and techniques.correlation analysisto assess the relationship between variables.Active swimmer athletewho are participating in the competition. A total of 80 questionnaires have been distributed, with a return rate of 100%.	Athlete Psychological Fatigue Questionnaire (ABQ)developed by Luo*et al*. (2021) dan Okholm Kryger *et al*. (2020) was used to assess the level of mental fatigue experienced by athletes.*Pre-competition Emotion Scale-T* (PES-T). Training and Competition Satisfaction Scale,which consists of six items measured using a seven-point Likert scale.	The results of this study indicate that there is a significant relationship between psychological fatigue experienced by swimmers and their emotions before the competition. Linear regression analysis indicated that factors such as reduced sense of achievement and negative assessment of training had a significant negative impact on training satisfaction and competition performance. In addition, this study found that both factors were able to explain 41.5% of the variability in training and competition satisfaction experienced by athletes.

Discussion

Based on the results of the analysis, psychological dynamics have a significant influence on the performance of competitive swimmers. Factors such as psychological fatigue, anxiety, self-confidence, stress, motivation, and mental recovery play crucial roles. Among these, psychological fatigue or mental fatigue emerges as the most commonly experienced condition, especially when athletes are subjected to high training loads, competition pressure, or an imbalance between stress and recovery.

Zhan and Xue (2022) assessed psychological fatigue using the Athlete Burnout Questionnaire (ABQ), which they correlated with pre-competition emotions through the Pre-Competition Emotion Scale-T and training satisfaction levels. Regression results indicated that burnout aspects, such as reduced sense of accomplishment and negative perceptions of training, were associated with decreased satisfaction and performance. In

essence, the higher the level of mental fatigue, the lower the athlete's emotional readiness. Bretonneau et al. (2024) adopted a holistic approach to assessing fatigue, including mood (POMS), heart rate, and sleep quality. Athletes experiencing functional overreaching (F-OR) scored higher in fatigue, reported poorer sleep quality (measured by PSQI and actigraphy), and showed diminished biomechanical performance compared to those experiencing acute fatigue (AF). This finding indicates that fatigue prior to tapering negatively impacts recovery effectiveness and competitive performance.

Almási et al. (2021) reviewed hormonal indicators of fatigue. Decreased testosterone levels and testosterone-to-cortisol (T/C) ratios following maximal swim testing signaled a risk of overtraining. High confusion scores on the Brunel Mood Scale also reflected mood disturbances, particularly in hormonally vulnerable adolescent female swimmers. Chortane et al. (2022), using CSAI-2R, found that four weeks of high-volume training increased both cognitive and somatic anxiety, and decreased self-confidence, without enhancing 50-meter freestyle performance. This highlights the adverse psychological and physical effects of overtraining-induced mental fatigue. Wang et al. (2023) examined seasonal fluctuations in fatigue and stress using DALDA, PSQI, and AD-ACL. During the competitive season, athletes experienced increased stress and fatigue, decreased performance, and more frequent illness symptoms such as respiratory issues. Athletes with high DALDA scores reported heightened tension and fatigue.

These five studies confirm that psychological fatigue affects emotional states, sleep quality, hormonal balance, and both physical and mental performance. Pageaux & Lepers (2018) found that psychological fatigue had a greater impact on moderate-intensity activities than high-intensity ones due to elevated perceived exertion. Congyuxin et al. (2024) showed that training pressure, life demands, and physiological factors could influence fatigue, which in turn affected aerobic endurance, decision-making, technical skills, and strategic planning (Wu et al., 2024). Loch et al. (2020) and Sun et al. (2021) also emphasized that prolonged cognitive activity reduces concentration, motivation, and athletic technique.

