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The problem of increasing densities of top level performances: Gould's Hypothesis

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ABSTRACT

Introduction

With the performance differences between competing top athletes becoming smaller and smaller, sometimes even within the error margins of the measuring systems, comparing performances and deciding on winners is becoming a perilous affair. Yet, it is of utmost importance: wrong decisions of the (referee) system may have disproportionate consequences. On the other hand, exceptional performances become rarer and rarer, and more and more labeled as a result of 'doping'. What aspects are responsible for these two interrelated phenomena in elite sports?



4x GOLD World Ch. Gymnastics 2015

Methods

In the case of Olympic speed skating, the finishing times are nowadays given in 1/1000 of a second. Although the error margin of finishing times is widely agreed to exceed 3/1000 of a second, this is not officially taken into account (yet). This silly situation has caused the Dutch 1500m specialist, Koen Verwey, to lose a gold medal at the 2014 Olympics in Sochi: he was 'beaten' by 3/1000 of a second according to the official

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measuring system. On the other hand, the two downhill skiers, Tina Maze from Slovenia and the Swiss Dominique Gislin, both received the gold medal with a difference of 0.05 seconds!

Results

For many sports, it has been observed that, while the level of competition has increased over the years, the variation in performance, especially at the top, has steadily decreased, and extreme events are becoming rarer and rarer. This phenomenon is called the Gould effect: Due to limitations of the human body, there is an absolute limit to sports performances, which is approached by the performances of the very best athletes. While the performance level of athletes increases, more and more athletes come closer to this boundary, and the difference between top and average athletes narrows down. Gould worked with baseball data, but similar results are found in various other sports, such as basketball and in golf, although in basketball a number of rule changes have kept the variability at a desirable level.

Discussion & Conclusion

It is this phenomenon of growing small performance differences and vanishing extreme events that brings us to the question of whether the Gould effect exists and can be measured for sports like speed skating and soccer, and to the question of fairness in the judgment of elite sport performances, and discuss the impact of increasing ex aequo top performance situations.

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From reaction to anticipation in sport

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ABSTRACT

The psyche of an athlete is built on his/her biology. In an ontogenetic way, knowledge of the game is learned through training activities. However, the biology of the individual is determined, very phylogenetically, by heredity. It is clear that having a high percentage of fast fibres (organism) will allow the athlete to be explosive in his/her actions, but will not guarantee his/her interpretation of the tactical game (person).

Both of these human abilities also differ time-wise. Life reacts, while the psyche anticipates. Taste buds do not detect flavour without food and our hearing does not hear anything before a sound. There is always a certain amount of time between the emission of the stimulus and the corresponding sensory response. This time delay or latency can be trained in order to be reduced to a minimum. It is the basis of proprioceptive training which causes varied and intense strains on joints in order to reinforce the reverse reflection of defence and protection.

But the psychic construction of an athlete is to learn to anticipate. The evolution of life to the psyche means changing the reaction with delay to anticipation based on the knowledge acquired. In this way, you can anticipate the taste of some strawberries before eating them, although perhaps on eating them the taste is not exactly what you had imagined (illusions). Or walking in your house in complete darkness anticipating your way around. The competitive requirement of sport trains anticipation. In team sports, the "pass into free space" is nothing more than a pass into the future. At the time of making the pass, the receiver position is anticipated depending on his/her angle of movement and speed. In defence, there is also anticipation in the intersection of a pass, because to deflect the ball the defender must move before the pass is made.

In general, we should agree that the difference between attack and defence does not lie in whether there is possession of the ball or not. The difference between attack and defence is to have the time initiative. Normally, defence follows the actions of attack; but sometimes defence does not conform to this tracking role and takes the time initiative, for example, in situations 2-on-1 on the player with the ball (trap). In these situations, we can say without any doubt that the defence is "attacking".

