Running Head [Case Study]

[Name of Student]

[Name of Institute]

Case Study

Introduction

The case study aims to elaborate on an athletic runner in terms of the understanding and elucidation of physiological principles in terms of the sports arena. Furthermore, the case study entails the importance of physiological tests which are conducted on every athlete in professional practice concerning the case along with the comparison and contrast of the results of elite athletes.

Definitions and Overview of the Topic

1. Lactic Acid

"Lactic acid" is the remaining product formed in the course of "anaerobic respiration" in muscle. It is produced in the muscles when the human body there is insufficient energy and a low oxygen level of the body due to which the body breaks down "carbohydrates" for energy elevation breaks down carbohydrates to use for energy when oxygen levels are low (Chernopolskaya et al., 2019). Concerning sports arenas such as athletics, lactic acid is considered a poison, produced during extreme exercises, which affects the athlete's performance negatively by causing severe pain in muscles (Rusdiawan et al., 2020).

2. Lactate Thresholds

The "lactate threshold" is a point in the course of an extensive, all-out workout at which "lactate (i.e., the quantity of lactic acid)" is produced in the muscles of the body and bloodstream more rapidly than the human body can eliminate it (Farzam et al., 2018).

3. VO_{2max}

$VO_{2\,max}$ is the amount of the concentrated quantity of oxygen a human body can exploit in the course of workouts and exercise (Lee and Zhang, 2021).

4. Fast Twitch Muscle Fibres

"Fast-twitch muscle fiber" are the fibers that contract rapidly, especially in the course of transitory extensive physical exercises or workout which requires strength (Chen et al., 2021).

5. Fatigue

Fatigue is the feeling of exhaustion, tiredness, and lack of energy in the human body which occurs when an athlete performs extensive exercises due to which the supply of "Adenosine Triphosphate (ATP)" is unable to meet the consumption of ATP during the workout (Enoka and Duchateau, 2016).

Overview of Topic

The overview of the topic is the case study of a 19 year old athlete who has enrolled newly in this field for his future career. Moreover, the coach of the athlete conducted some tests on him for evaluating his physical and psychological health.

Why it is important for his discipline?

According to the research of Boxer (2019), individuals when pursuing their career in a specific arena or getting enrolled in a subject must have some know-how about the terminologies which are frequently used in that field as this is important for them to better understand their area of practice. Following the research, the knowledge of the above-mentioned terms was significant for the case study athlete so that he could better comprehend his field effectively.

Explain why these particular tests were conducted on him.

1. Lactic Acid Test

According to the research of Jamnick et al. (2020), a lactic acid test in athletics is conducted to measure the amount of lactic acid in the bloodstream. This test was performed on the case study athlete because it can elucidate the hard-working of an athlete in terms of his exercise and the elaboration of his training zone.

2. Lactate Thresholds Test

The lactate threshold test is one the most important scientific test for athletics in which the amount of lactate is evaluated before it can hinder the performance of an athlete (Messias et al., 2018). This test was conducted on the athlete to measure the amount of lactate in his bloodstream which if high could negatively impact his performance in the future.

3. VO_{2max} Test

The elucidation of Scheer et al. (2018) entailed that VO_{2max} Test is performed upon the athlete to measure the amount of oxygen produced when he performs exercise.

4. Fast Twitch and Muscle Fibre Test

The “Fast Twitch and Muscle Fibre Test” was significant for the case study athlete to test the dominant muscle fiber in him through which his strength was measured by his coach in terms of weightlifting, sprinting movements, etc.

5. Fatigue Test

The fatigue test was significant for the case study athlete for evaluating his physical and psychological health in terms of measuring his energy level which could impact his performance (Wan et al., 2017).

Compare and contrast his results with that of top club/elite athletes and explain the significance of these scores.

Elite Athlete

According to the research of Rice et al. (2016), elite athletes are the ones who have attained the top position in a specific sport due to their high-level performance. Concerning the physiological test results of the case study athlete, the research of Lundby et al. (2017) elucidated that the predicted amount of $VO_{2\ max}$ is "70-85 mL/Kg/min" in males while "60-75 mL/Kg/min" in females. While the percentage of $VO_{2\ max}$ is 60-80% in elite athletes with 4mmol lactate threshold 2 turn point (Wylleman and Rosier, 2016). However, the athlete in the case study had "60mL/Kg/min" of $VO_{2\ max}$ with "57% $VO_{2\ max}$" and "4mmol" lactate threshold 2 turn point. As per the analysis of Gløersen et al. (2018), $VO_{2\ max}$ amount and percentage and lactate threshold amount are good for the athlete as per his age and height and determine that his absorption o oxygen during exercise is good enough to be physically fit. These scores of the athlete signify that his physical activity is near to the quantity achieved by the elite athletes which are effective for his future career in this field.

