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ROLE AND ESSENTIAL OF SPORTS PSYCHOLOGY AND NUTRITION FOR ELITE WOMEN TENNIS PLAYERS

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Abstract
Tennis is an intense, fast-paced sport that emphasizes physical strength. To compete at a high level, athletes must have higher levels of speed, agility, physical strength, and cardiovascular fitness. Elite tennis athletes are subjected to intense training and competition loads in order to improve these psychological components and grasp tennis-specific skills. Sport psychology, which uses psychological knowledge to support athletes' mental health, is crucial in this regard for maximizing athletes' mental toughness and athletic performance during competition. Since nutrition is essential for optimizing energy stores, reducing fatigue, encouraging training adaptations, facilitating injury recovery, and improving general health. The intake of nutrients in the diet mostly supplements the substances ingested during activity. Inappropriate diets might adversely affect sport performance and delay the recovery process. Therefore, this study aims to examine the role and essential components of sports psychology and nutrition in optimizing athletic outcomes for elite women tennis player. Thirty students (n = 30) with ages ranging from 15 to 21 were chosen at random to serve as subjects. For a total of fifteen (n = 15) subjects, the chosen individuals were divided into two equal groups at random: the EG and the CG. The standard distribution of the variables was ascertained using the Shapiro-Wilk test. The relationship between factors like psychological performance outcomes, and energy and macronutrient consumption was evaluated using Pearson and Spearman's correlations. A p-value of lesser than 0.05 was considered statistically significant. Based on the experimental findings, a high vitamin and mineral concentration lessens the skeletal muscle cell membrane's lipid peroxidation damage, which lessens muscular discomfort and speeds up recovery. High-intensity exercise can cause blood calcium levels to drop below the clinical threshold and increase urine calcium excretion. Cardiac muscle and skeletal function of women athletes can be effectively improved by supplementing with magnesium supplements. Women Tennis players can strengthen their immune systems and reduce fatigue and aching muscles by supplementing with iron, calcium, and vitamin D.

Keywords: Tennis, Sports, Elite Women Players, Mental Strength, Psychological performance, Sports Nutrition

1. INTRODUCTION

Tennis is a dynamic sport with ever-increasing technical and physical requirements for women players [1]. In order to meet the needs of each athlete and prepare them for these changes, training regimens have gotten more demanding. Psychology (mental health) of women tennis player is prominent to determine an athlete's trajectory toward setback or success in highly competitive sports [2]. Athletic performance demonstrates that an athlete has reached the pinnacle of their physical and mental capabilities. It includes a variety of elements, such as mental toughness, technical and tactical proficiency, injury-free status, and physical fitness. In addition to technical proficiency and physical, an athlete's mental health has a big influence on how effectively they perform on the court [3].

Nutrition is crucial for professional tennis players to maximize their psychological and physical performance during practice and competition, as well as for maintaining overall health [4]. A performance and recovery between matches of players can be greatly impacted by the type, amount, and timing of their food, beverages, and supplements [5]. Minerals and vitamins are involved in several bodily metabolisms. It is essential to sustaining human life activities. Elite tennis women players that participate in sports will be more susceptible to health issues

due to inadequate vitamin and mineral intake. Beta assessed the vitamin and mineral consumption of boys between the ages of 15 and 21. Significant disparities in vitamin and mineral consumption among the women players under study were the cause of the dietary imbalance [6], as evidenced by the substantial discrepancy between the average intake and the proportion of undernutrition. Insufficient consumption of calcium, folic acid, potassium, vitamin D, and a small quantity of magnesium, vitamin C, and E can lead to poor performance. Proper levels of nutrients including vitamin B12, folic acid, and cysteine are linked to the success rate of infertility therapy, and diet has been thought to be a major element affecting the health of both the mother and the fetus. Nevertheless, there are no precise values for acceptable levels and scant information on the average levels of micronutrients in the women blood of reproductive age.

Minerals are the elements that comprise human tissues and support normal physiological functions [7]. They are among the six nutrients that the human body needs. Minerals are the aggregate term for the more than 60 elements that comprise the human body. These elements include oxygen, carbon, nitrogen, hydrogen, and other elements, mostly in the form of organic molecules. Minerals serve a vital part in the physiological operation of human tissues, even though the body's total mineral content is lesser than 5% of body weight and cannot produce energy on its own. Instead, the body must obtain these minerals from the outside world.

