

Plasma Testosterone Levels in Freshmen in Collegiate Table Tennis Team

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Abstract

The aim of this study was to compare the resting plasma testosterone levels between freshmen and seniors of a college table tennis team. Six freshmen and four seniors participated in this study. They performed the same amount of training. Blood samples were obtained 5 times during 4 months and the mean levels of plasma testosterone, luteinizing hormone, follicle stimulating hormone, prolactin, catecholamines, and cortisol were compared between the two groups. Profiles of the mood states tests showed higher psychological stress in the freshmen. Plasma testosterone, luteinizing hormone, and prolactin were significantly lower in the freshmen. Plasma testosterone, luteinizing hormone, and prolactin were significantly lower in the freshmen. The other hormone levels showed no differences between the groups. The result suggested that psychological stress produced by circumstances in the freshmen period may reduce testosterone production, possibly by impairing hypothalamus-pituitary functions. We suggest that coaches should pay attention to reduce the psychological stress in freshmen in order to prevent the reduction in plasma testosterone levels.

Key words : testosterone, luteinizing hormone, prolactin

Introduction

There have been reports suggesting a decrease in the secretion of androgens – which are related to sexual desire, offensive activity and muscular anabolism– in males due to psychological stress (2-4, 6,7). The purpose of this study was to see whether plasma testosterone levels are lower in freshmen in a college table tennis team who were considered to be of higher psychological stress as compared to senior members.

Methods

The subjects of this study were 10 male members of a collegiate table tennis team. They consisted of 6 freshmen and 4 senior students. The freshman group (age: 18.37 ± 0.27 years) was compared with the senior group (age: 20.93 ± 0.68 years).

This study was performed from April through July. This period was selected because it was anticipated that the Freshmen group members would experience continuous over-stress immediately after joining the team until the start of the summer vacation.

The following substances were determined: Total testosterone (TESTO), prolactin (PRL), luteinizing hormone (LH), folliclestimulating hormone (FSH), cortisol, adrena-

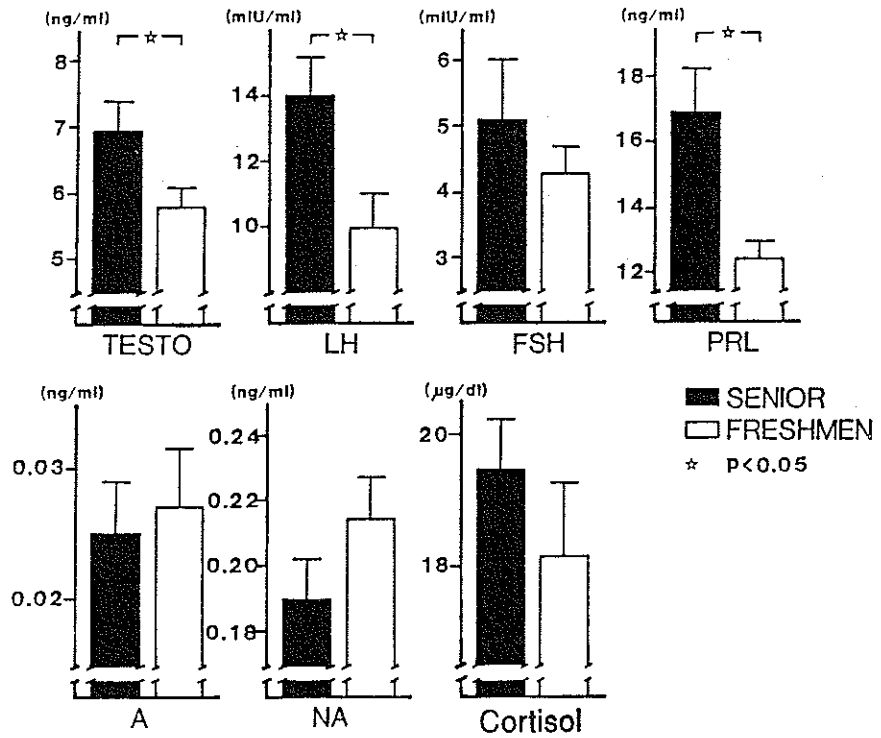


Figure 1. Comparison of the means of the concentrations obtained from April through July for each hormone between the freshmen and the seniors. Values are means \pm SE.