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The biological reaction is certain and predictable: no response without stimulus. But anticipative knowledge can leave the player exposed by a misreading of the game. This is the magic of sport. Quality training must balance organic preparation and knowledge of the game, together with the significant contribution of veteran players who, when they start to see their biology limited by age, still play the game brilliantly based on the knowledge they have acquired.

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Effects of different small-sided games training sessions on physical performance and skill qualities in rugby union players

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ABSTRACT

Introduction

Small-sided games (SSGs) are increasingly being used in rugby as a means of improving the skill and physical fitness levels. The aim of this study was to investigate the influence of four different SSGs training sessions on physiological demands in rugby union players.

Methods

Fourteen male senior rugby union players (22.4 ± 3.2 years) participated in this study. Four different rugby SSGs sessions with 15-min duration were planned for this study (1 vs. 1 and 2 vs. 1 evasion skills in SSGs, 7vs7 SSG and Match (Rugby sevens 7vs7)). All the practice sessions were performed at the same time of day on a natural turf pitch, under similar environmental conditions. A repeated measure analysis of variance (ANOVA) was performed to identify differences in time motion variables, HR and body impacts according to SSG's format. Pairwise differences were assessed with Bonferroni post hoc test.

Results

There was a significant effect of speed zones ($F=598.3$, $p<.001$, $\eta^2=.96$), with pairwise differences between all zones with exception of z2-z3 and z5-z6. In addition, the interaction between speed zones and SSG formats was significant ($F=94.7$, $p<.001$, $\eta^2=.78$). Overall, the SSG 1 presents lower variability across the speed zones, with lower distance performed in the z6. Conversely, compared with SSG 1, 2 and 3, the SSG4 showed higher mean values in z2, z3 and z6.

Discussion & Conclusion

Coaches can redesign SSGs training sessions to be more reflective of game demands. The movement activities and actions of the players occupying the positions while they are on the field, rather than for that

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position over the entire match need to be considered when constructing SSGs training programs designed to reflect the demands of match play.

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Behind closed doors: The delivery of performance analysis in a professional New Zealand rugby club

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ABSTRACT

Introduction


Despite the prevalence of technology with high performance environments, limited attention has been paid to understanding how Performance Analysis (PA) is being delivered by coaches and practitioners to impact on player performance and learning within competitive contexts (McKensie & Cushion, 2013; Middlemas & Harwood, 2015). The aim of this case study research was to gain an in-depth understanding of how a professional rugby team integrated PA support into their practice within a competitive season in New Zealand. It is argued that knowledge gathered in-situ can be valuable in guiding further research in applied sport science and informing best practice within applied settings (Williams & Kendall, 2007).

Methods

Permission was granted from the coaches, support staff and players to observe and capture team processes surrounding the use of PA, including pre-match and post-match team meetings, training sessions and pre-match preparations during a professional rugby season. Multiple ethnographic techniques were employed to generate a comprehensive picture of the phenomena, including participant observation, video recordings, formal and informal interviews, field notes, descriptive statistics and document analysis. Each meeting was transcribed separately and analysed using an inductive content analysis process (Neuendorf, 2002) and themes were identified and discussed with an independent researcher, acting as a 'critical friend'.

Results/Discussion

Some of the key theme that emerged included: (i) results v performance focus, (ii) learning environment (iii) group dynamics and (iv) coach vs. player driven. The findings reveal that while considerable emphasis was placed on the importance of player learning and engagement in the PA process, delivery was often ad hoc, coach-driven and results-focused. This applied case study highlights the messy reality of delivery effective support within a high performance environment, and the importance of personal relationships at the heart of effective delivery of PA.

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Developing a strategy based on game style clustering: A netball case study

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ABSTRACT

Introduction

Developing a strategy in sport is a complex task that needs to consider all factors that could influence performance. These factors might include a team's strengths and weaknesses, their opposition's strengths and weaknesses as well as the numerous performance indicators that contribute to these. Team performance can be described with increasingly large data sets thanks to modern computerised notational analysis systems and companies devoted collecting match data. The challenge of sorting through large multi-dimensional data to find important combinations of performance indicators to use in strategy development remains at the forefront of performance analysis.

