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Supporting Learning Sustainability in University Sport: Effects of Structured Sports Massage on Mental Toughness and Psychological Well-Being

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Abstract. High-performing university student-athletes navigate rigorous academic settings that require balancing strenuous physical training, psychological stress, and scholarly obligations. In higher education, recovery techniques are widely acknowledged as both performance-support mechanisms and developmental interventions that affect psychological preparation, adaptive learning, and sustained engagement. Although sports massages are commonly used in elite athletic programs, their impact on learning-related psychological outcomes remains insufficiently investigated. This research investigated the impact of a systematic sports massage intervention on mental resilience and psychological health among high-performance student-athletes in a university setting. This research employed a quasi-experimental design with pre- and post-assessments administered to an intervention group and a comparison group without random assignment. A total of 32 student-athletes who met the inclusion criteria were recruited through purposive sampling. Participants were allocated to either a standardized sports massage intervention or a sham light-touch control condition. Mental resilience and psychological health were evaluated using validated measures. An exploratory simple linear regression analysis was performed to assess the intervention's effects within the treatment group. The results demonstrated a statistically significant moderate effect due to sports massage on mental toughness (30.4% of the variance) and a substantial effect on psychological well-being (64.1% of the variance). The findings indicate that systematic sports massage significantly enhances emotional control, perceived readiness, and adaptive psychological functioning in high-performance student-athletes. The study demonstrates that sports massage extends beyond physical recovery, serving as a psychologically supportive intervention in university sports settings, with implications for enhancing learning sustainability, student well-being, and comprehensive athlete support in higher education.

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1. Introduction

The design of the curriculum and its instruction are not the only variables that educational institutions consider when seeking to improve student learning outcomes. Other relevant variables involve the students' psychological readiness and emotional control. They also consider the students' capacity to cope with prolonged periods of academic pressure and to manage either underperformance or overperformance. Contemporary educational research highlights that the mental readiness to perform a learning task and the capacity to regulate stress are critical to achieving educational objectives. This is evident in the growing interest among educational institutions in developing more holistic frameworks for student support that integrate the mental, emotional, and behavioral components of the student learning process to improve educational outcomes.

High-performance student-athletes in university sports constitute a distinctive cohort because they are dual-career students. They must undertake physically demanding training, compete, and fulfill their academic responsibilities within highly structured institutions. Dual-career student-athletes experience a high level of stress, as has been shown in studies, leading to high levels of anxiety, psychological stress, and strain. If unmanaged, these stressors also threaten the student's engagement in the learning process and thus the continuation of the learning process due to the stressors (Gomez et al, 2018; Harris & Maher, 2023; Domingo et al, 2025). The interplay of various factors among these student-athletes, particularly during the competitive or evaluative cycle, leads to psychological fatigue, emotional dysregulation, and reduced academic motivation, persistence, and performance.

Recent studies show that international and elite student-athletes experience anxiety and depressive symptoms. They face cultural adjustment challenges, social isolation, language difficulties, and heightened expectations for their performance. According to Jing et al. (2025), anxiety and depression among Chinese foreign student-athletes can be viewed as interrelated networks of symptoms, revealing the complexity of psychological discomfort within this population. This psychological discomfort can significantly affect the students' emotional functioning, academic engagement, and overall functioning, particularly when left unaddressed. Emotional symptoms affect the students' immediate learning experiences and have far-reaching effects on their motivation, self-regulation, and overall academic performance.

The growing academic and performance pressures faced by students have brought psychological well-being to the forefront of educational discourse. Rather than being a peripheral concern, it reflects the student's capacity to regulate their emotions effectively, to sustain a sense of direction and agency, and to adapt constructively to demanding academic environments. Within higher education contexts, empirical evidence consistently indicates that students who demonstrate

stronger psychological well-being are more likely to persist in their studies, display higher levels of intrinsic motivation, engage in self-directed learning behaviors, and show greater resilience, especially when exposed to prolonged or cumulative stress (Tan et al., 2021; Arslan, 2023; Chaliawala et al., 2025). In terms of sustainability, psychological well-being is a key focus area of emerging research in higher education, underscoring its importance as a supporting framework for sustainable higher education systems that facilitate long-term learning, employability, and overall student development (Bikar et al., 2023). This indicates that psychological well-being should be regarded as a collective responsibility of educational institutions rather than as an individual concern.

Researchers in educational psychology have long observed that physical activity can significantly affect university students' psychological well-being and overall mental health. Participation in sports and other fitness programs is associated with improved mental health, reduced stress, better emotional regulation, and social integration (Lao et al., 2025). However, such programs are constrained by time, fatigue, and effort, and are less likely to be undertaken by students with demanding academic or performance-related commitments (Abdullah et al., 2018). It is therefore essential to plan activities that are physically engaging without imposing an additional burden on the students' already busy schedules.