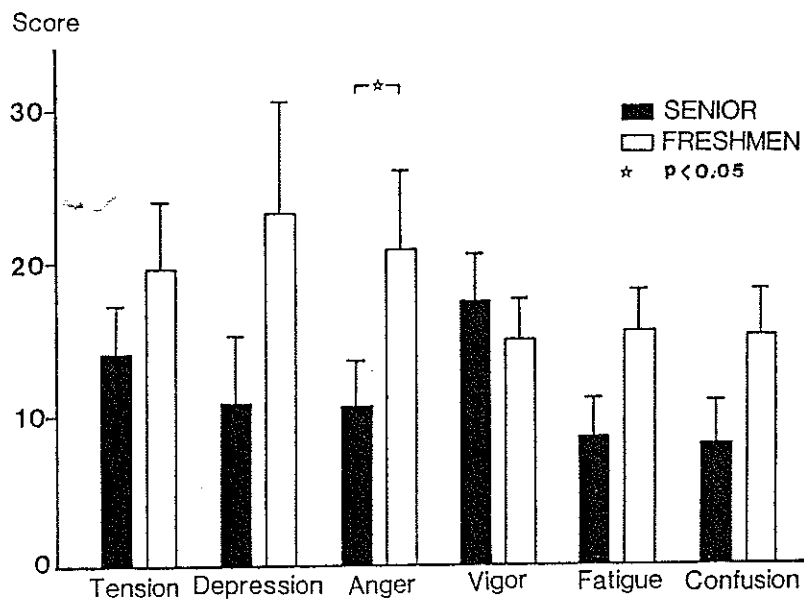


Figure 2. Comparison of the profiles of mood states determined by POMS test between the freshmen and the seniors.

line (A), and noradrenaline (NA).

Each hormonal level was determined twice in April at one-week intervals and then once a month (counting from the day of first blood collection) through July for a total of 5 times. In the morning (about 9:00), before breakfast, blood samples were collected using a syringe and a vacuum blood collector containing EDTA-2Na after resting 30 min or more. The blood sample was centrifuged, and the separated plasma was stored at -70°C until the time of analysis. TESTO, PRL, LH and cortisol were determined by the radio-immunoassay using a commercial kit for each hormone, while A and NA were determined by high performance liquid chromatography (HPLC). At the time of the first blood collection, the subject's profile of mood states were determined by POMS test (7). The differences between the two groups were tested by Mann - Whitney U test.

Results

TESTO, LH, and PRL levels tended to be lower in the freshmen group throughout the follow-up period.

Figure 1 compares the means of the concentrations obtained from April through July in the two groups for each hormone. The mean TESTO, LH, and PRL levels were significantly lower in the freshmen group than in the senior group ($p < .05$). There were no significant differences in the other hormones between the two groups.

Figure 2 compares the psychological state of the two groups as determined by POMS test. "Tension", "depression", "anger", "fatigue", and "confusion" tended to be higher in the freshmen group.

Discussion

The collegiate table tennis team annually perform a 6-day training camp early in March together with freshmen candidates prior to the new school year. Behavior of freshmen candidates during the training camp is supervised by senior members. It has been a tradition of this team to expose freshmen to strong psychological stress in order to subordinate them to senior team members. The present study began one month after initiation of that training camp when freshmen were familiarized with new college-life. We obtained interesting data that the levels of LH and PRL, as well as the TESTO level, tended to be lower in the freshmen group than in the senior group throughout the follow-up period. The literature (2 - 4, 6,7) indicates that over-stress is involved in a decrease in the testosterone level.

In the present study, because the senior and freshmen groups performed the same training, the degree of the stress due to physical exercise is considered to be almost the same. As speculated from the results of POMS test, it was very likely that the lower testosterone level in the freshmen group was due to psychological stress. Rose et al. (4) placed a male rhesus monkey of one group in another male group and reported that the testosterone level decreased strikingly in a short time and that the decreased level did not return to the original level even after one week. They (3) have also shown how training at Officer Candidate Course for humans causes a decline in testosterone level. Elias (2) measured the testosterone level of amateur wrestlers before and after a match and reported that the level increased in the winners, while it decreased in the losers. These results suggest that the testosterone level decreases due to psychological stress.

In the present study, the PRL level, as well as the testosterone level, was lower in the freshmen group than in the senior group. Generally, the PRL level is considered to increase under the stress. However, many reports described that continued stress caused a decrease in the PRL level.

Tache et al. (6) observed a striking decrease in PRL as well as testosterone level in rats in their 6-week restraint experiment. As described above, similar results were

reported by Aakvaag et al. (1) who investigated soldiers performing combat training and by Straus et al. (5) who studied wrestlers faced with a match requiring body-weight reduction. Moreover, Wheeler et al. (8) reported that the levels of testosterone and PRL in joggers were lower than those in ordinary persons. From those reports, it is speculated that the PRL level in the freshman group decreased due to exposure to continuous stress.

In the present study, the LH level in the freshman group was also lower than that in the senior group. In the literatures, there were not only studies detecting lowering of both testosterone and LH levels but also many reports claiming no change in the LH level. LH is known to undergo pulsatile secretion, and this may be one reason for the contradictory reports in which analysis of the LH concentration was made at only one time point. In the present study, the LH levels in all analyses on the 5 different blood samples tended to be lower in the freshman group than in the senior group. Therefore, we calculated LH values in the two groups from the mean values for the 5 samples of each subject. The LH level was significantly lower in the freshman group than in the senior group. The mean of the analyses of the 5 samples is believed to reflect more actual LH secretion level than that obtained from analysis of only one blood sample.

On the basis of the above results, we concluded that, due to strong psychological stress, the hypothalamus-pituitary-testis axis may be affected in the freshman group, which caused the decrease in the testosterone level.

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