The fundamental components of body tissues are minerals. Minerals are also necessary for proper osmotic pressure and acid-base equilibrium [8]. In order to participate in the creation of some unique physiological molecules, such as thyroid and blood hemoglobin, iron and iodine are required. Important components of human tissues, major elements regulate cell membrane permeability, maintain appropriate osmotic pressure and acid-base balance, manage water content, and, in combination with proteins, maintain neuromuscular excitability in extracellular fluid. They also make up enzyme components or activate the activity of enzymes and play a role in material metabolism. The necessary trace elements play a part in the metabolism of nucleic acids, are the vital active components of vitamins and enzymes, make up some hormones or play a part in hormone function, and support the function of major elements and macronutrients [9].

The importance of diet and its direct effect on energy stores, fatigue, injury recovery, and general health are well understood. For elite women players of all ages to succeed in sports, nutrition is seen to be a critical component of overall athlete development. Nutrition is especially important for young athletes, not just to meet their increased training demands but also to meet the needs brought on by the puberty-related growth spurt. To prevent the negative consequences of inadequate nutrient and energy intake (EI), it is essential to provide young tennis players who are competitive and well-trained with the right nutrition [10].

In this work, we examine the role and essential components of sport psychology and nutrition in optimizing athletic outcomes for elite women tennis player. Thirty students (n = 30) with ages ranging from 15 to 21 were chosen at random to serve as subjects. For a total of fifteen (n = 15) subjects, the chosen individuals were divided into two equal groups at random: the EG and the CG. The standard distribution of the variables was ascertained using the Shapiro-Wilk test. The relationship between factors like psychological performance and energy and macronutrient consumption was evaluated using Pearson and Spearman's correlations. Statistical significance was defined as a p-value of less than 0.05. Based on the experimental findings, a high vitamin and mineral concentration lessens the skeletal muscle cell membrane's lipid peroxidation damage, which lessens muscular discomfort and speeds up recovery.

2. RELATED WORKS

Wu [11] employs vitamins and minerals as a starting point to investigate their effects on the athletic abilities of sports tennis players and to run simulation tests on tennis players in our city. Only 54.3% of players are aware of the proper three-meal ratio, according to the trial data. The skeletal muscle cell membrane's lipid peroxidation damage is lessened by the high vitamin C concentration, which lessens muscular discomfort and speeds up recovery. High-intensity exercise can cause blood calcium levels to drop below the clinical threshold and increase urine calcium excretion.

Levillain et al. [12] Examine how well online emotional competences (EC) training works, paying particular attention to the connections between adherence, alliance, and confidence and how mental training affects EC. The current study employed a longitudinal four-wave measuring design, which includes pre-intervention, post-knowledge development, post-abilities development, and post-disposition phase. While the control group (n = 20) did not get this intervention program, the experimental group (n = 20) received a particular EC training intervention. Over the course of four measurement periods, these two groups answered self-report questionnaires measuring EC and emotional control. A questionnaire assessing adherence, confidence, and the alliance between the practitioner and the athlete was also filled out by intervention group participants. Findings from many measurements ANOVAs revealed that whereas the control group did not have a significant rise in EC, the intervention group did.

Ellis et al. [13] measure the acute energy expenditure (EE) and total daily energy expenditure (TDEE) of professional tennis players who engage in regular activity. A cohort study design was used to assess the TDEE and tennis training EE of 27 elite singles tennis players (n = 10 males, ages 22.3 ± 3.2 years, and n = 17 females, ages 23.8 ± 3.5 years). Male players were examined for 26 days and 33 (1.3 ± 0.5 sessions/day) tennis training sessions using Actiheart activity monitors across a two- to five-day training period, while female players were examined for 43 days and 58 (1.2 ± 0.4 sessions/day) tennis training sessions. Compared to females, males had a substantially higher TDEE. Compared to females, males had significantly greater absolute and relative tennis training EEs. The TDEE of male and female tennis athletes during normal training now highlights the continuous cycle of high energy demands faced by the best players. Individual evaluation and nutritional planning should be given priority, with an emphasis on carbohydrate requirements, given the wide ranges of TDEE and EE described here.

Li et al. [14] examine the effects on female tennis players' performance of two weeks of warm-weather training coupled with a dietary modification. The immunological indices of top female tennis players were tested during training to see how they changed and how a dietary intervention affected them. The quantity of exercise has a direct correlation with the rise in serum CK activity. The test group's serum CK value was much lower than the control group's, indicating greater adaptability to exercise. Numerous studies have demonstrated that serum CK activity rose dramatically following intense exercise. Following the nutritional intervention, the athletes' body fat percentage dramatically fell and their weight decreased marginally compared to before. Supplements of sugar and salt were significantly higher in athletes than before nutritional intervention. Additionally, there was a substantial increase in the rate of sweating, hydration, and hydration/sudden rate.