Recent data suggest that designed physical activity (PA) programs in educational contexts, particularly organized and outdoor ones, are effective at improving behavioral self-regulation, psychosocial functioning, and adaptive coping; however, more research is needed. These physical activity initiatives seem to extend beyond physical benefits, fostering the students' emotional and social self-regulatory capacities while strengthening the psychosocial resources necessary for independent learning and effective stress adaptation (Pa et al., 2026). Well-designed physical activity interventions can extend beyond recreational or fitness purposes to more essential developmental and methodological purposes.

Incorporating specialized recovery practices into elite competitive sports has revitalized interest in recovery research, particularly its acute psychosocial benefits. Sports massage has been used to relax athletes, improve both mental and emotional control, and reduce cognitive and physical stress. Massage therapy is thought to positively influence stress pathways through recovery and post-cortisol feedback, thereby facilitating emotional ease and mental preparation for performance demands (Pa et al., 2021; Taskin et al., 2025). This theory substantiates sports massage as both an aid and an intervention for managing increased stress in mentally and physically taxing sports and academia.

Thus, there is an evident need for research that not only focuses on sports massage therapy as a facilitative method for physical recovery, but also as an adjunctive method for pedagogical support in post-secondary education. Its relevance to the stress and mental resilience of high-level student-athletes is a step toward advancing recovery research in a pedagogical context and articulating the framework for supportive structures aimed at sustainable learning, flexible, adaptive functioning, and th long-term goals of student success.

1.1 Research Objective

1.1.1 To evaluate the effectiveness of structured sports massage as an institutional support strategy for enhancing mental toughness among high-performance student-athletes within university sport and learning systems.

1.1.2 To assess the contribution of structured sports massage to the promotion of psychological well-being among high-performance student-athletes as part of holistic student support and athlete development practices in higher education.

2. Literature Review

University athletic programs frequently utilize sports massage as a therapeutic modality. Traditionally, it has been argued that sports massage aids recovery through physiological effects, such as reduced muscle soreness and increased blood circulation. Between 2018 and 2025, systematic reviews and empirical studies have been inconclusive regarding the immediate recovery benefits of sports massage. Reviews have identified sports massage and its effects on recovery perceptions, including relaxation, comfort, stress relief, and emotional readiness (Dakić et al., 2023; Davis et al., 2020; Mathunjwa et al., 2025; Nizam et al., 2025). In educational settings, feelings of relaxation and confidence are vital, as they help students avoid burnout and sustain their efforts (Jiang et al., 2026).

The educational value of recovery therapies that aid relaxation and provide emotional comfort may also contribute to recovery by promoting emotional stability and self-regulation. The most recent evidence indicates that sports massage (SM) can alleviate anxiety and elevate mood and perceived well-being, which is crucial during high-stakes performance (Taskin et al., 2025). Emotion regulation and attentional control are central to mental health and emotional resilience, which may help explain how SM can positively impact learning. Research on educational resilience demonstrates that relaxation, positive affect, and perceived support enhance an individuals' ability to cope with enduring adversity and, consequently, improve well-being and resilience (Abulfaraj et al., 2024; Sayed et al., 2024).

Despite the stated theoretical connections, empirical studies on sports massage are scarce, and studies that are educationally relevant are virtually non-existent. Many studies have employed varied massage protocols, short intervention durations, or populations that do not include athletes. Thus, their findings have little relevance to high-performance university athletes. Additionally, the psychological aspects of university students' lives have been researched quite thoroughly, and body-based recovery intervention systems have been researched very little; that is, body-based recovery interventions have been researched very little in relation to their potential to improve the stress recovery balance and emotion regulation of student-athletes (Chaliawala et al., 2025; Abulfaraj et al., 2024). While mental toughness is generally regarded as a psychological phenomenon that can be easily modified, intervention studies focusing on mental toughness have been predominantly concerned with the enhancement of psychological skills, mindfulness, and cognitive-behavioral approaches, while

very few studies have examined the role of somatic recovery techniques in the enhancement of mental toughness (Pandian et al., 2022; Guzmán-Muzante et al., 2024).

3. Methodology

3.1 Research Design

Because of practical and ethical limitations, particularly those linked to team organization, athlete welfare, and performance commitments, random allocation was not possible in this context. This study therefore adopted a quasi-experimental approach incorporating pre- and post-intervention assessments with a comparison group that was not randomly assigned. This design is frequently used in educational and sport performance research, where strict experimental control is difficult to achieve. In university high-performance programs, athletes operate within highly structured training systems and predefined competitive pathways, making random reassignment both impractical and potentially disruptive to their preparation.

