

Evaluation of Knowledge, Attitude, and Practice towards Fatigue Management among Competitive Weightlifters

Srishti Kaur Hooda¹, Dr. Ankita Dabshede²

¹Intern, Indutai Tilak College of Physiotherapy, Tilak Maharashtra Vidyapeeth, Pune

²Associate Professor, Indutai Tilak College of Physiotherapy, Tilak Maharashtra Vidyapeeth, Pune

Abstract

Background: Competitive weightlifting demands repeated maximal and near-maximal force production under conditions of high physiological and psychological stress. When fatigue is not adequately recognized and managed, it can compromise training quality, delay recovery, and increase the risk of overtraining and musculoskeletal injury. While structured fatigue-management strategies are well described in the sports-science literature, little is known about how well competitive weightlifters understand these concepts and translate them into daily practice.

Objective: To evaluate the knowledge, attitude, and practice (KAP) of fatigue management among competitive weightlifters, and to examine the relationship among these three domains.

Methods: This observational, cross-sectional study included 50 competitive weightlifters (aged 13–25 years) recruited by convenience sampling from weightlifting clubs in Pune, India, over a six-month period. Data were collected using a self-made, expert-validated questionnaire comprising three sections assessing knowledge, attitude, and practice regarding fatigue management, administered online via Google Forms after obtaining informed consent and institutional ethical clearance. Descriptive statistics summarized KAP scores, and Pearson's correlation coefficient examined inter-domain relationships (SPSS v27.0; GraphPad Prism v7.0; significance at $p < 0.05$).

Results: Knowledge scores were good in 72% of participants (mean $82.0 \pm 24.06\%$), and attitude scores were good-to-very-good in 88% (mean $81.80 \pm 13.60\%$). Practice scores were comparatively lower, with only 44% classified as good (mean $66.88 \pm 19.37\%$). All three domains were significantly and positively correlated: knowledge–attitude ($r = 0.662$, $p = 0.0001$), knowledge–practice ($r = 0.706$, $p = 0.0001$), and attitude–practice ($r = 0.669$, $p = 0.0001$).

Conclusion: Competitive weightlifters in this sample demonstrated strong knowledge of and favourable attitudes toward fatigue management, but this did not consistently translate into daily practice, revealing a clear knowledge–attitude–practice gap. Since knowledge showed the strongest association with practice, educational interventions—supported by structured, coach-driven monitoring—may be the most effective route to improving athletes' fatigue-management behaviour.

Keywords: Competitive weightlifting, fatigue management, recovery, sports physiotherapy, power sport

1. Introduction

Competitive weightlifting is a high-intensity strength and power sport that requires exceptional muscle strength, explosive power, technical precision, and neuromuscular coordination. Unlike many other strength-based disciplines, weightlifting requires athletes to generate maximal force output within fractions of a second while simultaneously maintaining precise technical control over complex multi-joint movements such as the snatch and clean and jerk. Success on the competition platform depends on an athlete's ability to repeatedly produce maximal and near-maximal muscle contractions under conditions of significant physical and mental pressure, both during training and in competitive settings.

To achieve and sustain performance at this level, competitive weightlifters follow rigorous, highly structured training programmes characterized by high training volumes, high intensities, and frequent exposure to near-maximal loads. While such training is indispensable for athletic development, it simultaneously exposes athletes to considerable physiological and psychological stress, often within limited windows of recovery. Under these demanding conditions, the body's capacity to recover fully between sessions can be compromised, leading to the progressive accumulation of both acute, session-specific fatigue and more chronic, cumulative fatigue that builds over weeks or months of training.

When fatigue is not adequately recognized, monitored, and managed, its consequences can extend well beyond simple tiredness. Persistent, poorly managed fatigue can impair training quality, delay recovery between sessions, and increase the likelihood of athletes progressing toward overtraining, while also elevating the risk of musculoskeletal injuries[6]. Given these risks, the ability to understand, monitor, and effectively manage fatigue is fundamental to safeguarding the long-term health, training longevity, and competitive careers of athletes.