Mehrez et al. [15] examine the effects of brief food modifications on the plasma levels of tiredness indices during a two-hour tennis match. During a two-hour tennis match, investigate how short-term dietary changes affect the plasma levels of fatigue indices (such as lactate, ammonia, dopamine, the serotonin/dopamine ratio, and serotonin). Before and after each tennis match, the participants' RPE scores and plasma levels of fatigue indices were measured. The findings of this study demonstrated that the rise in dopamine/serotonin ratio was only significant in N-DM, and that serotonin, dopamine, lactate, and ammonia all increased considerably after the match. But compared to N-DM, DM showed a much smaller rise in ammonia, serotonin, and the serotonin/dopamine ratio. Following the match, lactate and dopamine levels were 21% and 8% higher, respectively, than in N-DM; however, these differences were not significant. RPE was found to have a negative relationship with dopamine, and a high and moderate correlation with the serotonin/dopamine ratio and other factors. This study demonstrated that most fatigue indices might be modulated by short-term dietary changes. Therefore, it may be suggested that tennis players change their diets to reduce fatigue and preserve their performance. Additionally, it was demonstrated that among fatigue indices, the serotonin/dopamine ratio may be the most accurate.

Abdioglu et al. [16] identify the best ergogenic supplement for athletes, the study will look at how caffeinated chewing gum (CAFGUM), carbohydrate gel (CHOGEL), and cho gel + cafe gum (CHOGEL + CAFGUM) affect tennis players' foundational strokes, heart rate (HR), ratings of perceived exertion (RPE), countermovement jumps (CMJ), and gastrointestinal discomfort during a training session. 14 male tennis players with experience competing in national and international competitions were included in the study; their mean age was 15.93 ± 0.83 years, their height was 173.86 ± 6.89 cm, and their body mass was 60.64 ± 2.58 kg. The CHOGEL + CAFGUM session showed lower RPE ratings than the CON and PLAGUM sessions when the training session's total RPE values were taken into account. When considering the total RPE values for the training session, the CHOGEL + CAFGUM session had lower RPE ratings than the CON and sessions. It was found that neither the HR nor the CMJ values were significantly impacted by any supplementation. In summary, the CHOGEL + CAFGUM supplementation utilized prior to and during training differed significantly from the control session in terms of basic strokes and RPE scores. However, there were no appreciable differences in performance between the CAFGUM and CHOGEL sessions.

3. MATERIALS AND METHODOLOGY

The current investigation was a randomized, controlled trial. Fifteen female tennis players made up the EG, and fifteen people made up the CG. This study aims to examine the role and essential components of sports psychology and nutrition in optimizing athletic outcomes for elite women tennis player. The working strategy of the proposed model is shown in Figure 1.

