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Psychophysiological Stress and Recovery in Sports Science Students: Evidence from RESTQ-Sport 76 Monitoring

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Abstract
Sports students face multidimensional pressures from academic demands and physical training, which have the potential to cause chronic stress and impaired recovery if not managed properly. This study aimed to analyze the stress and recovery profiles of sports students based on gender and type of sport (individual/team) using the RESTQ-Sport 76 instrument. Methodology: A cross-sectional study was conducted on 161 students of the Faculty of Sport Science, Semarang State University. Data were collected using the Indonesian version of the RESTQ-Sport 76 and statistically analyzed using t-tests to compare differences based on gender and type of sport. Results: There was no significant difference in stress and recovery levels between male and female students ($p>0.05$), although males tended to have higher recovery scores. Similarly, there was no significant difference between individual and team athletes. However, sleep and rest quality were identified as critical aspects that need to be improved. Conclusion: Stress and recovery in sports students are influenced by academic and training factors in general, not solely by gender or type of sport. Holistic monitoring and needs-based interventions are recommended to improve the well-being of student athletes.

Keywords: stress-recovery, sports students, RESTQ-Sport 76, gender, sport type

INTRODUCTION

Sport students are a population under multidimensional pressure, they have to balance high academic responsibilities with the burden of physical training and competition.[1] These pressures create a complex and ongoing stress burden that, if not properly monitored and managed, can negatively impact their physical performance, mental health and academic achievement.[2] Research shows that chronic stress that is not effectively managed contributes to an increased risk of mental

[1] Gomez, J., J. Bradley, and P. Conway. 2018. "The Challenges of a High-Performance Student Athlete." Irish Educational Studies 37 (3): 329–49. https://doi.org/10.1080/03323315.2018.1484299.

[2] Deng, Yuwei, Jacob Cherian, Noor Un Nisa Khan, Kalpina Kumari, Muhammad Safdar Sial, Ubaldo Comite, Beata Gavurova, and József Popp. 2022. "Family and Academic Stress and Their Impact on Students' Depression Level and Academic Performance." Frontiers in Psychiatry 13 (June). https://doi.org/10.3389/fpsyt.2022.869337.

fatigue[3], sports injuries,[4] sports performance, [5], and decreased motivation to learn and academic performance.[6]

Stress is a complex process that occurs when a person's resources are insufficient to cope with their demands, causing physiological and psychological responses. An imbalance between perceived demands and available resources can lead to a variety of physical, emotional, and behavioral symptoms.[7]

In the context of sport students, stress can stem from competitive pressures, academic demands, coach or institutional expectations, to lack of free time and social support.[8] In most cases, fatigue can be compensated through recovery, which usually includes restoring physiological and psychological resources.[9] Recovery is defined as a psychobiological process that allows individuals to restore optimal performance capacity, whether physically, cognitively, or emotionally. [10]

An imbalance between stress and recovery has been shown to have significant consequences. The accumulation of stress such as increased training load over a long period of time that exceeds recovery can have systemic consequences such as overtraining syndrome, resulting in decreased performance, increased risk of injury and disease, and disruption of the endocrine, neurological, cardiovascular, and psychological systems.[11] Research by Agortey (2023) on 335 students showed the results of exercise stress had a statistically significant effect on academic performance.[12]

Physiologically, the accumulation of stress that is not balanced with recovery can disrupt the neuroendocrine system, increase cortisol levels, reduce heart rate variability, and reduce the body's

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[4] Pal, Sajjan, Sheetal kalra, and Supriya Awasthi. 2021. "Influence of Stress and Anxiety on Sports Injuries in Athletes." Journal Of Clinical And Diagnostic Research. https://doi.org/10.7860/jcdr/2021/45973.14702.

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[11] Brenner, Joel S., and Andrew Watson. 2024. "Overuse Injuries, Overtraining, and Burnout in Young Athletes." Pediatrics 153 (2). https://doi.org/10.1542/peds.2023-065129.

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adaptive capacity to exercise.[13] This condition not only affects physical performance, but also affects cognitive abilities such as concentration, working memory, and decision-making, which are essential factors in the learning process and sports competition.[14]

Gender differences and sport type (individual vs. team) are among the variables that influence athletes' perception and response to stress and their recovery mechanisms .[15] [16] [17] [18]Research by Reynoso-Sánchez et al. (2021) showed that female athletes tend to have lower general recovery scores and higher sports stress scores compared to male athletes.[19] In addition, research by Correia and Rosado (2019) found that female athletes and athletes from individual sports reported higher levels of sports anxiety compared to their male counterparts and athletes from team sports. These differences could be attributed to biological, psychosocial and cultural factors that influence athletes' experiences and coping strategies.