Conclusion

From the case study, it is concluded that the elucidation of terminologies of fatigue, lactate threshold, $VO_{2max,}$ and fast twitch muscle fibers was significant for the case study athlete to understand the physiological principles of the sports arena as these terms are frequently applied in this field. Moreover, these tests were conducted on him to evaluate his energy level. Further, if the case study athlete can work on his activity, he can attain success as his physical activity is good enough and is comparable with the elite athletes.

References

Boxer, A.D.A.M., 2019. What is the best way to motivate students in your subject?. *Profession*, *18*, p.19.

Chen, C.H., Yang, W.W., Chen, Y.P., Chen, V.C.F., Liu, C. and Shiang, T.Y., 2021. High vibration frequency of soft tissue occurs during gait in power-trained athletes. *Journal of Sports Sciences*, *39*(4), pp.439-445.

Chernopolskaya, N., Gavrilova, N., Rebezov, M., Dolmatova, I., Zaitseva, T., Somova, Y., Babaeva, M., Ponomarev, E. and Voskanyan, O., 2019. Biotechnology of specialized product for sports nutrition. *International Journal of Engineering and Advanced Technology*, *8*(4), pp.40-45.

Enoka, R.M. and Duchateau, J., 2016. Translating fatigue to human performance. *Medicine and science in sports and exercise*, *48*(11), p.2228.

Farzam, P., Starkweather, Z. and Franceschini, M.A., 2018. Validation of a novel wearable, wireless technology to estimate oxygen levels and lactate threshold power in the exercising muscle. *Physiological reports*, *6*(7), p.e13664.

Gløersen, Ø., Myklebust, H., Hallén, J. and Federolf, P., 2018. Technique analysis in elite athletes using principal component analysis. *Journal of sports sciences*, *36*(2), pp.229-237.

Jamnick, N.A., Botella, J., Pyne, D.B. and Bishop, D.J., 2018. Manipulating graded exercise test variables affects the validity of the lactate threshold and V˙ O 2 peak. *PloS one*, *13*(7), p.e0199794.

Lee, J. and Zhang, X.L., 2021. Physiological determinants of VO2max and the methods to evaluate it: A critical review. *Science & Sports*, *36*(4), pp.259-271.

Lundby, C., Montero, D. and Joyner, M., 2017. Biology of VO2max: looking under the physiology lamp. *Acta Physiologica*, *220*(2), pp.218-228.

Messias, L.H.D., Polisel, E.E.C. and Manchado-Gobatto, F.B., 2018. Advances of the reverse lactate threshold test: Non-invasive proposal based on heart rate and effect of previous cycling experience. *PloS one*, *13*(3), p.e0194313.

Rice, S.M., Purcell, R., De Silva, S., Mawren, D., McGorry, P.D. and Parker, A.G., 2016. The mental health of elite athletes: A narrative systematic review. *Sports medicine*, *46*(9), pp.1333-1353.

Rusdiawan, A., Sholikhah, A.M.A. and Prihatiningsih, S., 2020. The changes in pH levels, blood lactic acid and fatigue index to anaerobic exercise on athlete after NaHCO. *Malaysian J Med Health Sci*, *16*(16), pp.50-56.

Scheer, V., Ramme, K., Reinsberger, C. and Heitkamp, H.C., 2018. VO2max testing in trail runners: is there a specific exercise test protocol?. *International Journal of Sports Medicine*, *39*(06), pp.456-461.

Wan, J.J., Qin, Z., Wang, P.Y., Sun, Y. and Liu, X., 2017. Muscle fatigue: general understanding and treatment. *Experimental & molecular medicine*, *49*(10), pp.e384-e384.

Wylleman, P. and Rosier, N., 2016. Holistic perspective on the development of elite athletes. In *Sport and exercise psychology research* (pp. 269-288). Academic Press.