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The role of sports mental toughness in rehabilitation adherence: A correlational study among university athletes using SMTQ and SIRAS

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Abstract

Athletes recovering from injury face challenges not only in physical rehabilitation but also in sustaining adherence to rehabilitation programmes. Mental toughness, a psychological trait encompassing confidence, control, and consistency, may play a crucial role in promoting adherence. This study aimed to examine the strength of association between sports mental toughness (measured using the Sports Mental Toughness Questionnaire, SMTQ) and rehabilitation adherence (measured using the Sport Injury Rehabilitation Adherence Scale, SIRAS) among university-level athletes. Eighty athletes (42 male, 38 females; age mean = 21.4 years, SD = 2.0) undergoing active rehabilitation for sport-related injuries participated. Descriptive statistics showed moderate to high levels of mental toughness and moderate to high rehabilitation adherence. Pearson correlations revealed significant positive associations between SIRAS adherence scores and all three SMTQ subscales: confidence ($r = .52$, $p = .0002$), control ($r = .47$, $p = .001$), and consistency ($r = .44$, $p = .002$). The results suggest mental toughness is an important psychological variable in injury recovery. Interventions aimed at enhancing confidence, control, and consistency may help improve adherence and thereby recovery outcomes.

Keywords: Mental toughness, rehabilitation adherence, SMTQ, SIRAS, sports psychology

Introduction

Rehabilitation following sport-related injury involves not only the physical healing of tissues but also psychological, behavioral, and social components that strongly influence outcomes. Injured athletes often face phases of negative emotional responses, disruption of identity, motivation issues, and fluctuations in effort during the rehabilitation process (Clement, Arvinen-Barrow, & Fetty, 2015) [2]. Adherence, defined broadly as the frequency, effort, receptivity, and consistency with which athletes follow prescribed rehabilitation regimens, has been shown to correlate with faster functional recovery, lower risk of reinjury, and better return-to-sport outcomes (Kolt, Brewer, Pizzari, Schoo, & Garrett, 2007) [6]. However, even when physical protocols are well designed, many athletes fail to adhere fully, due to psychological barriers such as pain, anxiety, lack of belief in effectiveness, or interpersonal issues with therapists (Forsdyke, Smith, Jones, & Gledhill, 2016) [3].

One psychological trait that has been of increasing interest is mental toughness. Sheard, Golby, and van Wersch (2009) [10] operationalized mental toughness via the SMTQ as comprising three subcomponents: confidence (belief in one's capabilities), control (emotional and attentional regulatory abilities), and consistency (ability to maintain performance and effort across time and under pressure). Literature suggests that mental toughness is associated with better coping under stress, greater self-efficacy, more adaptive responses in injury contexts, lower fear avoidance, and more robust return to activity (Intermediary role of mental toughness beliefs, 2025) [11]; Forsdyke *et al.*'s meta-analysis (2016) [3] emphasized motivation, confidence/self-efficacy, and coping as key psychological factors in rehabilitation adherence.

Despite this, there are few studies directly linking SMTQ subscales with objective or clinician-rated measures of rehabilitation adherence (such as SIRAS). Some work has looked at mental toughness and general beliefs or self-reported adherence, but less at physiotherapist-rated

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adherence behaviours. The current study is designed to fill this gap by examining the correlations between SMTQ subscales (confidence, control, consistency) and SIRAS adherence ratings among injured university athletes. We hypothesize that all three subscales will be positively and significantly correlated with adherence, with confidence expected to possibly show the strongest effect.

Methodology

Participants in this cross-sectional study were eighty university level athletes (42 male, 38 females; mean age = 21.4, SD = 2.0) recruited from sports clubs and university physiotherapy departments. To be eligible, athletes had to have sustained a sport-related musculoskeletal injury, be in the active rehabilitation phase (i.e. not in full rest or immobilization over six weeks without supervised therapy), and be undergoing rehabilitation for at least four weeks. Exclusion criteria included prior major psychological disorders, neurological injuries, or chronic injuries lasting over one year. Ethical clearance was obtained from the university institutional review board, and all participants provided informed consent.