Fatigue is best understood as a multifactorial phenomenon rather than a single, uniform state — a temporary decline in the body's ability to produce force or sustain performance over time, arising from a complex interplay of physiological, psychological, and environmental factors. It is widely recognized in the sports-science literature as a multidimensional construct involving both central and peripheral mechanisms and is considered a major determinant of performance, recovery capacity, and injury risk among strength athletes[1, 2]. Broadly, fatigue is categorized into two interconnected but mechanistically distinct forms: peripheral and central fatigue. Peripheral fatigue originates from changes occurring locally within the muscle tissue itself, including the depletion of key energy substrates, accumulation of metabolic by-products, and structural muscle damage resulting from mechanical stress of repeated near-maximal lifts. Central fatigue, in contrast, involves a reduction in neural drive from the central nervous system, altered neurotransmitter activity, and impaired recruitment of motor units. Both mechanisms are highly relevant to weightlifting, a sport in which maximal force production, precise neuromuscular coordination, and rapid rate of force development are all essential for successful performance[1].

In the specific context of weightlifting, fatigue can impair movement quality, lifting technique, rating of perceived exertion (RPE), and decision-making, ultimately compromising overall performance and athletic capacity. Fatigue that accumulates over time without adequate management can push athletes along a continuum from functional overreaching — a planned, short-term increase in training stress that typically resolves with recovery — toward non-functional overreaching and, eventually, overtraining syndrome, a state often accompanied by prolonged performance decline and psychological disturbance[7]. A systematic review examining resistance training found that a sustained decline in performance is the most reliable indicator of overtraining, whereas other physiological and biochemical markers show considerably less consistency[5].

Fatigue management refers to the strategies employed by athletes and coaches to monitor, prevent, and reduce the adverse effects of fatigue while promoting optimal recovery. These strategies include appropriate manipulation of training load, tapering, adequate sleep, proper nutrition, hydration, recovery modalities, structured rest periods, and subjective and objective monitoring tools.

Among the available monitoring approaches, the rating of perceived exertion (RPE) remains one of the most widely used indicators of internal training load, valued for its simplicity, low cost, and ease of administration across training contexts[8]. Alongside RPE, wellness questionnaires, heart-rate variability (HRV), and performance-based assessments provide athletes and coaches with a broader, more objective picture of accumulated fatigue and recovery status, although research indicates that few of these markers carry strong, consistent scientific support on their own[6]. Evidence from studies on competitive weightlifters indicates that tapering is a widely practiced strategy used to enhance recovery, reduce accumulated fatigue, and improve competition-day performance[4]. However, the effectiveness of tapering, like other fatigue-management strategies, depends heavily on the athlete's underlying knowledge, attitude, and consistency of practice.

Despite the substantial body of scientific evidence supporting structured, evidence-based approaches to fatigue management, a notable gap often exists between what research recommends and what athletes actually practice. Many athletes continue to rely on subjective perception, coach experience, or peer advice rather than structured, evidence-based monitoring strategies. A recent cross-sectional study examining athletes' and coaches' knowledge and attitudes toward sports-injury prevention found that while attitudes toward prevention were generally favorable, actual knowledge — particularly around fundamental management principles — remained limited, and that greater knowledge was associated with more favorable attitudes among athletes specifically[3]. This pattern of a disconnect between positive intent and limited underlying understanding may plausibly extend to fatigue management as well, although it has received comparatively little direct research attention within competitive weightlifting.

While tools such as self-reported questionnaires, training-load diaries, and perceived-exertion scales are increasingly recommended in the literature as practical and accessible means of monitoring fatigue, relatively little research has systematically examined how well competitive weightlifters understand the underlying concepts of fatigue, their attitudes toward its structured management, and how consistently they translate this knowledge into daily training practice. This gap between existing scientific evidence and its practical application at the athlete level is addressed in the present study.

This study aimed to evaluate the knowledge, attitude, and practice of fatigue management among competitive weightlifters, with the specific objectives of (1) assessing weightlifters' knowledge of the causes, signs, symptoms, and prevention of fatigue; (2) determining their attitude toward the importance of fatigue management in training and performance; and (3) evaluating their current fatigue-management and recovery practices.