The type of sport has a significant effect on athletes' stress levels and recovery process Click or tap here to enter text..[20] Athletes from individual sports, such as swimming or tennis, tend to experience higher stress levels because the responsibility of performance is entirely on oneself, with no direct support from teammates. In contrast, athletes from team sports can utilize social support and team cohesion as a shield against stress, which speeds up recovery. However, complex team dynamics, such as conflict or social pressure, can also be a source of stress in itself. Bang et al. (2024) showed that team sport participation has a lower risk of anxiety and depression than individual

[13] Kivimäki, Mika, Alessandro Bartolomucci, and Ichiro Kawachi. 2023. "The Multiple Roles of Life Stress in Metabolic Disorders." Nature Reviews Endocrinology. Nature Research. https://doi.org/10.1038/s41574-022-00746-8.

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[19] Reynoso-Sánchez, Luis Felipe, Germán Pérez-Verduzco, Miguel Ángel Celestino-Sánchez, Jeanette M. López-Walle, Jorge Zamarripa, Blanca Rocío Rangel-Colmenero, Hussein Muñoz-Helú, and Germán Hernández-Cruz. 2021. "Competitive Recovery–Stress and Mood States in Mexican Youth Athletes." Frontiers in Psychology 11 (January). https://doi.org/10.3389/fpsyg.2020.627828.

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sports,[21] while Vacher et al. (2017) reported the influence of stress recovery conditions on emotional responses in swimmers and their relationship with external and perceived training load.[22] Reynoso Sánchez et al. 2017 identified changes in stress-recovery balance, increased stress, and decreased recovery rates in handball athletes.[23]

The balance between stress and recovery needs to be monitored accurately, one of the instruments for monitoring stress and recovery is the Recovery-Stress Questionnaire for Athletes (RESTQ-Sport 76) developed by Kellmann and Kallus (2001). RESTQ-Sport 76 includes 76 items divided into 19 scales, designed to evaluate the balance between stress and recovery covering psychological, emotional, social, and physical aspects. This instrument has been internationally validated and widely used in sports research and practice due to its sensitivity and specificity in detecting changes in the psycho-physiological status of athletes.[24]

So far, the RESTQ-Sport 76 can only be used by professional or elite athletes, but the scientific literature has not widely documented the use for sports students with different lifestyles and stress. Sport students have a unique risk profile for physical and psychological stress due to the dual demands of academics and athletic training (Lopes Dos Santos et al. 2020)In Indonesia, research specifically examining the stress and recovery profiles of sport students based on gender and sport differences is still very limited, especially in the use of the linguistically and culturally adapted RESTQ-Sport 76.

Based on this background, this study aims to evaluate the stress and recovery characteristics of male and female sports students and types of sports (individual and team) using the Indonesian version of RESTQ-Sport 76. The results in this study are expected to be a reference in designing training programs that are more in line with the needs of athletes or sports students, as well as helping the development of a data-based physical and mental condition monitoring system in the sports education environment.

METHOD

Participants

A cross-sectional study was conducted with explanatory correlation coverage. A convenient non-probabilistic sampling was used. One hundred and sixty-one sports students at the Faculty of Sport Science, Universitas Negeri Semarang in 2025 (75.2% female and 24.8% male), aged 19.48 (1.2 years; range = 18-24) years, participating in 19 different sports disciplines football (23.0%), running (17.4%), futsal (12.4%), basketball and volleyball (8.1% each), badminton (6.2%), swimming (4.3%), gymnastics, silat, and tennis (3.1% each), and taekwondo and muangthai (2.5%) were also recorded. Sports with smaller participation included handball (1.9%), woodball (1.2%), and 0.6% each for cycling, weightlifting, chess, shot put, and wushu.

Instruments

Recovery-Stress Questionnaire for Athlete 76 (RESRQ-Sport 76)

Stress-recovery balance was assessed by the RESTQ-Sport 76. This questionnaire consists of 76 items distributed in 19 scales consisting of General stress; Emotional stress; Social stress; Conflict/Pressure; Fatigue; Lack of energy; Physical complaints; Success; Social recovery; Physical

[21] Bang, Hyejin, Mido Chang, and Sunha Kim. 2024. "Team and Individual Sport Participation, School Belonging, and Gender Differences in Adolescent Depression." Children and Youth Services Review 159 (April). https://doi.org/10.1016/j.childyouth.2024.107517.

