23. SCIENTIFIC COACHING

O-132 Heart rate recording optimization in soccer

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OBJECTIVES Even though coaching is not a science but an intervention practice, both activities share the foundations of decision making on empirical basis. This means that both coaches and scientists try to make their statements based on facts and evidences rather than believes and hopes. We tend to think that the more information we have the better, without taking into account the costs in time and storage it may have. Heart Rate (HR) monitoring is a good example of empirical control of coaching although reliable and effective analysis of data is not always as flexible and quick as it could be. The objective of this research is to assess if longer than five seconds recording intervals affect the variability of data due to its own facets.

METHODS Polar Team System© was used for recording HR from 18 2nd-B league players in 8 pre-season training sessions with the latest available version of Polar Precision Performance SW©. Heart Rate Data Compiler Osasuna 1.0 was designed and created for the compilation of HR files. Statistical analysis were made with SAS 9.1.3© package (VARCOMP and GLM) and GT.

RESULTS VARCOMP and GLM analyses showed that variance components, where the facet interval was included, showed no significant information in order to explain this models' variance. Generizability analysis showed that intervals' facet explained no variance and that recording could be optimized to the maximum.

Table 1. VARCOMP and GLM analysis results for (Players x Sessions x Drills x Intervals) model having HR as dependent variable, GENERALIZABILITY analysis for percentages of variance explain by every facet.

		VARCOMP			GLM		GT
Variance components	**DF**	**Sum of squares**	**Mean square**	**Type 1 estimates**	**F value**	**Pr > F**	**variance explained**
Players	17	12021479	707146	43.63009	2806.68	<.0001	7%
Sessions	7	42449244	6064178	177.59528	24068.90	<.0001	29%
players*sessions	53	9669973	182452	23.28003	724.16	<.0001	7%
Drills	12	44977629	3748136	257.04348	14876.40	<.0001	29%
players*drills	195	11095109	56898	13.11967	225.83	<.0001	7%
sessiones*drills	36	17680546	491126	255.65160	1949.29	<.0001	13%
player*sessio*drills	228	10548027	46263	190.90176	183.62	<.0001	9%
Intervals	5	135.15	27.03	0.0058226	0.11	0.9907	.
players*intervals	85	672.74	7.91	-0.04601	0.03	1.0000	.
sessiones*intervals	35	529.26	15.12	-0.03591	0.06	1.0000	.
player*sessio*interv	265	1613.08	6.08	1.29513	0.02	1.0000	.
drills*intervals	60	1952.31	32.53	0.04425	0.13	1.0000	.
player*drills*interv	975	7581.05	7.77	0.45279	0.03	1.0000	.
sessio*drills*interv	180	4071.55	22.61	-0.03936	0.09	1.0000	.
play*sess*dril*inter	1140	9518.03	8.34	-6.67163	0.03	1.0000	.
Error	174083	43860429	251.95	251.95			

DISCUSSION HR data recorded at different time intervals showed no significant differences. Therefore, both researchers and coaches may optimize their processes of control by reducing the amount of data they must use to a 1/6 at least.

KEY WORDS Heart rate, optimization, variance components, theory.

O-133 The impact of player numbers on the physiological responses to small sided games

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OBJECTIVES High intensity aerobic training can be delivered in a football-specific manner through small group play. Developing or maintaining maximal aerobic capacity through small sided games incorporates a technical as well as a physiological component and therefore constitutes an effective use of training time. The aim of this study was to examine the physiological demands imposed on players during small-sided training games (SSG). The impact of changing both the number of players and the size of the training area on heart rate responses was investigated.

METHODS Average heart rate was calculated during small sided games via short-range radiotelemetry (Polar Sport-tester, Polar Electro, Finland) for nine professional players (mean ± SD: age 17 ± 1.0 years). Recording intervals were set at 5 s. Player numbers increased from 1 vs. 1 to 5 vs. 5 which corresponded with an increase in pitch sizes from 15 x 20 metres to 25 x 30 metres.

RESULTS On a 15 x 20 m pitch mean HR in a 1 v 1 and 2 v 2 was significantly higher than in a 3 v 3 ($P<0.05$). The mean HR on a 20 x 25m pitch for 2 v 2 was significantly greater than for 3 v 3 ($P<0.05$) and 4 v 4 ($P<0.01$). On a 25 x 30m pitch mean HR for both 3 v 3 and 4 v 4 was significantly higher than 5 v 5 ($P<0.01$).

Pitch Size (metres)	**Player numbers**		
15 x 20 m	1 vs. 1	2 vs. 2	3 vs. 3
Mean HR (SD) (b.min^{-1})	**183 (7)**	**179 (7)**	**164 (12)**
20 x 25 m	2 v 2	3 v 3	4 v 4
Mean HR (SD) (b.min^{-1})	**180 (5)**	**166 (9)**	**152 (14)**
25 x 30 m	3 v 3	4 v 4	5 v 5
Mean HR (SD) (b.min^{-1})	**171 (11)**	**165 (5)**	**152 (6)**

DISCUSSION Games with higher numbers of players were not associated with sufficient physiological response to promote development of player's aerobic fitness. The 1 v 1 SSG and SSG in 15 x 20 m pitches imposed the highest physiological response. As player numbers increased, physiological stress decreased.

KEY WORDS Small sided games, high intensity, pitch sizes, player numbers.