Methods

In previous work we used self-organising maps (SOMs) as a tool for visualising rugby union match data (Croft, Lamb & Middlemas, 2015). In particular, the visualisation identified two game styles associated with winning and two styles associated with losing. The current paper reports the development of a SOM analysis aimed at clustering map regions to represent game styles. Training data consisted of discrete data from 250 matches, over four seasons of elite netball. Forty input variables, in the form of descriptive statistics, were chosen by the analyst and head coach as those most important to the team's performance. Map nodes were clustered using the k-means clustering algorithm to reveal seven game styles. Team specific analysis was then performed by comparing the matches of a specific team consistent with one cluster or game style to the corresponding game style of the opponent. For example, if Team A won ten and lost 5 matches that were represented by cluster 1, the opponent game styles responsible for beating Team A is those five losses, as well as the game styles that did not beat Team A are of great interest to the coach in strategy development. We present a case study to demonstrate the workflow from analysis to strategy development.



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Results/Case Study

The reported approach was applied, prior to competition, on a single opposition team (“Team A”), with a strong visual relationship existing between winning performances, in cluster 6 and the variables: Wing Attack-1st phase reception (WA1), Goal Attack – 1st phase reception (GA1) and Centre – 2nd phase reception (C2). These 3 variables also had inverse relationships in clusters 2 and 3, which had high percentages of losses. As a result, a strategy was devised by the coach to prevent the GA1 and C2, by instructing 2 defenders to “mark” each of those players at the appropriate time. WA1 was allowed to occur by not “marking” this player. To track progress during the match Figure 1 was created to indicate if the team had successfully (dark green) or unsuccessfully (red) implemented the strategy. Figure 1 indicates the execution of this strategy was “board line” which interestingly coincided with a 1 goal win to the team.

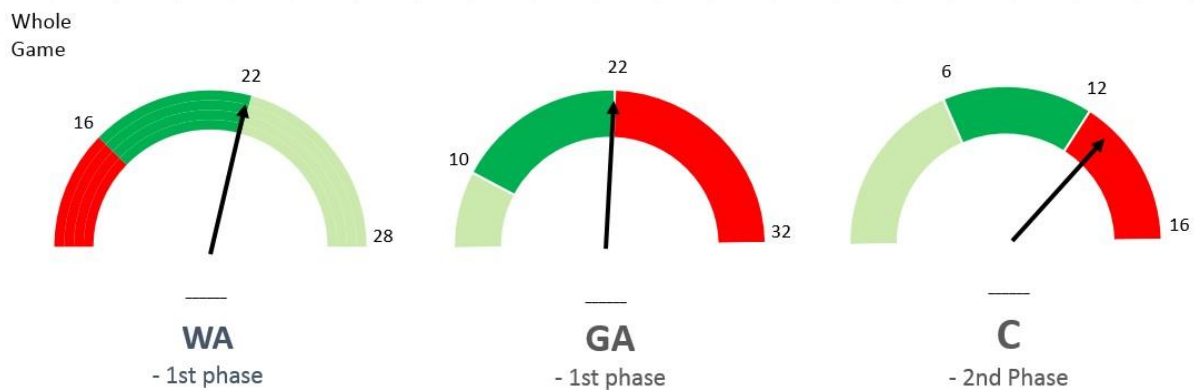


Figure 1. Dashboard used to track three inter-related performance indicators live during a netball match.

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Does changes to the scoring system change the game dynamics in South African university rugby?

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ABSTRACT

Introduction

Success in rugby is measured by winning the game and in order to do so, teams' needs to score more points than the opposition. The primary aim of this study was to investigate and compare the scoring profile of the 2011 and 2012 tournaments and to determine if modifying the scoring system at South African University rugby level changes the game dynamics.