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recovery; General well-being; Sleep quality; Disturbed rest; Emotional exhaustion; Injuries; Maintaining fitness; Personal achievement; Self-efficacy; Self-regulation. The 19 scales were then grouped into four dimensions: seven general stress (GS) scales, five general recovery (GR) scales, three sport stress (SS), and four sport recovery (SR) scales. The items in the RESTQ-Sport questionnaire are all in the form of incomplete sentences and a Likert-type scale is used with values ranging from 0 (never) to 6 (always). This answer indicates how many times the participant participated in the activity during the last three days/nights.[24]

Statistical Analysis

Descriptive analysis for mean (M), standard deviation (SD), and frequency distribution. The RESTQ-Sport scale was grouped into its respective dimensions and analyzed for differences using t-test for independent samples to determine differences in stress-recovery perceptions, according to gender (female and male) and type of sport (individual or team) as independent factors. A p value < 0.05 was considered as a significant difference. For the data analysis, the statistical packages SPSS v. 22 were used.

RESULT & DISCUSSION

Result

RESTQ-Sport 76 Assessment Based on Gender

Table 1 shows the descriptive analysis of the RESTQ-Sport 76 scores on the General Stress dimension, the mean scores on the General Stress, Emotional Stress, and Social Stress subscales were in the low to moderate range (1.91-2.21), with slightly higher values in the female group. However, there was no significant difference between genders ($p > 0.05$). The Conflicts/Pressure subscale showed the highest score in the male group (3.14) and 2.84 in the female group. This indicates that psychosocial stress is still moderate and has not shown symptoms of severe distress. Statistical analysis p=0.639, there is no gender difference in the Conflicts/Pressure variable.

In the General Recovery dimension, male students tend to show higher scores, especially in the subscales of Social Recovery (3.66), Success (3.46), General Well-being (3.47), and Physical Recovery (3.14) compared to females who have a slightly lower average. The Sleep Quality subscale showed a score of 2.54 in men and 2.47 in women, indicating that sleep quality is an area that needs further attention in the recovery aspect. P>0.05 there was no General Recovery dimension in male or female sports students.

Determinants of Sport Stress, the mean on the Disturbed Breaks, Emotional Exhaustion and Injury subscales (2.14 - 2.44) were all at a moderate level and showed no significant differences between genders. This indicates that stress due to interrupted breaks and emotional exhaustion related to sport activities are still felt quite high by sports students, but have not reached a critical level.

Meanwhile, in the Sport Recovery dimension, all subscales showed a mean score of 3, especially in the subscales of Fitness/Being in Shape (3.55 males and 3.13 females) and Self-Efficacy (3.41 males and 3.04 females). Although the mean recovery scores of male students were higher than those of female students across all subscales, the t-test results showed that the difference was not statistically significant ($p > 0.05$). This reflects that perceptions of post-exercise recovery in the context of sport are favorable and relatively evenly distributed between genders.

TABLE 1. RESTQ-Sport score by gender

Scale	RESTQ-Sport average score		t
	Male	Female	
	M ± SD	M ± SD	
General Stress (GS):			
General stress	1.91 ± 1.184	1.97 ± 1.05	0.759
Emotional stress	1.95 ± 1.04	2.00 ± 0.82	0.462
Social_stress	2.15 ± 0.99	2.21 ± 0.68	0.549
Conflicts/pressure	3.14 ± 0.99	2.84 ± 0.80	0.639
Fatique	2.17 ± 0.94	2.17 ± 0.89	0.303
Lack of energy	1.96 ± 0.87	2.03 ± 0.76	0.364
Physical_complaint	2.42 ± 0.76	2.33 ± 0.66	0.647

General Recovery (GR):			
Succes	3.46 ± 0.96	3.21 ± 0.79	0.963
Social recovery	3.66 ± 1.08	3.41 ± 0.94	0.759
Physical recovery	3.19 ± 0.99	2.84 ± 0.69	0.448
General well-being	3.47 ± 1.15	3.23 ± 0.97	0.824
Sleep quality	2.54 ± 0.64	2.47 ± 0.65	0.864
Sport Stress (SS):			
Distrubed breaks	2.44 ± 1.12	2.23 ± 0.92	0.234
Emotional exhaustion	2.42 ± 0.93	2.27 ± 0.87	0.627
Injury	2.24 ± 1.04	2.14 ± 0.90	0.741
Sport Recovery (SR):			
Fitness/being in shape	3.55 ± 1.23	3.13 ± 1.00	0.535
Personal accomphlisment	3.31 ± 1.05	3.06 ± 0.90	0.147
Self-regulation	3.41 ± 1.24	3.16 ± 0.99	0.490
Self-efficacy	3.41 ± 1.14	3.04 ± 0.82	0.231