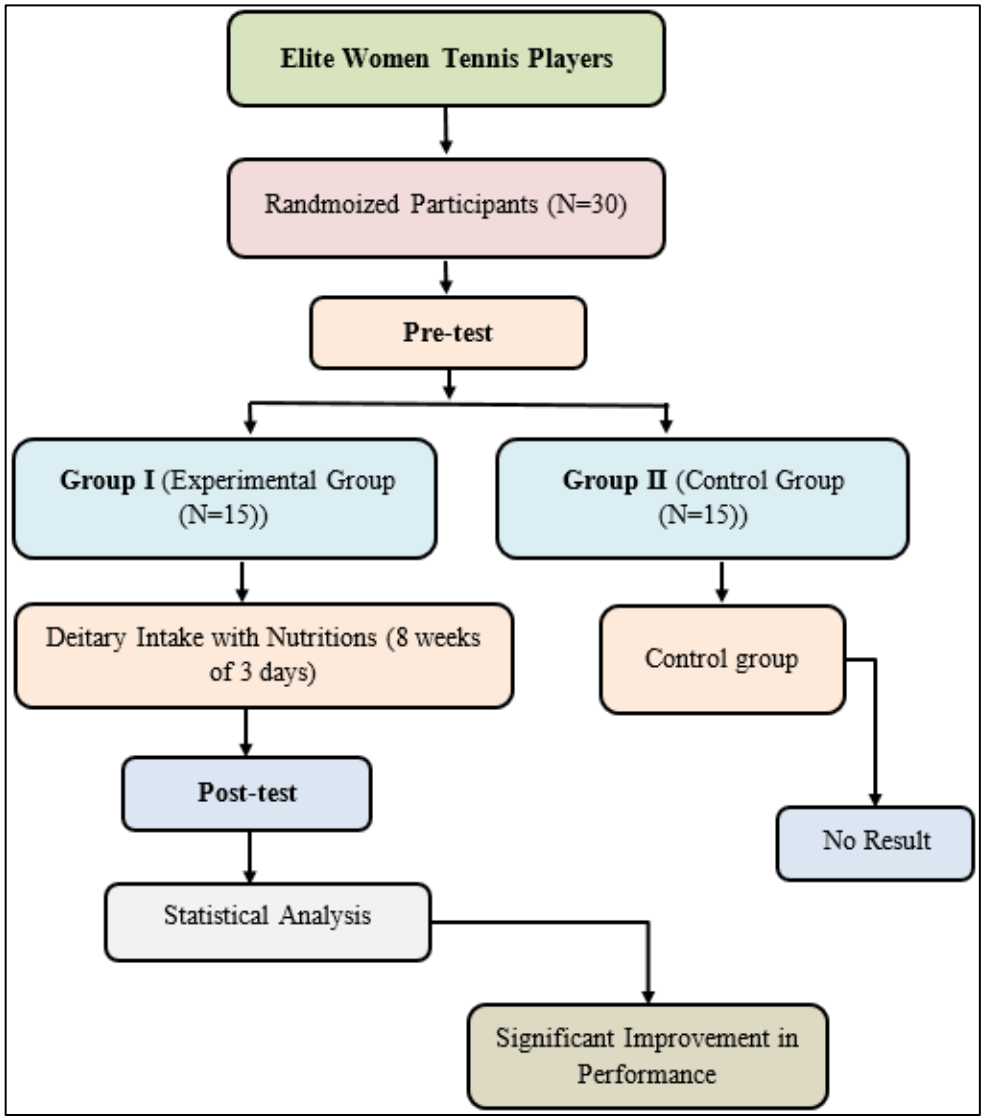

Figure 1. Working Stratergy of the Proposed Model

3.1. Statistical Analysis

SPSS was used for data and statistical analysis. The acquired parametric data were presented as absolute and relative frequency, mean, standard variation (SD), and 95% CI. The standard distribution of the variables was ascertained through the Shapiro-Wilk test. The relationship between factors like body composition, psychology performance outcomes, and energy and macronutrient consumption was evaluated using Pearson and Spearman's correlations. The three days of dairy food were compared using Friedman and the ANOVA tests. Statistical significance was defined as a p-value of less than 0.05.

4. RESULTS AND DISCUSSIONS

The EG and CGs “health assessment score" differences were compared. Furthermore, there was a significant change in the majority of other measures, including weight, skeletal muscle, body fat percentage, and heart rate index. Prior to the nutritional intervention, there was a notable difference between the EGs and CGs, suggesting that the athletes' psychology indices were essentially kept at the same level. This difference can be compared to the subsequent experimental intervention step. Following the intervention, the EG significantly outperformed the CG.

Analysis of Psychological Performance

In addition to providing valuable insights into the psychological characteristics of elite athletes, the psychological profiles of women tennis players—which include characteristics like anxiety, goal orientation, mental toughness, group cohesion, and personality—also enable more tailored training and assistance. The selection of

psychological variables that characterize the importance of psychological variables includes stress, anxiety, and aggression. The psychological variables of the women tennis players before and after the experiment was shown in Figure 1. The experimental group's stress, anxiety, and aggression levels decreased, according to the results, whereas the control group's values stayed mostly the same.