Methods

The study followed a mixed-method design during the research process. Mixed-method research combines elements of qualitative and quantitative research approaches (e.g. the use of qualitative and quantitative viewpoints, data collection, and analysis and inference techniques) to gain in-depth understanding and corroboration. A total of 4 coaches participated in the focus group semi-structured interviews. A total sixty-two Varsity Cup matches were recorded and analysed using Dartfish software® package during 2011 and 2012.

Results

From the interviews with the coaches revealed it was clear that the game at University level did not improve as an entertainment value due to the sources used to score the tries. In 2011 the home teams scored 773 points compared to the 816 points obtained by away teams, whereas in 2012 the opposite trend is found with home teams scoring 999 points, compared to 775 points for the away teams. The most points were accumulated during the 2nd half of the match during both season.

Discussion & Conclusion

Having a scoring profile will provide coaches with information regarding which modes of scoring their team make use of to win matches. The changes in laws showed that more tries were scored however the question remains whether rugby's at entertainment value improved at university level in South Africa?

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Influence of situational variables in gaining possession of the ball in advanced zones of the pitch in soccer

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ABSTRACT

Introduction

Gaining possession of the ball in advanced zones of the soccer pitch has been associated with a good performance in soccer. Previous studies concluded that team possessions originating from the advanced third of the pitch have considerably higher effectiveness for goal scoring and number of shots (Tenga, Ronglan and Bahr, 2010).


The present study attempted to broaden these results to the Spanish La Liga (first division). Previous studies demonstrated that La Liga have some differences in comparison to other professional leagues in terms of technical and physical aspects (Delall et al., 2011), and home advantage (Pollard & Gomez, 2009) that may affect to game dynamics and tactical aspects of the game.

This study examined whether the zone of the pitch where the ball was gained was influenced by situational variables like match location (i.e. playing at home or away) (Tucker et al., 2005), quality of opposition, and match status (i.e. whether the team was winning, losing or drawing). Previous research showed that these situational variables affect other performance indicators (Taylor, Mellalieu, James, & Shearer, 2008).

The aims of the present study were to examine the effects of match location, match status, and quality of opposition on the zone of the pitch where the ball was gained by teams in the Spanish La Liga.

Methods

Ten matches from the season 2010-2011 of the Spanish La Liga were analysed. A total of 1095 defensive pieces of play initiated in the opposing half were collected. A defensive piece of play initiated in the opposing

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half was used as the basic unit of analysis. Matches were analysed using a multi-camera system for match analysis (Amisco Pro®, version 1.0.2, Nice, France).

Chi square (χ^2) and Cramer's V statistic were used to estimate associations between the outcome of defensive pieces of play originating from the opposing half and; match status, quality of opposition, team quality and match location.

Results

For both match status and quality of opposition, a significant association ($p < 0.05$) showed that teams were less likely to gain the ball in advanced zones of the pitch when winning and drawing than when teams were losing, and that teams gained the ball further from the opposing goal when playing against better ranked teams.

No significant difference was found for playing at home or away on the zone of the pitch where the ball was gained.

Discussion

The higher likelihood of losing teams for gaining the ball in the opposing half of the pitch might be due to these teams employ a more aggressive style trying to play closer to the opposing goal in order to score. The higher control and ball possession of strong opposition could also explain the likelihood of regaining the ball close to the own goal when playing against top ranked teams.

Conclusion

The results emphasize the importance of accounting for match status and quality of opposition during the assessment of tactical aspects in soccer performance.

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Evaluation of the new vanishing spray in soccer

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ABSTRACT

Introduction


Blown calls and insufficient applications of rules respectively are part of all kind of sports including elite level sports. Such decisions occur inter alia due to the limits of perception and (unconscious) bias, entailing the potential to influence match outcomes and the related consequences. In order to overcome these deficiencies, several sport associations introduced various new technologies to support the referees and umpires respectively, that can be classified in three categories. Such technologies that replace the referees for specific decisions (e.g. goal line technology. See Kolbinger, Linke, Link, and Lames (2015)), such that serve as decision aids (e.g. replay reviews) and such that support the referee to enforce rules, as the new vanishing spray does. The goal of this study was to evaluate the use of the vanishing spray in the German Bundesliga, which was introduced on the 8th day of the 2014/2015 season. Therefore, its impact on violations of the minimum distance rule, the success of free kicks and the referees' behavior were investigated. The study was funded and commissioned by the Deutsche Fußball Liga GmbH.