To enhance the study's internal validity, several procedural restrictions were implemented. First, to reduce the impact of seasonality, training cycles, and academic load, both the treatment and control groups were assessed during the same academic and competitive periods. Second, to ensure adequate baseline comparability, baseline measures were obtained prior to the intervention. Third, to reduce variability in regulation, all interventions and evaluation protocols were standardized and conducted by trained staff. The aforementioned measures, along with maintaining ecological validity in a real university sports context, address the most common concerns of quasi-experimental designs regarding maturation, history, and testing effects (Nazarudin et al., 2025).

3.2 Participants

The study's participants were 32 elite university student-athletes who were recruited from the university's high-performance sports program. All participants were involved in organized training and competitive sports at the institution, state, or national level.

Inclusion criteria:

1	Enrolled high-performance student-athletes at the university;
2	Engagement in organized training programs during the duration of the study;
3	Devoid of acute injuries or medical conditions that may limit involvement in massage therapy.

Exclusion criteria:

1	Present musculoskeletal injury necessitating medical rehabilitation;
2	Participation in simultaneous psychological or therapeutic treatments;
3	Irregular attendance during the intervention phase.

Participants were assigned to a treatment group (n = 16) and a sham-control group (n = 16) based on program availability and training schedule.

3.3 Sampling Technique

A purposive sampling technique was employed, involving active participants who were determined to have met performance goals aligned with the study's objectives. Purposeful sampling limits the ability to draw statistical generalizations but the extensive recording of participant attributes may enable greater analytical transferability to other university sport contexts.

Before the data collection began, power analysis was conducted using G*Power to estimate the minimum number of participants required. This ensured that the study was adequately powered to detect meaningful intervention effects, while also reducing the likelihood of both false positive (Type I) and false negative (Type II) errors.

3.4 Intervention Procedure

The experimental group received a sports massage intervention for a period of four weeks, while the control group was assigned a sham light touch condition.

Sports Massage Intervention (Experimental Group)

The treatment was delivered bi-weekly over a total of 8 sessions, each lasting approximately 30 minutes. All sessions were delivered by a qualified sports massage therapist to ensure compliance with the treatment protocol and to facilitate standardization for future research using the same protocol.

The sports massage protocol consisted of techniques conventionally recognized for use in the high-performance recovery of athletes and included the following components:

- Effleurage (long, flowing strokes to promote relaxation and improve circulation);
- Kneading and manipulating tissues to engage the muscles;
- Tapotement (rhythmic percussion for the activation of the neuromuscular system);
- Trigger point therapy aimed at sports-specific muscle groups.

The participants' muscle group selection was based on the athletes' sport-specific requirements, whereas the order, timing, and execution of the techniques were the same for all participants. To preserve the fidelity of the intervention, all aspects were governed by a fixed protocol, including the sequence of techniques, the duration of each technique, and the expected behavior of the physical therapist.

3.4.1 Sham Control Condition

In the control group, the participants received light-touch sessions to simulate a therapist’s engagement and attention without any direct pressure, manipulation, or other therapeutic techniques. The use of a sham control condition was designed to mitigate the expectation effect, therapist-participant interaction, and procedural attention, while increasing the methodical control as part of the psychological outcome assessment.

3.5 Research Instruments

The assessment of mental toughness was conducted using the Sport Mental Toughness Questionnaire (SMTQ), which examines the dimensions of confidence, consistency, and control within the benchmark of mental toughness. Psychological well-being was evaluated using the 21-item version of the Depression Anxiety Stress Scale (DASS-21), a self-reporting measure designed to capture levels of stress, anxiety, and depressive symptoms. In this instrument, higher total scores indicate greater psychological distress and, consequently, lower overall well-being.

In the present sample, both measurement tools showed acceptable internal reliability, with the Cronbach's alpha coefficients exceeding .70, indicating that the scales were sufficiently consistent for use in this investigation.

3.6 Data Collection Procedure

To limit the effects of variability due to the demands of the training cycle and the academic responsibilities of participants, all data was captured within the same competitive and academic semester. All test and retest evaluations were performed in a consistent, standardized manner and were subject to the evaluators.

3.7 Data Analysis

The data analysis focused on the use of inferential statistics within quasi-experimental contexts. This paper presents within-group simple linear regression analyses to assess the sensitivity and effect of the sports massage intervention on the mental toughness and psychological wellness of the treatment group, with assessments conducted at pre-test and post-test for both the treatment and control groups.

Given the small sample size, an analytical approach was selected because the limited statistical power precluded detecting interaction effects in the within-group comparisons. The sham control condition was designed to address expectancy and procedural effects, rather than to provide a basis for strong causal explanations. Statistical power was measured against the alpha threshold for measuring statistical significance.