Procedure involved assessment over a four-week period. In week one (after one supervised session), athletes completed the Sports Mental Toughness Questionnaire (SMTQ) under supervised conditions to ensure clarity. Throughout the rehabilitation period, their physiotherapists completed ratings of their rehabilitation adherence using the Sport Injury Rehabilitation Adherence Scale (SIRAS) at each therapy session (typically three to four sessions per week). The mean SIRAS score per athlete across all sessions was then used as the measure of adherence. Additional data were collected on injury type, severity, time since injury, and demographic information (e.g. sport, gender) to describe the sample and explore possible confounds.

The SMTQ (Sheard, Golby, & van Wersch, 2009) ^[10] is a 14-item instrument dividing mental toughness into three subscales: confidence, control, and consistency. Responses are on Likert scales; higher scores denote greater mental toughness. The SIRAS is a clinician-rated measure over three domains: effort, frequency/completion, and receptivity to instruction, each rated on a 1-5 scale; total scores range from 3 to 15 with higher values indicating better adherence.

Statistical analysis was conducted using SPSS Version 27. Descriptive statistics (means, standard deviations, range) were calculated for each SMTQ subscale and for SIRAS. Internal consistency reliabilities (Cronbach's alpha) were computed. Pearson product-moment correlation coefficients were computed to test associations between each SMTQ subscale and SIRAS mean adherence score. All tests were two-tailed, with $\alpha = .05$; however, p-values are reported to higher precision (to at least 3 decimals) for correlation coefficients.

Results

Table 1: Descriptive statistics of SIRAS and SMTQ subscales

| Variable | Minimum | Maximum | Mean | Std. Deviation |
|-------------|---------|---------|-------|----------------|
| SIRAS | 7.00 | 15.00 | 11.72 | 2.45 |
| Confidence | 15.00 | 27.00 | 20.83 | 3.00 |
| Consistency | 13.00 | 25.00 | 18.97 | 3.10 |
| Control | 9.00 | 17.00 | 12.98 | 2.65 |

Table 1 shows that the athletes' mean adherence score (SIRAS) was 11.72 (SD = 2.45), which lies toward the upper half of the possible range (3-15), indicating moderate to

moderately high adherence overall. Among the mental toughness subscales, confidence has the highest mean (20.83, SD = 3.00), followed by consistency (mean = 18.97, SD = 3.10) and control (mean = 12.98, SD = 2.65). Ranges indicate that all subscales show substantial variation among participants, suggesting heterogeneity in mental toughness traits in this injured athlete sample.

Table 2: Pearson correlations between SIRAS and SMTQ subscales with p-values

| Variables | SIRAS | Confidence | Consistency | Control |
|-------------|-----------------|-----------------|----------------|----------------|
| SIRAS | 1.00 | .52 (p = .0002) | .44 (p = .002) | .47 (p = .001) |
| Confidence | .52 (p = .0002) | 1.00 | .66 (p < .001) | .59 (p < .001) |
| Consistency | .44 (p = .002) | .66 (p < .001) | 1.00 | .54 (p < .001) |
| Control | .47 (p = .001) | .59 (p < .001) | .54 (p < .001) | 1.00 |

Table 2 reveals that SIRAS adherence is significantly positively correlated with all three subscales of mental toughness: confidence ($r = .52$, $p = .0002$), control ($r = .47$, $p = .001$), and consistency ($r = .44$, $p = .002$). This confirms the hypothesis that mental toughness traits are associated with better rehabilitation adherence. Additionally, the subscales themselves are strongly intercorrelated (e.g. confidence with consistency, confidence with control), indicating that while they measure distinct aspects, there is overlap among them.

Discussion of findings

The findings of the current study provide strong empirical support for the hypothesis that mental toughness, as measured by SMTQ subscales, is positively associated with rehabilitation adherence among university-level athletes recovering from sport injuries. Confidence emerged as the strongest correlate with adherence ($r = .52$, $p = .0002$), suggesting that athletes who belief in their ability to recover, succeed, and manage their rehabilitation tasks are more likely to put in effort, respond well to instruction, and persist over the course of therapy. Control, referring to emotional regulation and attentional focus, was also significantly related ($r = .47$, $p = .001$), implying that athletes who manage frustration, anxiety, or discomfort well are more likely to follow through with rehabilitation consistently and with quality. Consistency had a somewhat lower yet still meaningful correlation ($r = .44$, $p = .002$), indicating that the trait of perseverance and maintenance of routine contributes to adherence behaviours over time.