Anxiety is another critical psychological aspect. High pre-competition anxiety affects focus, self-confidence, and mental readiness. Aouani et al. (2024) examined the impact of high-intensity training (HIT) on anxiety using CSAI-2R. Athletes experienced significant increases in both cognitive and somatic anxiety and a decrease in self-confidence ($p = 0.020$), indicating that high intensity without adequate recovery strategies may worsen mental conditions. Chortane et al. (2022) found similar results. After a high-volume training program, athletes exhibited spikes in anxiety (somatic: from 15.00 to 20.12; cognitive: from 10.91 to 15.91, $p < 0.001$) and a drop in self-confidence, indicating that training pressure, although physically beneficial, can impose a significant psychological burden. Zhou et al. (2024) used a mixed-methods approach and found that the highest anxiety levels occurred before world championships and during intensive training periods. They measured anxiety using T-AI and MRF-3. Their findings highlight that the competitive context, not just individual traits, influences anxiety levels. Kumar et al. (2024), using SCAT, found that non-disabled swimmers exhibited higher anxiety levels compared to para-swimmers, potentially due to social expectations or performance pressure. Wang et al. (2023) reported that anxiety and stress peaked during the competitive season, contributing to performance decline and increased fatigue. Overall, anxiety affects swimming performance. Aleksandra (2025) found that high cognitive anxiety reduces concentration and leads to technical errors. Nicolescu (2021) added that unmanaged anxiety can lead to

muscle tension and diminished performance, although it can be managed through relaxation, visualization, and emotional regulation techniques.

Self-confidence is also a key factor. Chortane et al. (2022) reported a significant decrease in self-confidence (from 14.27 to 11.64; $p < 0.001$) alongside increased anxiety following high-volume training. Aouani et al. (2024) observed an 8.96% decrease in self-confidence in the HIT group, while the control group remained stable—highlighting the importance of psychological recovery management. Zhou et al. (2024) noted that, on average, male athletes had higher self-confidence than females ahead of championships. Self-confidence declined during high-pressure preparation phases and improved as athletes felt more ready, indicating that confidence is dynamic and influenced by training intensity, mental state, and competitive pressure. González-Hernández (2024) affirmed that high self-confidence correlates positively with peak performance, though its impact may vary depending on the sport and performance evaluation (Lochbaum et al., 2022). Nicolescu (2021) stated that confidence enhances motivation and mental resilience, strengthening resistance to fatigue and anxiety. Hays et al. (2009) and Woodman & Hardy (2003) emphasized that confidence can be boosted through mental techniques such as self-talk and mental training.

Stress in competitive sports like swimming is both a physiological and psychological response to training and competition demands. Wang et al. (2023), using a longitudinal design and the DALDA scale, showed that increased stress correlates with upper respiratory symptoms and performance decline during the in-season phase. Athletes also experienced lower energy and increased emotional tension. Bretonneau et al. (2024) found that athletes with F-OR exhibited higher fatigue scores and worse sleep quality than those with AF, indicating chronic stress that impairs recovery. Almási et al. (2021) recorded elevated cortisol levels and reduced T/C ratios in adolescent male swimmers after maximal training, indicating high stress levels that pose a risk of overtraining.

Kullik et al. (2025) compared pre- and post-menarche female athletes. Post-menarche athletes reported higher night-time stress. Although both groups showed poor sleep quality (PSQI > 5), this pattern suggested persistent daily stress. Clemente-Suárez et al. (2021) linked stress to anaerobic performance; better performance was associated with lower stress levels ($r = 0.526$; $p = 0.025$). Zhou et al. (2024) noted pre-competition stress spikes in the form of cognitive and somatic anxiety, with no significant gender differences, indicating that pre-competition stress is universal. Various studies concluded that stress arises from training loads, competitive anxiety, and social demands. Khan, Manzoor, & Luqman (2023) and Hardy (1992) identified fear of failure and social pressure as major stress sources. Moen et al. (2019) emphasized that athletes with high resilience are more resistant to stress and burnout. Perception of challenges plays a key role in determining stress impact.

Nicholls, Polman, & Levy (2012) also highlighted the importance of self-perception and control in shaping emotional responses. Athletes with adaptive coping strategies are better able to maintain optimal performance under pressure (Tossici, Zurloni, & Nitri, 2024). While stress can have negative effects, psychological strategies such as goal-setting, self-talk, and relaxation have been shown to be effective in its management (Hardy, 1992).

Motivation is a primary driving force in swimming performance, encompassing internal drives like the "will to win" as well as psychological factors such as mood and confidence. Kumar et al. (2024) found that general swimmers had higher Will to Win scores (9.21) than para-swimmers (8.62), indicating strong competitive motivation. Aouani et al.