3.8 Ethical Considerations

Before the study commenced, formal approval was secured from the relevant institutional ethics board. Participants were informed about the purpose and procedures of the research, and they were assured that their responses would remain confidential and anonymous. They were also made aware that participation was entirely voluntary and that they could discontinue their involvement at any stage without penalty. Written consent was obtained from all individuals prior to the data collection, and the research was conducted in accordance with established ethical standards for studies involving human participants.

4. Results and Findings

4.1 Effect of sports massage on the mental toughness of high-performance student athletes.

This study sought to determine whether participation in a structured sports massage intervention could enhance the level of mental toughness among high-performance student-athletes. The first research question focused on the potential impact of the massage program on this psychological attribute. Accordingly, the null hypothesis (H_{01}) proposed that the intervention would not produce a statistically meaningful change in mental toughness. To examine this, linear regression analysis was performed using data from the intervention group, where exposure to the sports massage program was treated as the predictor variable and mental toughness was the outcome variable.

Table 1: Simple Linear Regression Test: Sports Massage on Mental Toughness (Treatment Group)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.594	1	1.594	13.123	.001[b]
Residual	3.645	30	.121		
Total	5.239	31			

Dependent Variable: Mental Toughness
Predictor: Sports Massage

The impact of the sports massage intervention on the athletes' mental toughness scores was assessed using a regression model, which yielded F (1, 30) = 13.123, p = .001. The model had a regression sum of squares of 1.594, which was significantly larger than the residual sum of squares of 3.645, indicating that the predictor (sports massage) was a major contributor to the model's explanatory power.

The p-value of .001, which was about 5 times smaller than .05, means that the chances of the null hypothesis being correct are significantly low. These findings indicate that participation in sports massage may contribute to enhanced mental toughness among athletes. This is consistent with the theory that the psychological aspects of being prepared to fight can be enhanced by the process of physical recovery, because some of the psychological aspects of being prepared to fight, especially emotional control and tension relief, can be enhanced by the process of physical recovery.

Table 2: Regression Coefficients: Sports Massage on Mental Toughness

Model	Unstandardized B	Std. Error	Standardized Beta	t	Sig.
(Constant)	2.424	.195	-	12.441	< .001
Sports Massage	.446	.123	.552	3.623	.001

Dependent Variable: Mental Toughness
Predictor: Sports Massage

The intercept (B = 2.424, p < .001) reflects the estimated baseline level of mental toughness in the absence of the sports massage intervention. The positive regression coefficient for sports massage (B = .446) indicates that greater exposure to the intervention is associated with higher mental toughness scores. Specifically, for each one-unit increase in sports massage participation, mental toughness is predicted to rise by approximately 0.446 units. This is a strong increase in psychological toughness.

The standardized beta coefficient (β = .552) indicates a moderate positive effect, indicating that the sports massage improves mental toughness after adjusting for measurement scales. The associated t-value (3.623, p = .001) indicates the strength of this relationship. Evidence from these studies supports the notion that sports massage improves the mental toughness of high-performance student-athletes.

Table 3: Model Summary: Sports Massage towards Mental Toughness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.552[a]	.304	.281	.34856

Predictor: Sports Massage

The correlation coefficient (R = .552) shows a moderate positive relationship between sports massage and mental toughness. This indicates that athletes who received the intervention exhibited greater mental toughness. The coefficient of determination (R^2 = .304) indicates that the sports massage intervention accounts for 30.4% of the variance in mental toughness. This shows the significant psychological effect due to the intervention, given the complex nature of mental toughness.

The adjusted R^2 value (0.281) indicates that sample size and model simplicity were accounted for. This means that 28.1% of the change could reasonably be credited to the intervention. The standard error of the estimate (0.34856) shows a moderate predictive accuracy. This means that the model gives a precise estimate of mental toughness scores in relation to the sports massage variable.

The regression output, including the overall model fit and parameter estimates, suggests that the sports massage intervention is moderately associated with higher levels of mental toughness among the players. The F-statistic indicates that the model provides a statistically meaningful explanation of variance in the outcome variable. The corresponding p-values fall below the accepted significance threshold, and the proportion of variance explained by the model reflects a moderate effect size. This variation indicates that sports massage generally helps athletes improve their stress-coping, sustained focus, and resilience in sport.

Based on these findings, the null hypothesis (H_{01}) is not supported, indicating that participation in the sports massage program is associated with improved mental toughness among high-performance student-athletes. Beyond its role in physical recovery, the intervention appears to offer psychological benefits, potentially

helping athletes build the mental readiness required to cope with demanding competitive environments.