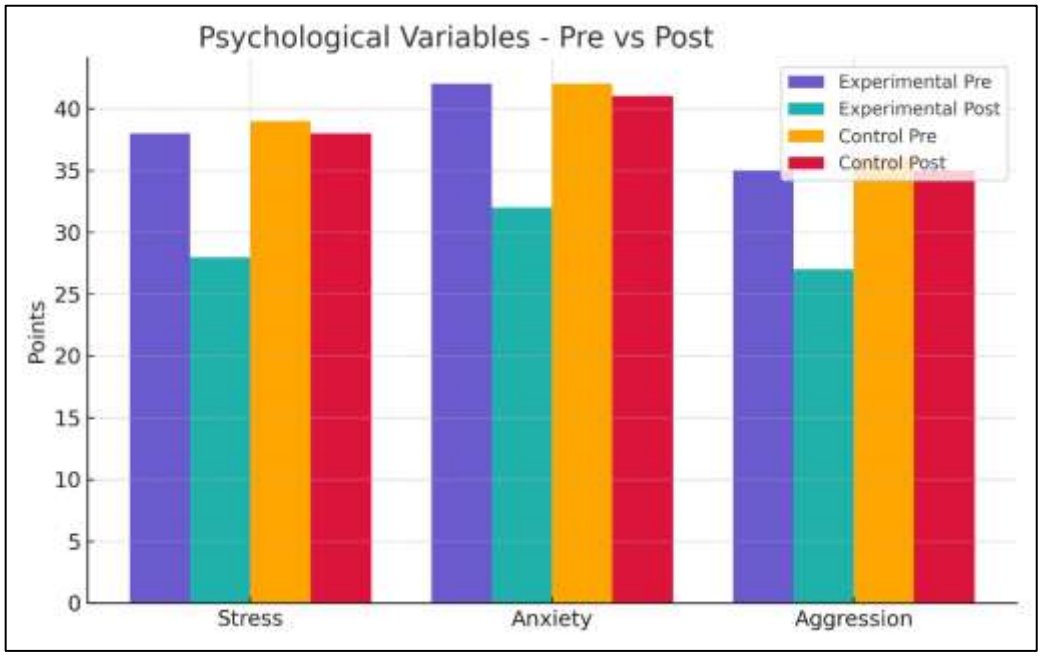

Figure 1. Psychological Variables of EG and CG of Stress, Anxiety and Aggression

Analysis of Energy intake vs Expenditure

Since energy intake supports all the biological processes needed for health and performance and gives the women athlete the opportunity to consume essential macronutrients, micronutrients, and other nutritive substances, it forms the basis of an elite player's nutrition plan. Exercise workload (duration, frequency, and intensity of sessions) and the need for growth (i.e., intentional gains in lean mass) are two important elements that contribute to the variability in energy needs among athletes and within individuals.

The unpredictable nature of exercise energy expenditure is a characteristic of tennis, especially when playing in tournaments or on the circuit in general. High-level players' energy expenditure can be measured with either specialized or comprehensive (activity sensors and personalized metabolic rate measurements) techniques. The EG average daily energy intake (~3000 kcal/day), which is either exactly equal to or marginally higher than their daily energy expenditure (~2800 kcal/12). There is an energy deficit as a result of CG intake (~2400 kcal/day) and higher expenditure (~2600 kcal/day). While HG exhibits under-feeding and potential fatigue danger, LG's adequate fueling meets training needs.

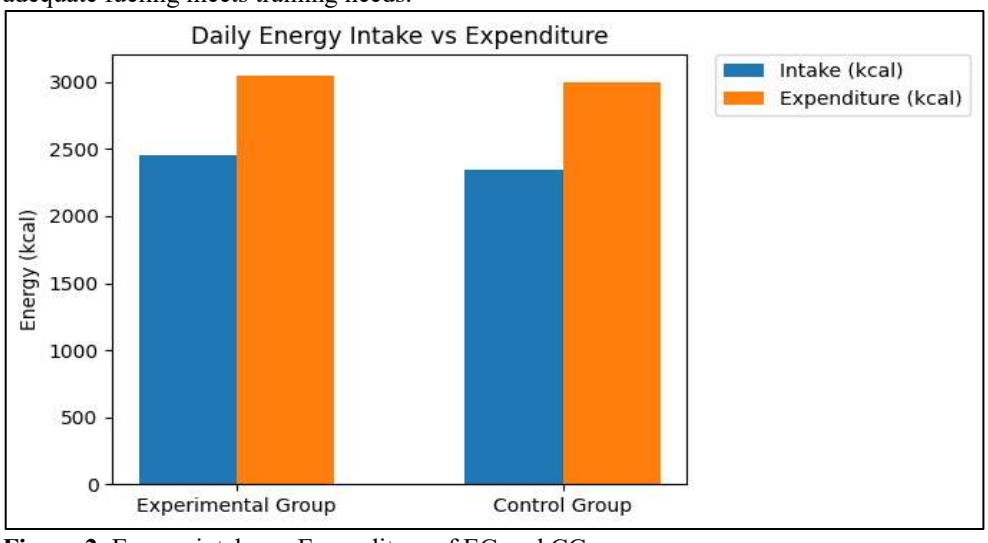

Figure 2. Energy intake vs Expenditure of EG and CG

Analysis of Macronutrient Distribution

Energy intake must guarantee that all macro- and micronutrient requirements are met, including the right kind of fuel for exercise and competition. The quantity of active muscle, the anticipated daily energy needs, and the need to improve body composition should all be taken into consideration when making individualized nutrition recommendations. EG was acquired Increased consumption of protein (~1.7 g/kg/day), carbohydrates (~6 g/kg/day), and balanced fat (~30%). CG was acquired reduced protein intake (~1.5 g/kg/day), increased fat content (~32%), and decreased carbohydrate intake (~4.5 g/kg/day). While the low carbohydrate and protein content of CG may hinder muscle repair and glycogen replenishment, the composition of the EG diet promotes endurance and recovery.