Notes: Likert scale RESTQ-Sport: 0 = Never; 1 = Rarely; 2 = Sometimes; 3 = Often; 4 = Quite often; 5 = Very often; 6 = Always, M=mean, SD = standard deviation
Sources: Author, 2025 (edited)

RESTQ-Sport Assessment 76 Based on Sport Type

A total of nine types of sports were identified in this study, which were then categorized into individual and team sports. A total of 47.8% of sports students participated in individual sports and 52.2% in team sports. Analysis of RESTQ-Sport 76 scores by sport type showed that students from individual and team sports had relatively balanced patterns of stress and recovery, although there were some minor differences in mean subscale scores.

In the General Stress dimension, mean scores indicated low to moderate levels of stress, with Social Stress being the highest subscale in both individual (2.13 ± 0.91) and team sport athletes (2.21 ± 0.94). Other subscales such as General Stress and Emotional Stress had scores below 2, indicating that stressful experiences were common but still within tolerable levels. No significant differences were found between groups ($p > 0.05$), including on the Conflicts/Pressure subscale which had the highest mean among the stress subscales (M = 3.10 individual vs. M = 3.03 team).

General Recovery, the results showed that both groups had a fairly good level of recovery. The subscales Social Recovery (M = 3.62 individual; M = 3.58 team) and Success (M = 3.40 individual; M = 3.39 team), indicated a positive perception of personal success and social support. Sleep quality remained the lowest scoring area (M = 2.53 individual; M = 2.51 team). All differences between groups were not statistically significant ($p > 0.05$).

Within the Sport Stress dimension, the mean scores indicated a tendency towards moderate psychological distress arising from the sporting context. The Disturbed Breaks subscale scored 2.29 for individuals and 2.49 for teams, followed by Emotional Exhaustion and Injury, which both scored around 2.3-2.4 in both groups. There was no significant difference between the individual and team sport groups in this dimension ($p>0.05$).

The RESTQ-Sport scores on the Sport Recovery dimension showed sport students from both disciplines demonstrated positive recovery perceptions. The Personal Accomplishment subscale showed high scores (M = 3.51 individual; M = 3.40 team), followed by Self-Regulation and Self-Efficacy. There were no significant differences between groups in all sport recovery subscales ($p > 0.05$), indicating that sport type did not substantially affect students' psychological and physical recovery levels.

TABLE 2. RESTQ-Sport score by sport type

Scale	RESTQ-Sport average score		t
	Individual	Team	
	M±SD	M±SD	
General Stress (GS):			
General stress	1.90 ± 1.12	1.96 ± 1.19	0.758
Emotional stress	1.90 ± 0.98	2.02 ± 0.99	0.462
Social_stress	2.13 ± 0.91	2.21 ± 0.94	0.548
Conflicts/pressure	3.10 ± 0.86	3.03 ±1.04	0.636
Fatique	2.25 ± 0.94	2.10 ± 0.92	0.303
Lack of energy	1.92 ± 0.88	2.04 ± 0.81	0.369

Physical_complaint	2.42 ± 0.67	2.37 ± 0.79	0.647
General Recovery (GR):			
Succes	3.40 ± 0.92	3.39 ± 0.94	0.963
Social recovery	3.62 ± 1.11	3.58 ± 1.00	0.755
Physical recovery	3.17 ± 0.95	3.05 ± 0.92	0,449
General well-being	3.43 ± 1.13	3.39 ± 1.09	0.826
Sleep quality	2.53 ± 0.60	2.51 ± 0.70	0.864
Sport Stress (SR):			
Distrubed breaks	2.29 ± 1.06	2.49 ± 1.08	0.234
Emotional exhaustion	2.42 ± 0.90	2.35 ± 0.94	0.627
Injury	2.19 ± 0.88	2.24 ± 1.12	0.763
Sport Recovery (SR):			
Fitness/being in shape	2.30 ± 0.80	2.36 ± 0.90	0.535
Personal accomphlisment	3.51 ± 1.21	3.40 ± 1.17	0.147
Self-regulation	3.41 ± 0.80	3.29 ± 1.16	0.490
Self-efficacy	3.43 ± 0.99	3.26 ± 1.04	0.231

