

# AN EVALUATION OF PHYSICAL LOADING, RECOVERY AND STRESS IN YOUTH SOCCER

Häyrinen, M.<sup>1</sup>, Luhtanen, P.<sup>1</sup>, Juntunen, J.<sup>1</sup>, Hynynen, E.<sup>1</sup>,  
Vänttinen, T.<sup>1</sup>, Lipponen, K.<sup>2</sup> and Heliskoski J.<sup>2</sup>  
<sup>1</sup>KIHU – Research Institute for Olympic Sports, Jyväskylä, Finland,  
<sup>2</sup>Football Association of Finland



## INTRODUCTION

The stress in a soccer tournament where the matches are played in very tense time table is high. The training and playing disturbs the homeostasis of many processes of the body. The regulation of the autonomic nervous system is affected by training and heart rate and heart rate variability can be used to detect these changes [1]. The overload situation of the body can be noticed from the changes of the autonomic nervous system [2]. Also it has been noticed that the overloading situation will weaken physical and cognitive performance [3, 4]. The goal of this project was to use the latest know-how in heart rate based stress and recovery analysis in improving the quality of training and team selection of the Finnish youth soccer national team.

## METHODS

The subjects of this study were the players of the Finnish youth soccer national team in Granatkin tournament in St. Petersburg 2007 (n=18, 16 field players and 2 goalkeepers, 17.4±0.5 y, 179.8±4.8 cm, 71.2±4.6 kg). The playing system of the Finnish youth soccer team is shown in figure 1.



Figure 1. The playing system of the Finnish youth soccer team.

The duration of the tournament was ten days and the team played five matches in the 2nd, 4th, 6th, 8th and 10th day of the tournament. During the tournament the subjects daily filled two questionnaires concerning their stress and recovery levels and collected heart

rate during the matches and the nights using Suunto Smartbelt. The heart rate variability was analyzed using Firstbeat Sports 1.2.0.8 -software. The means and SDs for the Excess Post-exercise Oxygen Consumption (EPOC), night stress index and recovery index were calculated.

## RESULTS

The figure 2 represents the means and SDs of the maximum EPOCs (ml/kg) during the match, the stress and recovery indices for the following nights for all the players who played 90 minutes.

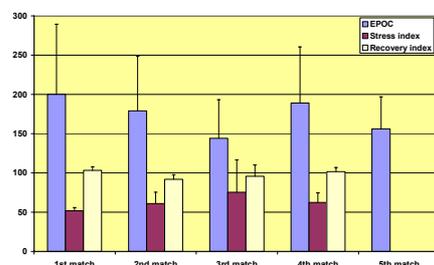


Figure 2. The means and SDs of maximum EPOCs (ml/kg) during the match, stress and recovery indices for the players who played 90 minutes in the match.

It can be seen from figure 3 that the players who play the whole match mostly achieve their maximum EPOCs during the first half of the match. The drop in the maximum EPOCs can be as high as 60 ml/kg as seen in match 5.

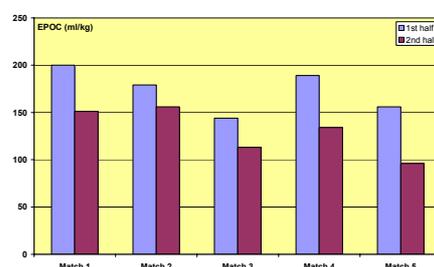


Figure 3. The means of the maximum EPOCs during the first and second halves of the match for the players who played 90 minutes in the match.

From the figure 4 it can be seen that the role and playing position affect a lot to the stressfulness of the players. The midfielder players and the wingers were physically loaded most and the goalkeeper least.



Figure 4. The means of maximum EPOCs (ml/kg) for players playing in different playing positions. The means are calculated from those players who played more than 45 minutes in each match.

## CONCLUSIONS

From these results it can be speculated that the lowering of EPOC-values and climbing of the stress indexes until the middle of the tournament tell that the time table of the tournament was stressful and demanding for the players. Also it can be speculated that the characteristics of the match and the tactics of the team influence the stressfulness of the player a lot. This can be seen from the figure 2 concerning matches 3 and 4 as the communication with the coach unveiled. The drop in maximum EPOC-values between 1st and 2nd halves probably originates from the depletion of the glycogen. The measuring system works well in team sports like soccer in controlling the stressfulness of training and matches and the level of overall stress.

## REFERENCES

- [1] Pichot, V., Roche, F., Gaspoz, F.E., Antoniadis, A., Minini, P., Costes, F., Busso, T., Lacour, J.-R. & Barthélemy, J.C. (2000). *Med Sci Sports Exerc* 32: 1729–1736.
- [2] Uusitalo, A.L.T. (2001). *Phys Sportsmed* 29: 35–50.
- [3] Hynynen E., Rusko H., Kontinen N. & Uusitalo-Koskinen A. (2004). *9th Annual Congress of the European College of Sport Science, July 3–6, 2004. Book of Abstracts*, 236.
- [4] Rietjens, G.J.W.M., Kuipers, H., Adam, J.J., Saris, W.H.M., van Breda, E., van Hamont, D. & Keizer, H.A. (2005). *Int J Sports Med* 26: 16–26.

E-mail: mikko.hayrinen@kihu.fi