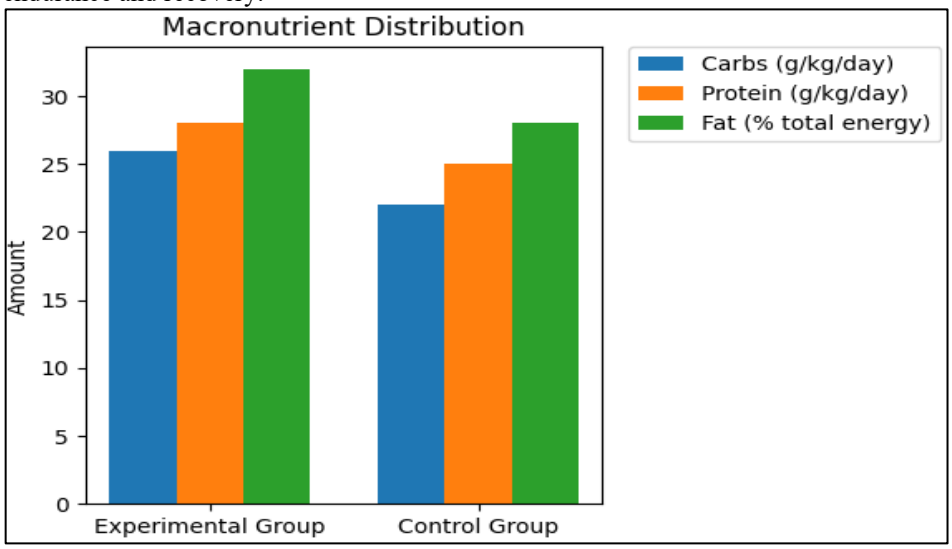

Figure 3. Macronutrient distribution of EG and CG

Analysis of Micronutrient Deficiencies

Vitamins A, E, C and D are the most important factors affecting women tennis players' athletic performance. Vitamin E can help tennis players in several ways, such as improving muscle nutrition and blood flow, enhancing muscle quality, and boosting competitiveness—all of which help sports dancing athletes compete successfully. Lack of vitamin C causes iron deficiency anemia and weakness in female tennis players, which will affect how well their bodies work. Iron is a essential component for elite women players due to its role in growth, energy metabolism, and oxygen delivery. Female players increase the body's need for iron to support its rapid growth and increasing blood volume. Iron deficiency, which is especially high in the sports participants, especially elite atheletes, affects about 30% of athletes overall, more than 25% of women players, and up to 72% of women tennis players. Among the factors that enhance the risk for female athletes and endurance athletes include menstrual blood loss, reduced dietary iron intake, and improved iron turnover from intense training loads. Consequently, vitamin D supplementation help reduce fatigue and muscle soreness while also enhancing immune system function.