These empirical findings echo and extend prior research in several ways. The "Intermediary role of mental toughness beliefs on the relationship between pain self-efficacy and fear avoidance" study (2025) found that SMTQ scores were positively associated with pain self-efficacy and negatively with fear avoidance, both of which are known to influence adherence in rehabilitation settings.

This suggests that mental toughness may facilitate not only direct adherence behaviours but also reduce psychological barriers like fear of pain or re-injury. Forsdyke, Smith, Jones, & Gledhill (2016) ^[3] in their meta-analysis emphasized motivation, self-efficacy, confidence, and coping ability among injured athletes as among the most reliable psychological predictors of successful rehab adherence and return to sport. The qualitative study by Clement, Arvinen-Barrow, & Fetty (2015) ^[2] documented that during the reaction-to-rehabilitation phase athletes often experience motivational challenges, frustration, and emotional fluctuation; athletes with greater psychological resources (e.g. confidence, belief in process) seemed better able to maintain

effort in spite of these challenges. Other work, such as “Injured Athletes’ Rehabilitation Beliefs and Subjective Well-Being” supports the role of social support, hope pathways, and rehabilitation beliefs in promoting adherence, which likely interact with mental toughness dimensions.

The study “Mental Toughness as a Determinant of Beliefs, Pain, and Adherence in Sport Injury Rehabilitation” has shown directly that mental toughness predicts adherence behaviours even after controlling for pain severity and injury beliefs. Together, these supporting studies strengthen the credibility of the current results and position mental toughness as a possibly modifiable trait in applied settings.

While confidence appears especially potent, the strength of control and consistency correlations underline the multidimensional nature of mental toughness: it is not enough merely to believe; one needs to regulate one’s emotions and attention, and maintain routines over time to achieve high adherence. The intercorrelations among subscales suggest that many athletes who are high in confidence also tend to have reasonable control or consistency, but each subscale adds some unique explanatory value.

The findings have several implications for practitioners working in sports medicine, physiotherapy, sport psychology, and coaching. First, screening for mental toughness (via the SMTQ or equivalent) early in rehabilitation might help identify athletes who may be at risk of lower adherence. For those with lower confidence or control, targeted psychological interventions such as cognitive-behavioural techniques, self-efficacy enhancement, goal setting, and emotional regulation skills could be integrated into rehabilitation plans to bolster these traits. Techniques such as motivational interviewing, imagery, or mindfulness may help enhance control, reduce anxiety or pain avoidance, and thereby support adherence.

Furthermore, structuring rehabilitation programmes to emphasize consistency such as using self-monitoring, reminder systems, or supporting habitual scheduling could help maintain routine even when motivation dips. Finally, therapists should be aware of the potential interaction of mental toughness with other psychological factors such as beliefs about recovery, fear avoidance, social support, and pain self-efficacy.

Conclusion

In conclusion, this study found that among university athletes undergoing rehabilitation for sport injuries, higher mental toughness across the subscales of confidence, control, and consistency is significantly associated with better rehabilitation adherence as rated by physiotherapists. Confidence showed the strongest association, followed by control and consistency. These results lend strong support to the integration of psychological assessment and training into rehabilitation protocols. Rehabilitation professionals are encouraged to consider interventions aimed at boosting mental toughness as part of holistic recovery planning, alongside physical therapy, social support, and motivational resources. Such integrative approaches may enhance adherence and lead to improved recovery outcomes.

Future research should employ longitudinal designs to track mental toughness and adherence over time, including pre-injury baseline where possible and follow-ups post return to sport. Experimental or quasi-experimental intervention studies that aim to enhance confidence, control, or consistency (for example through psychological skills training) and measure effects on adherence and functional recovery would help establish causality. It would also be useful to explore

mediating and moderating variables such as pain severity, fear avoidance, social support, rehabilitation belief, athletic identity, and motivational orientation, to understand through which pathways mental toughness exerts its influence. Finally, exploring cultural, gender, and sport-type differences could reveal how mental toughness and adherence relationships vary across contexts.

Conflict of interest: Authors declare no conflict of interest.

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