(2024) showed that tapering strategies positively impacted mood by reducing fatigue, tension, and depression while increasing vigor. A 3.5% performance improvement post-tapering reinforced the link between a positive mental state and competitive motivation. Chortane et al. (2022) stated that high training loads negatively affected confidence, potentially reducing competitive drive. Zhan & Xue (2022) also found that low achievement satisfaction and training dissatisfaction could reduce intrinsic motivation. Although focused on fatigue, Bretonneau et al. (2024) showed that the AF group had higher vigor scores than the F-OR group. Vigor as a measure of mental energy is a critical indicator of competitive readiness and high motivation.

Motivation is not only reflected in the explicit desire to win but also in psychological indicators such as confidence, vigor, and perception of training. High motivation is closely associated with effective recovery, positive mood, and satisfaction with training achievements. Conversely, psychological fatigue and chronic stress can lower competitive spirit. Other literature emphasizes the role of intrinsic and extrinsic motivation. Congyuxin et al. (2024) and Nicolescu (2021) stated that strong motivation helps athletes cope with physical and mental pressure. Fransen et al. (2018) showed that perceived competence enhances intrinsic motivation. Coaching styles that support autonomy, as discussed by Mageau & Vallerand (2003), have also been shown to improve athletes' overall motivation.

Psychological recovery is a critical component in maintaining athletic performance, particularly in high-demand sports like swimming. When recovery is compromised, aspects such as mood, sleep, and stress are also affected. Bretonneau et al. (2024) assessed recovery multidimensionally using POMS, CD-RISC, and sleep monitoring tools like Dreem 1 and ActiGraph. The AF group exhibited higher vigor, lower fatigue, and better sleep quality compared to the F-OR group, underscoring the importance of recovery in physical and mental readiness before competition. Kullik et al. (2025) examined recovery differences in pre- and post-menarche athletes. Post-menarche athletes experienced lower night-time stress and better morning recovery. However, PSQI scores above 5 in both groups indicated generally poor sleep quality. Aouani et al. (2024) recorded that a two-week tapering phase reduced total mood disturbance by 14.4% and increased vigor by 42.6%. This strategy improved not only psychological states but also swimming performance by 3.5%.

These findings indicate that psychological recovery strongly depends on training management, sleep quality, and mental readiness. Tapering strategies, stress management, and adequate sleep are key components of the recovery process. Russell et al. (2023) emphasized that techniques such as relaxation, mental detachment from the sport, and other psychological methods are effective in accelerating recovery and minimizing the negative effects of fatigue. Proper management of both biological and psychological aspects is essential in supporting performance balance and athletes' mental health.

CONCLUSION

Various studies have demonstrated that psychological dynamics have a crucial impact on the performance of competitive swimmers, both directly and indirectly. The six primary aspects analyzed, namely psychological fatigue, anxiety, self-confidence, stress, motivation, and psychological recovery, are interrelated and collectively influence the athletes' psychological and physical condition. Psychological fatigue, often arising from intense training loads or competitive pressure, can reduce a sense of achievement, lower

satisfaction, and trigger anxiety. Anxiety itself, particularly in pre-competition phases, has been shown to impair focus and mental readiness, while self-confidence is highly dynamic and susceptible to fluctuations due to training intensity and competitive stress. Stress, as a natural response to athletic demands, can adversely affect sleep quality, energy levels, and overall performance. On the other hand, high motivation, manifested through a strong desire to win and confidence, supports optimal performance. The importance of psychological recovery cannot be overstated; effective recovery enhances energy levels, improves mood, and positively influences sleep quality and poolside performance. Therefore, optimizing the potential of swimmers requires a balanced emphasis on both physical and psychological aspects, along with the integration of psychological strategies into every training and coaching program.

Overall, this in-depth analysis of swimmers' psychological dynamics underscores that performance in the pool is not determined solely by physical strength and technique, but is also heavily influenced by the athletes' mental condition. The implications of these findings are extensive, highlighting the need for a holistic approach in athlete training and development. For coaches, sports psychologists, and support staff, this entails integrating mental skills training and routine psychological monitoring as essential components of training programs. Future research should continue exploring the effectiveness of psychological interventions, conduct more comprehensive longitudinal studies, and integrate multidimensional data to better understand the complex interaction between mind and body in competitive sports.

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