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Proceedings of the 1st International Summit Conference on Exercise Science, Sports Management, Outdoor Recreation, and Physical Education, ExSPORT 2024, 28th - 29th August, Malaysia

Exporting Research Insights to Practical Applications in Sports
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Gender Difference in Fatigue Index and Power Output

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Abstract | Understanding how men and women react differently to high-intensity exercise is critical for designing effective training regimens. Research suggests that men can become fatigued even if they generally have a greater peak strength compared to women. This study investigates potential sex-based differences in fatigue resistance and power production. Healthy volunteers of both genders will go through a Running-Based Anaerobic Sprint Test (RAST) methodology. The RAST measures peak power output (PPO), which is the greatest power generated during a sprint, and fatigue index, which is the drop in power output during repeated sprints. Twenty-four ($N = 24$) participants were divided into two groups, twelve (n =12) male participants and twelve (n = 12) female participants, to perform RAST. The statistical study will compare these measures across genders. This study seeks to determine if men and women differ significantly in fatigue resistance and power generation during high-intensity exercise. The findings can help to build gender-specific training tactics that address each sex's unique physiological responses. An Independent Sample T-Test was used to analyse the data obtained. The minimum power output recorded for females was ($M = 94.3$, $SD = 35.7$), whereas male data reported that the minimum power output was ($M = 136.8$, $SD = 51.1$) with $p = 0.027$. The maximum power was ($M = 251.2$, $SD = 42.8$) for female participants and males was ($M = 504.2$, $SD = 345.9$), and the p-value reported was 0.020. The findings of the fatigue index results showed that females had ($M = 3.30$, $SD = 0.77$) while males showed ($M = 8.92$, $SD = 8.01$) with a significant p-value of 0.024. The results indicated there was a significant difference in power output and fatigue index between males and females.

Keywords: *Gender, fatigue index, power output.*

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I. INTRODUCTION

Understanding the disparities in power output and fatigue between men and women requires considering several factors. While males have higher peak strength, they tend to exhaust more quickly, most likely due to a higher proportion of fast-twitch muscle fibres, which are geared for brief bursts of power but tire faster. In contrast, women have more slow-twitch fibres, which aid in endurance and fatigue resistance. Hormones also play a role: testosterone increases muscular growth and peak power in men, while oestrogen helps women avoid exhaustion. Psychological and social factors, such as stress and societal expectations, can influence how men and women perceive exhaustion.

The variations in power output and fatigue index between genders are investigated in this study. The evidence is conflicting, with some studies revealing no discernible gender differences while others suggest that males have higher peak power but tire more quickly [9] [11]. Through a thorough analysis of these variables, this study seeks to determine if men and women feel fatigue and power decline during exercise in different ways. This information will be useful in designing more specialised training regimens that maximise performance and effectively manage fatigue for both genders.

II. METHODS

The major approach for collecting data for this study is the Running-Based Anaerobic Sprint Test (RAST), which is used to examine gender differences in fatigue index and power output. To answer the question of whether there is any difference between genders in these two variables, the research is set up as a cross-sectional study. Accurate measurement of the important variables is made possible by the study design, which guarantees the validity and reliability of the data collection methods. Six 35-meter sprints will be performed by participants, who will be chosen according to predetermined standards, with 10-second rest intervals in between. The results of the study will be examined considering the body of prior research, with an emphasis on the research question, to advance our knowledge of how gender influences variations in athletic performance.

The study uses an experimental methodology for data analysis to investigate any gender differences in fatigue index and power output. The statistical analysis will be conducted using Jamovi software version 2.3.28, which will include Independent Sample T-Tests to compare the power output and mean fatigue index between the male and female groups. The findings will indicate whether the responses of men and women to high-intensity exercise differ statistically significantly. This methodology guarantees a thorough analysis of gender differences and adds significant insights to the field of sports science. It is bolstered using validated instruments such as PAR-Q+ and RAST [3] [8].

III. RESULTS AND DISCUSSION

The objective of the study is to determine the disparity in fatigue index and power output between genders. A total of 24 candidates from the Faculty of Administrative Science and Policy Studies at UiTM Seremban 3 were selected to take part in this examination. The participants were categorised into two cohorts based on their gender, specifically male and female, and underwent the Running-Based Anaerobic Sprint Test (RAST). The data obtained from this investigation were evaluated and analysed using the statistical software Jamovi. This chapter begins by examining the descriptive analysis, followed by an exploration of the Independent Sample T-Test, and concludes with a summary. The test consisted of 12 male participants and 12 female participants.

This study employed the RAST (Repeated Anaerobic Sprint Test) protocol, in which subjects performed six 35-meter sprints with 10 seconds of rest between each sprint. The descriptive data revealed that the standard deviation for maximum power output for males was 345.883, while for females it was 42.780. The mean maximum power output for males was 504.17, while for females it was 251.17.

Additionally, the table shows that the standard deviation for minimum power output in the Faculty of Administrative Science and Policy Studies at UiTM Seremban 3 for males was 51.092, while for females it was 35.668. The mean minimum power output for males was 136.75, while for females, it was 94.25. Lastly, the results revealed that the standard deviation for the fatigue index for males was 8.011, while for females it was 0.765. The mean fatigue index for males was 8.92, while for females it was 3.30. The Independent Sample T-Test showed statistically significant differences in maximum power output (p = 0.020), minimum power output (p = 0.027), and fatigue index (p = 0.024) between genders.

TABLE 1
DESCRIPTIVE DATA FOR GENDER DIFFERENCE IN FATIGUE INDEX AND POWER OUTPUT

Variables	**Mean (Male)**	**SD (Male)**	**Mean (Female)**	**SD (Female)**	***p*-value**
Maximum Power Output	504.17	345.883	251.17	42.780	0.020
Minimum Power Output	136.75	51.092	94.25	35.668	0.027
Fatigue Index	8.92	8.011	3.30	0.765	0.024

Through the use of Independent T-Tests and a quantitative approach with a descriptive design, this study discovered that, whereas male individuals showed higher maximum and minimum power outputs, female participants showed stronger fatigue resistance. The hypotheses were supported by data, which underwent analysis using Jamovi and showed substantial gender differences in tiredness index and power output. These results are consistent with previous studies, showing that men and women differ physiologically in terms of muscle strength, endurance, and power production.

IV. CONCLUSIONS

This study extensively examined the research findings about gender differences in fatigue index and power output. The study reveals notable discrepancies between male and female participants in relation to physiological responses and performance measures. Male participants exhibited a higher average minimum power output, demonstrating the ability to sustain higher power levels even during less intense activity. This can be attributed to their larger muscle mass and strength. Women demonstrated superior fatigue resistance, as seen by a lower fatigue index, enabling them to endure extended periods of exercise without experiencing rapid weariness. Men exhibited greater maximal power outputs under vigorous physical exertion, which can be attributed to an increase in muscle mass and alterations in fibre composition. These findings emphasise the necessity of training programs that are tailored to specific genders.

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