2. Materials and Methods

2.1 Study Design and Setting

This was an observational, cross-sectional study conducted over a six-month period among competitive weightlifters training at weightlifting clubs in and around Pune city, Maharashtra, India. Ethical clearance was obtained from the Institutional Ethics Committee, Department of Physiotherapy, Tilak Maharashtra Vidyapeeth, prior to commencement of the study.

2.2 Participants

A total of 50 competitive weightlifters aged 13–25 years were recruited using a convenience sampling method

Inclusion criteria:

1. Age 13–25 years, both sexes
2. Minimum one year of weightlifting training experience
3. Training frequency of at least 3–4 days per week
4. Currently competing at a competitive level
5. Voluntary informed consent to participate

Exclusion criteria:

1. Participants not currently training or who had taken a break exceeding three months
2. Individuals who declined to provide informed consent

2.3 Outcome Measure

A self-made questionnaire evaluating knowledge, attitude, and practice toward fatigue management was used as the outcome measure. The instrument comprised three sections: Section A (knowledge; 9 yes/no items on the causes, signs, and prevention of fatigue), Section B (attitude; 10 items on a five-point Likert scale ranging from strongly disagree to strongly agree), and Section C (practice; 8 yes/no items on current fatigue-management behaviours), preceded by a demographic data section.

2.4 Procedure

Following institutional ethical clearance, the aims and objectives of the study were explained to prospective participants, and those meeting the inclusion criteria were enrolled. The questionnaire was reviewed by experienced physiotherapists for relevance, clarity, sequence, and conceptual appropriateness, and their feedback was incorporated to improve its validity prior to data collection. Informed consent was obtained from all participants before administration. The validated questionnaire was then distributed online via Google Forms, and participants selected the most appropriate response for each item. Responses were compiled and analysed.

2.5 Statistical Analysis

Collected data were coded and analysed using descriptive statistics (frequency, percentage, mean, and standard deviation) to characterize the sample and the distribution of knowledge, attitude, and practice scores. Pearson's correlation coefficient was used to examine the relationships among the three KAP domains. Analyses were performed using SPSS version 27.0 and GraphPad Prism version 7.0, with $p < 0.05$ considered statistically significant.

3. Results

A total of 50 competitive weightlifters participated in the study, aged 13–25 years (mean age 19.68 ± 3.22 years). The majority (60%, $n = 30$) belonged to the 13–20-year age group, while 40% ($n = 20$) were aged 21–25 years. Males constituted a slight majority (52%, $n = 26$) compared with females (48%, $n = 24$). With respect to competition level, most participants competed at the district level (60%, $n = 30$), followed by the state level (24%, $n = 12$) and national level (16%, $n = 8$).

3.1 Knowledge Regarding Fatigue Management

Table 1. Distribution of competitive weightlifters according to level of knowledge score

Level of Knowledge Score	No. of Weightlifters	Percentage (%)
Poor (0–3)	5	10

Average (4–6)	9	18
Good (7–9)	36	72
Total	50	100
Mean $\pm$ SD (range)	7.38 $\pm$ 2.16 (2–9)	—
Mean % $\pm$ SD (range)	—	82 $\pm$ 24.06 (22–100%)

The majority of participants (72%, $n = 36$) demonstrated a good level of knowledge regarding fatigue management, while 18% ($n = 9$) had average knowledge and 10% ($n = 5$) had poor knowledge, corresponding to a mean knowledge score of 7.38 ± 2.16 (mean percentage $82 \pm 24.06\%$).

3.2 Attitude Regarding Fatigue Management

Table 2. Distribution of competitive weightlifters according to level of attitude score

Level of Attitude Score	No. of Weightlifters	Percentage (%)
Very Bad (0–10)	0	0
Bad (11–20)	0	0
Average (21–30)	6	12
Good (31–40)	20	40
Very Good (41–50)	24	48
Total	50	100
Mean $\pm$ SD (range)	40.90 $\pm$ 6.80 (21–50)	—
Mean % $\pm$ SD (range)	—	81.80 $\pm$ 13.60 (42–100%)

Attitude scores were strongly favourable: 88% of participants fell into the good or very good categories (48% very good, 40% good), with none in the bad or very bad categories, and a mean attitude score of 40.90 ± 6.80 (mean percentage $81.80 \pm 13.60\%$).

