Muhamad Noor Mohamed . Raja Nurul Jannat Raja Hussain .
Mardiana Mazaulan . Noor Azila Azreen Md Radzi .
Nurul Ain Abu Kasim . Nur Hani Syazwani Bakri .
Ummi Khaltum Mohd Mokhtar . Mohd Aizzat Adnan .
Editors

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Positional Profiling Feasibility of U18 Ice-hockey Players Based on Anthropometry and Aerobic Capacity

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Attila Czont, Zsolt Bodor, and Ildikó Miklóssy*.

Abstract | Identification of talented players necessitates both subjective and objective evaluations of their playing ability and performance. Evaluating anthropometric characteristics and general physiological performance can aid sports professionals in player selection. This study aimed to determine if positional profiling is feasible for national-level ice hockey players by examining their anthropometric characteristics and physiological performance in two different seasons. The study included two U18 ice hockey teams from the "Székelyföldi" Ice Hockey Academy (SZJA). Data collection occurred in May 2020 and June 2023 at the SZJA's Medical and Methodological Center. Body height, including barefoot height, was measured using a wall-mounted stadiometer ($\pm$ 0.1 cm accuracy), while body weight was recorded with a standard scale. A standard incremental maximal oxygen uptake test was conducted in the laboratory using open-circuit spirometry and computerised instrumentation (CPET Cosmed, Italy) following the Bruce protocol. Additionally, cortisol levels were measured by ELISA from saliva samples to assess the players' physical stress levels. Descriptive statistics revealed no significant differences in anthropometric characteristics between forwards and defensemen. However, some potential differences in maximal and absolute oxygen uptake rates were observed. Although descriptive statistics indicated no significant differences between the two positions, the Mann-Whitney U test, considering.

Keywords: VO_2 max, Spiroergometry, cortisol, ice hockey, playing position

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A., Czont., and I., Miklóssy* (📧).
Faculty of Natural Sciences, University of Pécs, 7624 Pécs, Hungary Department of Bioengineering, Faculty of Economics.
Corresponding author: miklossyildiko@uni.sapientia.ro

Z., Bodor.
Socio Human Sciences and Engineering, Sapientia Hungarian University of Transylvania, 530104 Miercurea Ciuc, Romania.

I.   INTRODUCTION

In ice hockey, anthropometric data can help in talent identification [1] by distinguishing physical attributes that correlate with performance [2]-[4]. Specific characteristics can be associated with role-specific demands [5] [6], but there may be variations within positions [7]. Player profiling needs a series of additional factors, like skill level, tactical understanding, and psychological attributes, which can also correlate with cortisol levels [8] [9].

II.   METHODS

This study involved two national-level U18 ice hockey teams: the U18 team from the year 2020 and the U18 team from the year 2023. 16 forward (F) players and 8 defensemen (D) for the 2020 team, and 16 forwards and 6 defensemen for the 2023 team were studied. Anthropometric data were collected to assess the physical characteristics of the participants. Height was measured using a wall-mounted stadiometer, weight was measured using a digital scale. Aerobic performance was assessed using the Quark CPET (Cosmed, Italy) device, a system designed for cardiopulmonary exercise testing. Salivary cortisol was determined by ELISA (IBL, Germany). Descriptive statistics and data visualisation was implemented in Microsoft excel. Spearman rank correlation (SPSS) was calculated to assess the relationships between variables.

III.   RESULTS AND DISCUSSION

While no significant difference was observed in anthropometric characteristics between positions, we found moderate and strong correlations between pre-season and mid-season VO_2max and salivary cortisol levels in case of defensemen. The anthropometric characteristics and physiological performance data show no significant differences between forwards and defenders on either of the studied teams (ex. VO_2 max levels (ml/min/kg) U18 2020 Forwards 55.65 ± 5.29, Defensemen 52.39 ± 4.22. U18 2024 Forwards 53.42 ± 4.87, Defensemen 53.67 ± 3.96). In both studied groups, mean salivary cortisol values increased mildly in mid-season, as did VO_2max levels (e.g., in Forwards, salivary cortisol increased from 5.67 to 6.91 ng/ml). According to the Spearman correlation coefficient, there is a strong, and a moderate relationship between cortisol levels and VO_2max levels, in pre- and mid-season, within the U18 2023 defense group ($\rho = 0.6$ and $\rho = 0.36$, Fig. 1).
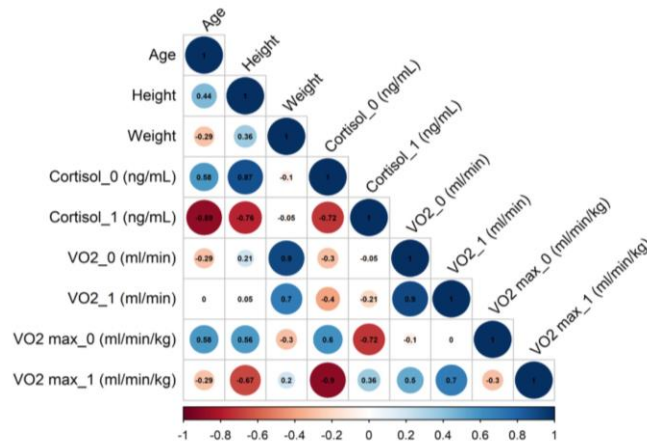
Fig. 1 Spearman correlation coefficients for all recorded variables in the U18 2023 defensemen group during pre/mid-season. (xxx_0 values stand for pre-season and xxx_1 values for mid-season)

IV. CONCLUSIONS

In conclusion, despite the lack of differences in physical performance metrics, an interesting trend was observed in the physiological response to training, as evidenced by the mild increase in mean salivary cortisol levels during the mid-season period. The correlation analysis indicates a significant relationship between cortisol and VO$_2$ max levels, particularly within the U18 2023 defense group, suggesting that hormonal responses may play a role in the physiological adaptations of young athletes. It is possible that defenders, who often engage in more physical confrontations, might experience different physiological responses that could affect their performance metrics differently than forwards.

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