4.2 Effect of Sports Massage on the Psychological Well-Being of High-performance student-athletes.

The second research objective examined the degree to which sports massage positively impacts the psychological health of high-performance student-athletes. Research Question 2 asked whether the intervention leads to a measurable change in psychological health. The null hypothesis (H_{02}) posited that sports massage has no effect on this variable. The data obtained from the intervention group was examined through a simple linear regression procedure, where exposure to the sports massage program was treated as the predictor variable and psychological health served as the outcome measure.

Table 4: Simple Linear Regression: Sports Massage for Psychological Well-Being (Treatment Group)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	16.327	1	16.327	53.545	< .001[b]
Residual	9.147	30	.305		
Total	25.474	31			

Dependent Variable: Psychological Well-Being
Predictor: Sports Massage

The regression analysis revealed that participation in the sports massage program was significantly associated with psychological health outcomes, $F(1, 30) = 53.545$, $p < .001$. This result provides strong statistical evidence against the null hypothesis. In practical terms, the findings suggest that the intervention is linked to improvements in psychological health among high-performance student-athletes.

The regression sum of squares (16.327) was substantially larger than the residual sum of squares (9.147), suggesting that the model captures substantial variability in psychological health. The large effect and large p-value ($p < .001$) suggest that this effect is stable and reliable. In this case, the effect of sports massage is likely to extend beyond the athletes' physical recovery to include their emotional and psychological health. Elite athletes should consider sports massage, as well as its individual effects on psychological well-being, stress, anxiety, and fatigue, and recovery quality. This may suggest that more positive emotional responses are possible. Participants may experience greater recovery and more positive psychological responses to massage during periods of intense training.

Table 5: Regression Coefficients: Sports Massage and Psychological Well-Being

Model	Unstandardized B	Std. Error	Standardized Beta	t	Sig.
(Constant)	.786	.309	-	2.545	.016
Sports Massage	1.429	.195	.801	7.317	< .001

Dependent Variable: Psychological Well-Being

In the absence of sports massage, the unstandardized coefficient for the constant term (B = .786, p = .016) represents the baseline psychological well-being score. Each unstandardized 1-unit increase in sports massage (B = 1.429) is associated with a 1-unit increase in psychological well-being. This is a clear positive for the intervention and a clear demonstration of its success. The analysis demonstrates a substantial positive association between participation in the sports massage program and the level of psychological well-being. The magnitude of the standardized beta coefficient indicates that exposure to the intervention meaningfully contributes to the prediction of athletes' psychological well-being in this sample.

The t-statistic (t = 7.317, p < .001) indicates that the observed relationship is highly unlikely to be due to chance. This reinforces the interpretation that the intervention is consistently linked to the improved psychological well-being among the athletes studied. These findings strongly support the assertion that sports massage confers significant psychological benefits in elite athletics.

Table 6: Model Summary: Sports Massage and Psychological Well-Being

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.801[a]	.641	.629	.55219

Predictor: Sports Massage

The summary of results illustrates the effectiveness and explanatory power of sports massage as a psychological intervention. The correlation coefficient (R = .801) indicates a strong association between sports massage and psychological well-being. More sports massage sessions were associated with higher psychological ratings of wellness.

The model's R^2 of 0.641 indicates that approximately 64.1% of the variance in psychological well-being scores is explained by participation in the sports massage program. Psychological studies are often influenced by numerous external factors, which accounts for the exceptionally high percentage. The adjusted R^2 (0.629) further confirms the positive impact of the sports massage intervention, after controlling for sample size, thereby increasing the model's generalizability to similar athlete populations. The Standard Error (0.55219) indicates that the predicted and actual values are closely related, further supporting the regression model's strong predictive ability.

Taken together, the findings suggest that participation in the sports massage program is associated with improved psychological well-being among high-performance student-athletes. The strength of the overall model, reflected in the F-statistic, the proportion of variance accounted for, and the magnitude of the standardized beta coefficient indicate that the intervention meaningfully contributes to psychological outcomes in this sample.

5. Discussion

The results clearly show that sports massage not only aids physical recovery but also supports athletes in maintaining emotional equilibrium, alleviating psychological strain, and enhancing mental health. In light of these findings, the second null hypothesis (H_{02}) is not supported, suggesting that engagement in the sports massage program is associated with improved psychological health among student-athletes.

The results further offer empirical support for incorporating sports massage as a structured component of athlete support programs, given its observed contribution to strengthening mental toughness in high-performance university athletes. Regression analysis showed that sports massage accounted for 30.4% of the variance in mental toughness, a positive, moderate, and practically significant finding. Achieving such a level of variance is atypical and represents a threshold. Mental toughness is widely recognized as a complex and sophisticated psychological domain (Pachaiappan et al., 2025), and is a psychobiological function comprising individual psychological attributes, environmental conditions, stress and/or pressure, exposure, and developed psychological skills. The findings of this study demonstrate that recovery-related somatic interventions improve the psychologically flexible non-technical and/or cognitive capabilities of adaptive psychological function and the learning-performance continuum related to both.