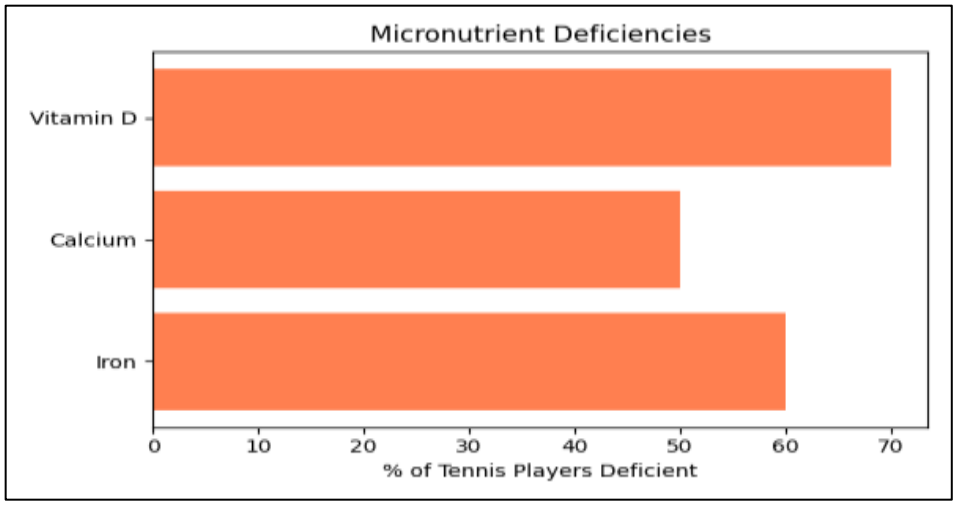

Figure 4. Micronutrient Defiencies of EG and CG

All athletes had lower than recommended intakes of VC, VA, VB2, VE, VB1, and folic acid. Reduced rates of insufficiency (around 40% for iron, 35% for calcium, and 45% for vitamin D). Greater prevalence of deficiencies (around 70% for iron, 60% for calcium, and 75% for vitamin D). While CG is more likely to become dehydrated and perform worse during lengthy rallies, EG keeps their hydration levels closer to ideal.

Supplement Usage among Tennis Players

Due to competition eating habits, reliance on outside catering, and the restricted supply of fresh, high-quality food connected with travel, there may be a chance of consuming insufficient amounts of micronutrients during a tournament. Depending on the person, multivitamin and mineral supplements might be suitable in this situation. Cyanocobalamin supplementation (2,000 µg/week or 50–100 µg/day split into two doses) is safe and necessary for women athletes who follow vegetarian or vegan diets in order to avoid deficits that could have an adverse effect on their health.

Female athletes need protein to maintain tissue healing, muscle protein synthesis, and general growth. According to current dietary standards, children and adolescents between the ages of 8 and 19 should consume 0.75 to 1.05 g/kg body weight of protein daily. To support training adaption, muscle maintenance, and recovery, women players are usually recommended to ingest 1.4–2.0 g/kg/day, according to the sports nutrition literature. Figure 5 shows the supplement usage among elite women tennis players.

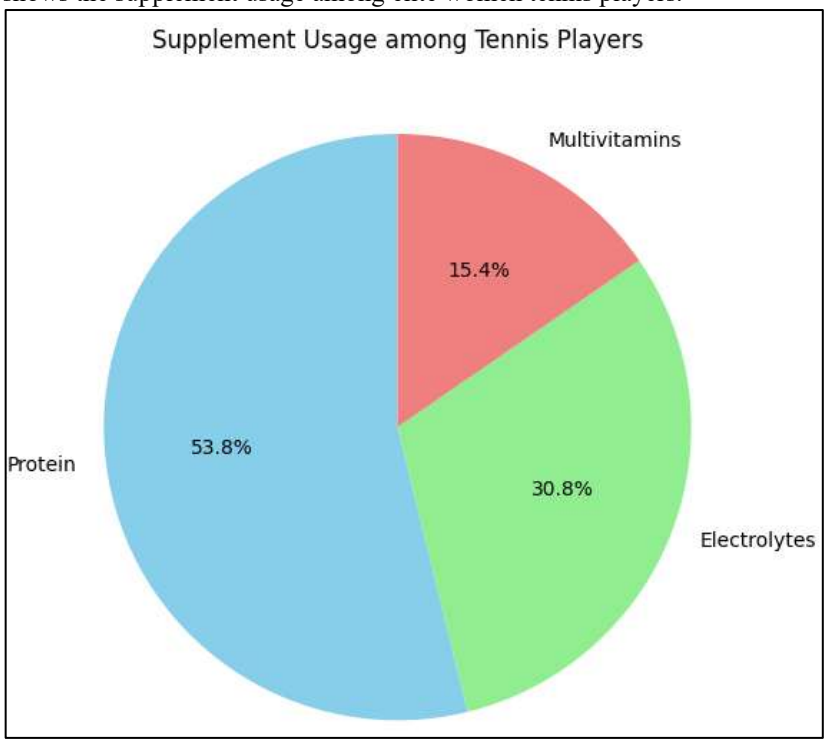

Figure 5. Supplement Usage among Elite Women Tennis Players

This method promotes muscle repair and prolonged anabolic signaling, particularly in the 16–48-hour period after resistance training. Research indicates that in order to maintain recovery and promote muscle growth, teenagers should eat high-quality protein soon after working out, preferably within the 1st hour, and then continue to do so, as part of meals and snacks every two to four hours. In order to maximize MPS in women atheletes, it is generally advised that post-exercise protein intake be between 0.25 and 0.30 g/kg of body weight. While CG depends less on supplements, which may lead to greater inadequacies, EG benefits from evidence-based supplementation to fill up dietary gaps.

Correlation between Energy balance and Performance

Significant negative correlations were found among women tennis athelets between the percentage decrease in the intermittent endurance test and total energy, between CHO and protein intake. Higher performance scores (~88/100) are associated with a positive or neutral energy balance. Decreased performance scores (~82/100) are associated with negative energy balance. Strong association between improved match performance and sufficient energy availability. Compared to CG, EG maintains endurance, accuracy, and recovery.