3.3 Practice Regarding Fatigue Management

Table 3. Distribution of competitive weightlifters according to level of practice score

Level of Practice Score	No. of Weightlifters	Percentage (%)
Poor (0–3)	5	10
Average (4–6)	23	46
Good (7–9)	22	44
Total	50	100
Mean $\pm$ SD (range)	6.02 $\pm$ 1.74 (2–8)	—
Mean % $\pm$ SD (range)	—	66.88 $\pm$ 19.37 (22.22–88.89%)

Practice scores were comparatively modest: only 44% ($n = 22$) of participants demonstrated good practice, 46% ($n = 23$) showed average practice, and 10% ($n = 5$) showed poor practice, with a mean practice score of 6.02 ± 1.74 (mean percentage $66.88 \pm 19.37\%$) — noticeably lower than the corresponding knowledge and attitude scores.

3.4 Correlation Between Knowledge, Attitude, and Practice

Table 4. Correlation between knowledge, attitude, and practice scores (Pearson's correlation coefficient)

Variables	Mean $\pm$ SD	n	r: K-A	r: K-P	r: A-P
Knowledge score	7.38 $\pm$ 2.16	50	0.662*	0.706*	0.669*
Attitude score	40.90 $\pm$ 6.80	50	p=0.0001	p=0.0001	p=0.0001
Practice score	6.02 $\pm$ 1.74	50			

K = Knowledge; A = Attitude; P = Practice.

*Statistically significant at $p < 0.05$.

A statistically significant, positive correlation was found between knowledge and attitude scores ($r = 0.662$, $p = 0.0001$), between knowledge and practice scores ($r = 0.706$, $p = 0.0001$), and between attitude and practice scores ($r = 0.669$, $p = 0.0001$), indicating that as knowledge of fatigue management improved, corresponding improvements were observed in both attitude and practice. The strongest correlation was between knowledge and practice, suggesting that knowledge level is the most influential factor associated with practice behaviour among competitive weightlifters.

4. Discussion

The present study aimed to evaluate the knowledge, attitude, and practice (KAP) of competitive weightlifters toward fatigue management, and the findings reveal a distinct pattern across the three domains. Knowledge and attitude scores were both high, with 72% of participants demonstrating good knowledge (mean 82%) and 88% showing good-to-very-good attitudes (mean 81.80%), whereas practice scores were comparatively modest, with only 44% classified as good and a mean of 66.88%. This gradient, in which knowledge and attitude exceed practice, forms the central finding of the study and is discussed below in relation to existing literature.

4.1 Knowledge of Fatigue Management

The high level of knowledge observed among the weightlifters in this study is a notable finding, particularly when contrasted with comparable research in other athletic populations. Soni and Vora[3] reported an average correct-response rate of only 39% among athletes and coaches assessed on sports-injury prevention knowledge, describing this as a persistent and concerning gap. In comparison, the mean knowledge score in the present study was considerably higher. This difference may reflect the direct, first-hand relationship weightlifters have with fatigue: because fatigue and its management bear immediately on daily training capacity and competitive performance, athletes may be more motivated to understand and retain this information than they would for a less immediately relevant topic such as general first-aid procedures. It may also reflect the influence of structured training environments in weightlifting clubs, where concepts such as overtraining, rest, and tapering are frequently discussed as part of periodized training programmes.

4.2 Attitude Toward Fatigue Management

Attitude scores were consistently favourable, with the majority of participants recognizing the importance of rest, recovery, and structured fatigue monitoring. This is consistent with previous research in sports-injury prevention, where attitudes toward preventive practices were also found to be more favourable than the corresponding knowledge levels[3]. Taken together with the present findings, this suggests a broader pattern across sports-science domains in which athletes are generally receptive to health- and performance-protective concepts, even in areas where their factual understanding may be incomplete. The strongly

positive attitude observed here, with no participants falling into the bad or very bad categories, may also reflect the visible and immediate performance consequences of poor recovery in a sport such as weightlifting, where fatigue directly and rapidly compromises technical execution of the snatch and clean and jerk.