The enhancement in mental toughness may be due to indirect mental processes following the sports massage. Previous work has shown that sports massage therapy improves relaxation, promotes feelings of recovery, and reduces cognitive and physical anxiety (Davis et al., 2020; Taskin et al., 2025). In contemporary mental toughness literature, emotional control and cognitive load management are critical (Crust & Azadi, 2010; Guzmán-Muzante et al., 2024; Pachaiappan et al., 2025). Because sports massage appears to facilitate relaxation and alleviate stress responses, it may support student-athletes in maintaining concentration, emotional stability, and psychological resilience when navigating both academic demands and competitive pressures. This reasoning aligns with stress-recovery theory, which posits that appropriate recovery techniques help restore the balance in physical and psychological functioning and prevent stress from accumulating, which can derail functioning in a positive way (Dakić et al., 2023).

The findings are remarkably consistent with the most recent literature conceptualizing mental toughness as flexible and changeable, rather than fixed and rigid. Recent literature suggests that mental toughness can be positively influenced by environmental and experiential factors over time (Guzmán-Muzante et al., 2024). In this study, the moderate standardized beta coefficient suggests that student-athletes may be more in control of their physical and psychological states when they are exposed more frequently to sports massage. Perceived control is critical to adaptive coping and psychological resilience, particularly in high-pressure situations in the university environment, where individuals must juggle competing academic and sport commitments (Gomez et

al., 2018; Domingo et al., 2025). From the standpoint of educational practice, these results substantiate the need to use somatic recovery techniques within the student-athlete developmental support model.

The findings of this study indicate a substantial positive association between participation in the sports massage program and psychological well-being. The model results show that approximately 64.1% of the variation in well-being scores was accounted for by the intervention, reflecting a meaningful improvement in psychological outcomes among the athletes. The positive impact underscores the importance of recovery-focused interventions for improving emotional and psychological well-being in highly demanding educational and performance settings. Psychological well-being can be understood as a multifaceted concept encompassing emotional balance, self-governance, meaning, and positive functioning (Ryff, 2014; Arslan, 2023; Sayed, Malan, & Fourie, 2024). The results suggest that psychological massage also tends to reduce psychological problems and increase the likelihood of having a healthy psyche.

More recent studies provide strong empirical evidence that sports massage improves mood, reduces stress/ anxiety, and enhances elite athletes' recovery and relaxation (Dakić et al., 2023; Mathunjwa et al., 2025). Additional evidence in this study is that sports massage improves psychological well-being beyond emotional and psychological relief. This differentiation is particularly important in high-performance university settings, where continuous academic and performance-related stressors are prevalent and detrimental to mental well-being, increasing the likelihood of burnout and disengagement (Nuetzel, 2025).

The relevance of sports massage extends beyond physical recovery as it may influence psychological functioning through mechanisms such as self-regulation and psychophysiological restoration. Psychological well-being, in this context, refers to an individual's capacity to regulate their emotional responses, adapt to stressors, and maintain psychological equilibrium despite ongoing environmental pressures (Klainin-Yobas et al., 2021). Sports massage can enhance an individual's self-regulatory capabilities by reducing physical discomfort and emotional and physical stress, thereby improving emotional and psychological functioning. This explanation aligns with the literature on resilience, which argues that when well-being-focused resources are combined, the person being supported also gains an increased capacity to adapt to and cope with stress (Sayed et al., 2024; Tartakowsky-Pezoa et al., 2025).

These findings are particularly applicable to high-performance student-athletes in university contexts who experience psychosocial stressors specific to academic responsibilities, including performance evaluations, injury risk, and uncertainty about their future careers. Research shows that student-athletes are particularly stressed and experience barriers to seeking professional support for their mental health, which is detrimental to their psychological well-being and involvement (Harris & Maher, 2023; Cosh et al., 2024). Here, sports massage is an accessible, non-stigmatizing support strategy that can be incorporated into existing sports and educational practices.

By extending services to include structured sports massage, higher education institutions can promote psychological and emotional health and foster long-term interest in learning and performance. It also aligns with more comprehensive student-centered frameworks, in which psychological and emotional health is foundational to learning, retention, and long-term success.

Taken together, research in this area shows that sports massage has both moderate and substantial psychological effects. It increases mental toughness and psychological resilience; therefore, sports massage should be included in programs to promote emotional recovery and psychological resilience. This dual effect supports a psychosocial model of recovery, whereas traditional approaches focus solely on physical recovery and neglect to recognize the impact of physical recovery on mental stress, emotional control, and performance readiness.