O-134 Effectiveness of coaching and scouting in football

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OBJECTIVE Decisions about the effective use of human capital, the players, need not be taken anymore solely on the base of intuition and common sense, but can be supported by advanced systems. Coach & Scout Assistant (C&SA) and Effectively In Action (EIA) (University of Groningen, Neth.) allow clubs to measure and analyze the performance of the players efficiently and allows for sound decision making process. The purpose of this study was to trace the progress of junior players and present the surplus value and best position of scouted players by C&SA, and to generate graphs that reflected the performance of the teams in World Cup 2006 matches.

METHODS C&SA analyzed players on measurable qualities and competencies: technical (e.g. passing, heading, shooting, physical (e.g. speed, power) and mental (pressure resistant, team discipline). EiA calculated the performance of the teams and drew effectiveness graphs.

RESULTS C&SA showed progress curves of players on all eleven positions, and for each non basis player the qualities/competencies for becoming competitive with a basis player were presented. Clicking on the effectiveness graph in EIA, a short video clip is showed around that time in the match. The two systems supplement the expertise of the technical and financial staff with rational arguments and conclusions.

CONCLUSION This study showed that the two computer systems, C&SA and EiA, are complementary tools for analyzing the actual surplus value of individual players in relation to team performance, as well as the development of the effectiveness of players and teams during the match.

KEY WORDS Coaching, football.

O-135 Physiological costs of solo-run in Gaelic football

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OBJECTIVE In Gaelic Football the ball may be carried by the player for no more than four steps without bouncing it or trapping and catching it in a solo-run. These efforts may entail added physiological costs which have not been determined. The aim of the study was to examine the added physiological strain associated with a solo-run in comparison to normal locomotion at the same running speed.

METHODS Thirteen male Gaelic footballers (20.1 ± 2.0 years) participated in the study. They performed 20-m shuttle runs at 9, 10.5, 12 and 13.5 km.h-1 while "soloing" and normal running. Oxygen uptake (VO_2), blood lactate and heart rate (HR) were recorded and perception of effort was monitored at each exercise intensity.

RESULTS The solo-run caused elevations in HR (mean increase from 160 to 181 beats.min^{-1} for running and 167 to 189 beats.min^{-1} for solo-runs between 9 km.h^{-1} and 13 km.h^{-1} respectively). Corresponding increases in blood levels were 4.7 to 18.2 vs 6.1 to 21.3 mM, and VO_2 were 52.0 to 63.6 vs 54.8 vs 65.3 ml.kg^{-1}.min^{-1}. Perceived exertion showed similar trends.

CONCLUSION There is an added physiological cost due to the solo-run that exacts a high proportional use of VO2max. This extra stimulus could be used in a training context.

KEY WORDS Energy cost, heart rate, solo-run.

O-136 Development of an offensive evasion model for training high performance rugby players

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OBJECTIVE The improved defensive ability of rugby players has increased the difficulty for the offence to penetrate defensive lines. However, there is little scientific data on specific evasive techniques adopted by elite players. This paper is the sum of over 10 years of qualitative and quantitative research conducted on some of the world's most high performance players. The purpose of this research was to develop a clear performance model of the evasion techniques utilised by high performance rugby players.

METHODS To ensure both internal and external validity, this model was based on a combination of qualitative assessment, performance analysis research, and advanced three-dimensional kinematics analyses. First, 3D kinematics analyses were undertaking on 22 elite players during an evasion task to test for correlates with performance. Next, evasion KPI's were created following extensive video based qualitative analyses of 70 elite players during evasive play. Finally, the model was tested using 60 international matches via the systemic analysis of offensive play using standard game analysis software.

RESULTS Summary of the numerous statistical analyses used in this research indicate that effective evasion can be expressed by 5 variables. These indicate that the ball carrier should strive to:
1. Accelerate into and through the contact zone.
2. Use positive stepping patterns to avoid direct contact with the defender and maintain running velocity through contact.
3. Offload the ball either prior to contact, or in contact.
4. Avoid going to ground unnecessarily.
5. Be deceptive by disguising intentions.

KEY WORDS Rugby, high performance.

O-137 The transition from player to coach: A case study from rugby league and rugby union

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OBJECTIVE Presently elite players are being recruited into professional coaching roles in both rugby league and rugby union. However, playing ability doesn't necessarily translate into coaching aptitude. According to USA Olympians the ability to teach and the ability to motivate or encourage are the two most important qualities they want in their coach. The aim of this study was to gain an insight into how to assist athletes make a successful transition to coaching. Identifying general strengths and weaknesses will have implications for coach education. Mastery of the identified skills will contribute to the development of the excellence that the Australian athlete and coach are seeking.

METHODS Four former athletes who were in the early stages of their coaching careers were observed and video-taped during a minimum of four coaching sessions. Participants commented on their coaching before and after viewing the video-tape. Semi-structured interviews were also conducted with each coach.

RESULTS Analysis revealed that the coaches were confident with their technical knowledge and skills of the game. They also perceived having played at an elite level as an advantage to their coaching and have all been influenced by their former coach's style. Areas identified for further improvement included: communication, planning, organisation and self reflection. Specific examples will be outlined.

CONCLUSION Results of this study are discussed in relation to literature and coach education programs. Evaluation and feedback can assist the early career coach in their own development. Enhancing generic skills such as effective instruction and teaching skills, specific feedback, comprehensive evaluation skills and good communication will allow for a smooth transition from an elite player to successful coach

KEY WORDS Coach development, video analysis, evaluation.