4.3 Practice of Fatigue Management: The Knowledge–Practice Gap

Despite strong knowledge and attitude, practice scores were comparatively lower, indicating that favourable awareness and intent did not consistently translate into daily behaviour. This knowledge–attitude–practice gap mirrors findings reported by Soni and Vora[3], who similarly described a disconnect between positive intent and consistent application of injury-prevention practices among athletes. It is also consistent with the broader literature on training-load monitoring, which notes that although tools such as RPE and structured questionnaires are readily available and simple to use, their consistent day-to-day application remains variable[5, 8]. Several factors may explain this gap in the present sample: fatigue-management practices such as structured rest days, recovery modalities, and relaxation techniques require sustained behavioural commitment, access to appropriate facilities, and coach support, none of which are guaranteed even when an athlete is personally convinced of their value. Additionally, competitive and training pressures, particularly among weightlifters training at the district level, where the current sample was concentrated, may discourage athletes from prioritizing recovery practices over additional training volume, despite their stated beliefs.

4.4 Interrelationship Between Knowledge, Attitude, and Practice

The correlation analysis provides further insight into how these three domains relate to one another. All three pairwise correlations were positive and statistically significant, with the strongest relationship observed between knowledge and practice ($r = 0.706$), followed by attitude and practice ($r = 0.669$) and knowledge and attitude ($r = 0.662$). This pattern suggests that knowledge may be the most influential determinant of actual fatigue-management behaviour in this population, more so than attitude alone. This finding is considerably stronger than the corresponding relationship reported by Soni and Vora[3], where knowledge and attitude were only weakly correlated ($r = 0.232$) among athletes. The stronger relationships observed here may again reflect the more direct, tangible link between fatigue and performance outcomes in weightlifting compared with the more general injury-prevention knowledge assessed in that study. Practically, this suggests that educational interventions aimed at improving athletes' factual understanding of fatigue mechanisms and management strategies could have a cascading effect, improving not only attitude but also translating more directly into consistent practice.

4.5 Interpretation in Light of Fatigue Management Literature

These findings align with the broader sports-science literature on fatigue and its management. Fatigue in weightlifting arises from a combination of central and peripheral mechanisms[2], and its cumulative, poorly managed form has been linked to overtraining and increased injury risk[5]. The relatively high knowledge scores observed in this study suggest that participants understood these underlying concepts, such as the fact that overtraining increases injury risk and that adequate rest supports recovery, a foundation described as essential by Robson-Ansley et al.[9] in their review of fatigue management in Olympic athletes. However, the comparatively modest practice scores, particularly around structured monitoring and recovery techniques, echo Halson's[8] observation that despite the availability of accessible tools such as RPE and wellness questionnaires, no single approach is consistently or universally applied by athletes in daily training. This suggests that bridging the gap between knowledge and practice may require not only educational efforts but also structural support, such as coach-driven monitoring and

formal rest scheduling, similar to the structured tapering protocols described among competitive weightlifters by Winwood et al.[4].

Overall, the findings of this study suggest that competitive weightlifters in this sample possess a solid theoretical foundation and a positive disposition toward fatigue management, but face a gap in consistently translating this knowledge into practice, with direct implications for coaches, sports physiotherapists, and athletes themselves.

4.6 Clinical Implications

The findings of this study carry several implications for clinical and coaching practice.

- Identifying gaps in weightlifters' knowledge can guide sports physiotherapists and coaches in designing targeted educational interventions.
- Enabling athletes to recognize early signs of fatigue before they progress into overtraining or injury.
- Understanding current attitudes and practices can inform the development of structured, evidence-based fatigue-management protocols within training programmes, potentially reducing overuse injuries.
- Can also help clinicians and coaches tailor recovery strategies to an athlete's training load, experience level, and existing awareness rather than applying a one-size-fits-all approach.
- The study underscores the need for closer collaboration between coaches, sports physiotherapists, and sports-medicine professionals in monitoring fatigue, and may serve as a foundation for developing simple, practical screening tools that clinicians and coaches can use to regularly assess recovery status among competitive weightlifters.