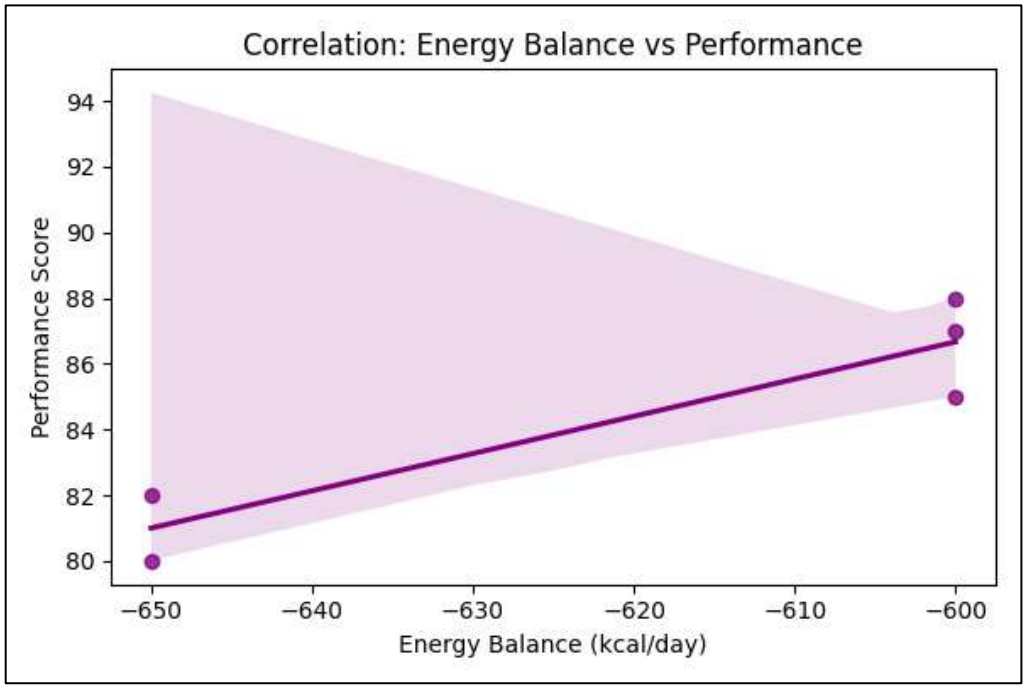

Figure 5. Correlation between Energy balance and Performance of Elite Women Tennis Players

Higher calorie intake, balanced macronutrients, fewer deficiencies, increased hydration, and supplement use all have a good effect on performance, as demonstrated by EG. Lower performance outcomes are linked to CG's energy shortages, nutritional gaps, and dehydration hazards.

5. CONCLUSION

In this study, we examine the role and essential components of sports psychology and nutrition in optimizing athletic outcomes for elite women tennis player. Thirty students (n = 30) with ages ranging from 15 to 21 were chosen at random to serve as subjects. For a total of fifteen (n = 15) subjects, the chosen individuals were divided into two equal groups at random: the EG and the CG. The standard distribution of the variables was ascertained using the Shapiro-Wilk test. The relationship between factors like psychological performance outcomes, and energy and macronutrient consumption was evaluated using Pearson and Spearman's correlations. Statistical significance was defined as a p-value of less than 0.05. According to the experimental findings, a high vitamin and mineral concentration lessens the skeletal muscle cell membrane's lipid peroxidation damage, which lessens muscular discomfort and speeds up recovery. High-intensity exercise can cause blood calcium levels to drop below the clinical threshold and increase urine calcium excretion. Skeletal and cardiac muscle function of female players can be effectively improved by supplementing with magnesium supplements. Women elite athletes can strengthen their psychological performance outcomes along with immune systems and reduce fatigue and aching muscles by supplementing with iron, calcium, and vitamin D.

Understanding these hazards may also help athletes themselves by motivating them to seek expert dietary advice early in their careers to prevent the development of potentially harmful habits that could impair their athletic performance. With an emphasis on female athletes participating in weight-dependent and endurance sports, our findings underscore the significance of earlier identification and sport nutrition instruction for all elite female athletes. To improve screening tools like the DESA-6H and EAT-26 for elite athletes, more research is required. This includes creating a more sophisticated cut-off point strategy that is suited for early risk identification to aid in prevention initiatives or for a prompt diagnosis to enhance the treatment of DE and ED.

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