These findings are perhaps the first to examine a psychological adjustment to sports massage. There is an abundance of literature addressing the physical benefits, but very little addressing the emotional and psychological components. The observed relationship between sports massage, mental toughness, and psychological well-being highlights its potential role within broader athlete support frameworks. These findings suggest that sports massage could be considered part of an integrated strategy to promote mental health and overall development among high-performance university athletes.

6. Conclusion

This investigation examined whether a systematically delivered sports massage program could influence mental resilience and psychological well-being among high-performance university student-athletes. The findings demonstrate that participation in the structured massage intervention was associated with meaningful improvements in mental toughness. A considerable proportion of the variability in mental toughness scores was accounted for by the intervention, suggesting that sports massage may contribute to enhanced emotional control, sustained attentional focus, and greater resilience in managing both competitive and academic demands.

Similarly, the analysis addressing the second research objective revealed that engagement in the massage program was positively linked to improvements in psychological well-being. The intervention accounted for a substantial proportion of the variance in indicators such as emotional balance, perceived stress levels, and overall mental health status. These outcomes indicate that structured sports massage may serve as a valuable component in supporting the psychological functioning of high-performance student-athletes.

Collectively, the results extend the role of sports massage beyond physical recovery, highlighting its potential psychological benefits within university high-performance settings. Integrating structured massage into athlete support systems may foster sustained mental resilience and emotional stability, thereby contributing to longer-term engagement, adaptability, and performance sustainability in both academic and sporting contexts.

7. Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this study. The research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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9. References

Abdullah, M. F., Nazarudin, M. N., Saadan, R., Wan Pa, W. A. M., & Abdul Razak, M. R. (2018). Benefits and barriers of physical activities among technical university students. *Journal of Advanced Research in Social and Behavioural Sciences, 13*(1), 1–8. https://eprints.ums.edu.my/id/eprint/23701/

Abulfaraj, G. G., Upsher, R., Zavos, H. M. S., & Dommett, E. J. (2024). The impact of resilience interventions on university students' mental health and well-being: A systematic review. *Education Sciences*, *14*(5), 510. https://doi.org/10.3390/educsci14050510

Arslan, G. (2023). Psychological well-being and mental health in youth: Technical adequacy of the Comprehensive Inventory of Thriving. *Children, 10*(7), 1269. https://doi.org/10.3390/children10071269

Bikar, S. S., Talin, R., Rathakrishnan, B., Sharif, S., Nazarudin, M. N., & Rabe, Z. B. (2023). Sustainability of graduate employability in the post-COVID-19 era: Initiatives by the Malaysian Ministry of Higher Education and universities. *Sustainability, 15*, Article 13536. https://doi.org/10.3390/su151813536

Chaliawala, K. S., Vidourek, R. A., & King, K. A. (2025). Anxiety among Asian international college students in the US: a systematic literature review. *Journal of American College Health*, *73*(6), 2564-2571. https://doi.org/10.1080/07448481.2024.2317170

Cosh, S. M., McNeil, D. G., Jeffreys, A., Clark, L., & Tully, P. J. (2024). Athlete mental health help-seeking: A systematic review and meta-analysis of rates, barriers and facilitators. *Psychology of Sport and Exercise, 71*, 102586. https://doi.org/10.1016/j.psychsport.2023.102586

Crust, L., & Azadi, K. (2010). Mental toughness and athletes' use of psychological strategies. *European Journal of Sport Science, 10*(1), 43–51. https://doi.org/10.1080/17461390903049972

Dakić, M., Toskić, L., Ilić, V., Đurić, S., Dopsaj, M., & Šimenko, J. (2023). The effects of massage therapy on sport and exercise performance: A systematic review. *Sports, 11*(6), 110. https://doi.org/10.3390/sports11060110

Davis, H. L., Alabed, S., & Chico, T. J. A. (2020). Effect of sports massage on performance and recovery: A systematic review and meta-analysis. *BMJ Open Sport & Exercise Medicine, 6*(1), e000614. https://doi.org/10.1136/bmjsem-2019-000614

Gomez, J., Bradley, J., & Conway, P. (2018). The challenges of a high-performance student athlete. *Irish Educational Studies, 37*(3), 329–349. https://doi.org/10.1080/03323315.2018.1484299

Guzmán-Muzante, J. P., Riquelme-Ortíz, G., Urrea-Cuéllar, Á., Romero-Carrasco, A. E., & Fonseca, A. M. (2024). Mental toughness: State or trait? Context and sporting

performance in rugby union. *Retos, 61*, 988–995. https://doi.org/10.47197/retos.v61.104841