Notes: Likert scale RESTQ-Sport: 0 = Never; 1 = Rarely; 2 = Sometimes; 3 = Often; 4 = Quite often; 5 = Very often; 6 = Always, M=mean, SD = standard deviation
Sources: Author, 2025 (edited)

Discussion

The results of this study indicate that perceptions of stress and recovery in sport students, both by gender and sport type (individual and team), tend to be at a moderate level and show no statistically significant differences. However, differences in mean scores on some subscales still provide important insights for contextual interpretation. For example, although not significant, male university students tended to show higher recovery scores, particularly on Self-Efficacy, Fitness, and Social Recovery, which is in line with Reynoso-Sánchez et al.'s (2021) findings that female athletes have higher recovery scores, that female athletes had lower recovery scores and higher levels of sport stress than males.[19] Research by Chanchon (2022) women felt higher levels of stress than men in almost all aspects studied, except work (Méndez-Chacón 2022). [25]

The results showed that there were gender differences in recovery capacity. In male athletes, social recovery (3.66 versus 3.41) and self-efficacy scores were higher (3.41 vs. 3.04), although not significant (*p*>.05). Differences in stress-recovery responses could be due to biological-physiological,[26] and psychosocial differences, including hormonal responses to stress, [27] [28] differences in coping strategies, as well as gender-based social expectations. [18]

There are brain connections involving the amygdala and the influence of stress hormones (cortisol) on brain networks differs between women and men. [29] Women show stronger amygdala

[25] Méndez-Chacón, Ericka. 2022. "Gender Differences in Perceived Stress and Its Relationship to Telomere Length in Costa Rican Adults." Frontiers in Psychology 13 (February). https://doi.org/10.3389/fpsyg.2022.712660.

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responses to stress processing and negative emotions, but amygdala activity in men increases when processing positive emotions. [25] [29] [30] Neuroendocrine studies support the findings of this study on the role of testosterone in stress resilience.[31] Reynoso-Sánchez et al. (2021) that female athletes had lower recovery scores and higher levels of exercise stress than males.[19] Research by Chanchon (2022) that women felt higher levels of stress than men in almost all aspects studied, except work. [25]

The results of this study suggest that the relationship between sport type and stress levels and recovery is not always in line with popular opinion. Based on analysis using the RESTQ-Sport 76, psychosocial stress levels in sports students from individual sports (1.90± 1.12) and team sports (1.96± 1.19) were found to be similar, with a p value = 0.758 on the General Stress subscale. The results of this study contradict the opinion that in individual sports, the entire burden of effort, competitive pressure, and final results are entirely the responsibility of the athlete, so the potential stress borne is more personalized,[32] as well as a much higher level of competitive anxiety compared to team athletes. [33]

Several studies provide a different perspective: in modern team sports. In modern team sports, pressures arising from group dynamics and collective expectations can induce psychological stress comparable to that of individual athletes. This is influenced by factors such as shared emotions, individual performance demands within the team, and the complexity of interactions between members. [34] [35] [36]

RESTQ-Sport 76 identifies psychophysiological changes by incorporating various aspects of stress and recovery. Disturbed Breaks and Sleep Quality were among the low-scoring subscales across groups, suggesting that elements of passive recovery should be addressed. Elevated cortisol, impaired cognitive function, and risk of overtraining syndrome have been associated with poor sleep quality.[37]

This study has some methodological limitations. Interpretation of causality between stress and

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recovery variables is limited by the cross-sectional design. Self-report tools such as the RESTQ-Sport 76 may introduce subjective bias. In addition, findings may be influenced by the uneven distribution of the sample across different sports and uncontrollable factors, such as academic pressure and training load. To gain a more in-depth and generalized understanding, it is recommended to conduct further research using a longitudinal approach and control variables.

CONCLUSION

This study examined the stress and recovery profiles of sport students using the RESTQ-Sport 76 instrument. Results showed that stress and recovery levels were in the moderate range, with no significant differences by gender or sport type (individual/team). However, male students tended to have slightly higher recovery scores, especially in the aspects of social recovery and self-efficacy. No significant differences were found between individual and team sport athletes, suggesting that academic stress and training may be affecting all university students equally. These results suggest that thorough monitoring, particularly of sleep and rest quality, is crucial for recovery.

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DECLARATION OF CONFLICTING INTERESTS

The authors declare that there is no conflict of interest in this research or the publication of this research.

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