4.7 Limitations

- Data collection relied on a self-reported questionnaire, which may be subject to recall bias and social desirability bias.
- The study depended on subjective self-report rather than objective clinical or physiological measures of fatigue and performance.
- The relatively limited sample size ($n = 50$) may not fully capture the diversity of knowledge, attitudes, and practices present within the broader competitive weightlifting community.
- The study was geographically restricted to weightlifters training in Pune, Maharashtra, so findings may reflect region-specific training cultures and may not be fully generalizable to other settings in India or internationally.
- Differences in coaching styles, training methodologies, and recovery protocols among participants were not controlled and may have influenced responses.

4.8 Future Scope

Future research could extend this line of enquiry to other strength-related sports for cross-disciplinary comparison, develop and evaluate weightlifter-specific fatigue-management education workshops, and employ longitudinal designs with larger, more diverse samples to track how knowledge, attitude, and practice evolve over time. Structured awareness campaigns and interventional studies assessing the real-world impact of fatigue-management programmes on performance and injury reduction would further strengthen the evidence base in this population.

5. Conclusion

This study evaluated the knowledge, attitude, and practice of competitive weightlifters toward fatigue

management. The findings show that the majority of participants possess good knowledge of the causes, signs, and prevention of fatigue (mean score 82%) and hold strongly favourable attitudes toward its structured management (mean score 81.80%). However, translation of this knowledge and attitude into consistent daily practice was comparatively limited (mean score 66.88%), revealing a clear knowledge–attitude–practice gap. Pearson's correlation analysis confirmed that knowledge, attitude, and practice are all significantly and positively associated with one another, with the knowledge–practice relationship being the strongest ($r = 0.706$), suggesting that improving athletes' factual understanding of fatigue may be the most effective lever for improving their actual recovery behaviour.

Closing this gap will likely require more than education alone: structured, coach-supported monitoring systems and formal recovery protocols embedded within training programmes may be necessary to help athletes act consistently on what they already know and believe. Addressing this gap has direct relevance for injury prevention, training longevity, and long-term athletic performance, and underscores the value of a collaborative approach between athletes, coaches, and sports physiotherapists in promoting evidence-based fatigue management in competitive weightlifting.

Acknowledgements

The authors thank the participating weightlifters and the coaching staff of the weightlifting clubs in Pune for their cooperation, and the Department of Physiotherapy, TMV's Indutai Tilak College of Physiotherapy, for institutional support.

References

1. Soni J, Vora D. Knowledge and attitudes toward sports-injury prevention and management among athletes and coaches: a cross-sectional study. *Cureus*. 2025.
2. Winwood PW, Keogh JW, Travis SK, Pritchard HJ. The tapering practices of competitive weightlifters. *J Strength Cond Res*. 2023.
3. Rebelo A, Pereira JR, Martinho DV, Valente-dos-Santos J. Rating of perceived exertion in professional volleyball: a systematic review. *J Hum Kinet*. 2023.
4. Inoue A, dos Santos Bunn P, do Carmo EC, Lattari E, da Silva EB. Internal training load perceived by athletes and planned by coaches: a systematic review and meta-analysis. *Sports Med Open*. 2022.
5. Grandou C, Wallace L, Impellizzeri FM, Allen NG, Coutts AJ. Overtraining in resistance exercise: an exploratory systematic review and methodological appraisal of the literature. *Sports Med*. 2020.
6. Zajac A, Chalimoniuk M, Maszczyk A, Gołasz A, Lngfort J. Central and peripheral fatigue during resistance exercise – a critical review. *J Hum Kinet*. 2015.
7. Halson SL. Monitoring training load to understand fatigue in athletes. *Sports Med*. 2014.
8. Robson-Ansley PJ, Gleeson M, Ansley L. Fatigue management in the preparation of Olympic athletes. *J Sports Sci*. 2009.