Harris, B. R., & Maher, B. M. (2023). Student-athlete mental health, help-seeking, and service utilization: Implications for a multi-tiered, public health approach on college campuses. *Journal of College Student Psychotherapy, 37*(4), 371–390. https://doi.org/10.1080/87568225.2022.2109548

Hernando Domingo, C., Renau-Michavila, M., et al. (2025). Dual-career student athletes in Spanish universities: Characteristics and interests. *Frontiers in Sports and Active Living, 6,* 1507859. https://doi.org/10.3389/fspor.2024.1507859

Jing, S., Wan Pa, W. A. M., & Awang, M. M. (2025). Anxiety and depression among Chinese international student-athletes during study abroad: A psychological network approach. *Physical Education of Students, 29*(1), 27–38. https://doi.org/10.15561/20755279.2025.0103

Klainin-Yobas, P., Vongsirimas, N., Ramirez, D. Q., Sarmiento, J., & Fernandez, Z. (2021). Evaluating the relationships among stress, resilience and psychological well-being among young adults: A structural equation modelling approach. *BMC Nursing, 20*(1), 119. https://doi.org/10.1186/s12912-021-00645-9

Liew, G. C., Kuan, G., Chin, N. S., & Hashim, H. A. (2019). Mental toughness in sport: Systematic review and future directions. *German Journal of Exercise and Sport Research, 49*(4), 381–394. https://doi.org/10.1007/s12662-019-00603-3

Mathunjwa, M. L., Mahlangu, S., & Haddad, M. (2025). Evaluating the impact of massage therapy on performance and well-being in Taekwondo practitioners: A systematic review. *International Journal of Environmental Research and Public Health, 22*(5), 742. https://doi.org/10.3390/ijerph22050742

Nuetzel, B. (2025). Stress and its impact on elite athletes' wellbeing and mental health: A mini narrative review. *Frontiers in Sports and Active Living, 7,* 1630784. https://doi.org/10.3389/fspor.2025.1630784

Pachaiappan, R. S. P., Veeraswamy, V. B., Mahalingam, K., & Parthiban, B. (2025). Mental toughness and athletic performance: A narrative review. *Journal of Basic and Clinical Physiology and Pharmacology.* https://doi.org/10.1515/jbcpp-2024-0127

Pandian, P. R. S., Kumar, B., Kannan, M. V., Gurusamy, G., & Lakshmi, B. (2023). Impact of mental toughness on athlete's performance and interventions to improve. *Journal of basic and clinical physiology and pharmacology*, *34*(4), 409-418. https://doi.org/10.1515/jbcpp-2022-0129

Ryff, C. D. (2014). Psychological well-being revisited. *Psychotherapy and Psychosomatics, 83*(1), 10–28. https://doi.org/10.1159/000353263

Sayed, T., Malan, H., & Fourie, E. (2024). Exploring the associations between resilience and psychological well-being among South Africans during COVID-19. *Frontiers in Psychology, 15*, 1323466. https://doi.org/10.3389/fpsyg.2024.1323466

Tan, Y., Huang, H., Geng, J., Cheung, S. P., & Zhang, Y. (2021). Psychological well-being in Chinese college students during the COVID-19 pandemic: Roles of resilience and environmental stress. *Frontiers in Psychology, 12,* 671553. https://doi.org/10.3389/fpsyg.2021.671553

Tartakowsky-Pezoa, V., Araneda-Bengoechea, M. E., & Marín-Medina, C. (2025). Relación entre la resiliencia, el bienestar psicológico y la satisfacción familiar en universitarios atendidos en servicios universitarios de atención psicológica. *Autoctonía. Revista de Ciencias Sociales e Historia, 9*(Número especial), 2310–2348. https://doi.org/10.23854/autoc.v9iespecial.580

Taskin, M., Korkmaz, E., Budak, M., Sahin, I. H., & Taskin, H. (2025). The effect of sports massage on state anxiety in elite soccer athletes. *Frontiers in Psychology, 16,* 1724892. https://doi.org/10.3389/fpsyg.2025.1724892

Wa Pa, W. A. M., Hamid, R., & Mazalan, N. S. (2026). Effects of outdoor physical activity on behavioural regulation among Malaysian university students. *Retos, 77*, 488–496. https://doi.org/10.47197/retos.v77.118157

Wan Pa, W. A. M., Salamuddin, N., Mohamad Zin, N., & Koh Choon Lian, D. (2021). The effect of sports massage towards cortisol and pre-competition anxiety among Malaysian elite tennis athletes. *Journal of Contemporary Issues in Business and Government, 27*(2), 1518–1528. https://doi.org/10.47750/cibg.2021.27.02.163