Methods

A self-designed observational system was used to screen 1833 free kicks of the 2013/2014 and 2014/2015 season. For 308 of the 725 free kicks after the introduction the spray was used. 299 pairs of 'SPRAYED' and 'NON-SPRAYED' free kicks were built by running a parallelization process based on the location and the numbers of players in the wall. The groups were compared using chi square tests and paired t-tests respectively, depending on the nature of the respective variable.

Results

The results showed no changes in the proportion of free kicks with violations of the minimum distance rule ($M_{\text{NON-SPRAYED}} = 25.4\%$; $M_{\text{SPRAYED}} = 25.8\%$), but a significantly lower rate of massive rule violations ($M_{\text{NON-SPRAYED}} = 16.7\%$; $M_{\text{SPRAYED}} = 10.7\%$; $X^2 = 4.58$; $p = .032$). No yellow cards were awarded for these rule violations and no free kick was retaken. Concerning the distance set by the referee between the ball and the wall, as well as the success of free kicks, no significant differences were found.

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Discussion

Summed up, the results showed that the main goal could be achieved by reducing the extent of minimum distance rule violations, but the spray affected no further effects on referees' behavior or the success of free kicks. Furthermore, the study uncovers a discrepancy between the official rules and its application on the field, concerning the estimation of the minimum distance and the punishment of the respective violations.

Conclusions

This study showed that the spray seems to create a rather small effect on the competition. However, this benefit seems to be big enough to outweigh the caused disadvantages and costs, as more and more associations introduce this spray. Nevertheless, associations need to be aware that the spray helps to enforce the minimum distance rule, but the related set of rules is still not applied correctly according to the laws of the game (Kolbinger & Link, 2016).

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Determining stable and unstable game states to aid the identification of perturbations in football


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ABSTRACT

The majority of existing Performance Analysis (PA) research has adopted a reductionist approach which considers only selected events such as number of shots or pass success rates for analysis (Mackenzie & Cushion, 2013). A different approach is the dynamical systems perspective which considers how a game changes between stable and unstable situations as a consequence of perturbations. Previous research has attempted to identify perturbations in football (Hughes et al., 1997 and Hughes & Reed, 2005), however there were no operational definitions of stability, instability or perturbations suggesting some subjectivity for determining these events. The purpose of this paper was to establish operational definitions for determining stable and unstable game states to facilitate the identification of perturbations. English Premier League matches (n=18) from the 2015-16 season were analysed resulting in 6 situations, deemed unstable game states; CA (Count Attack), RAD (Ratio of Attacking to Defending players), SCiPB (Successful Cross into Penalty Box), SP (Set Piece), PBP (Penalty Box Possession) and S (Shot). A total of 989 unstable situations (54.9 per match) preceded 474 shots (26.3) and 47 goals (2.6), of which 365 were as a consequence of a PBP and 52 a RAD. Home teams created more unstable situations in winning (M = 34.6, SD = 10.6; Cohen's d = 0.7), drawing (M = 37.8, SD = 16.9; Cohen's d = 0.7) and losing situations (M = 23.3, SD = 6.9; Cohen's d = 1.1) than away teams (M = 28.2, SD = 7.5; M = 27.6, SD = 12; M = 15.9, SD = 6.3 respectively). Similarly, Opponent quality affected the number of unstable situations created (F = 4.583, df = 2, 33, p < 0.05) with less against top teams (M = 20, SD = 8.9) than middle (M = 33.2, SD = 14.4) or bottom teams (M = 29.3, SD = 8.6). The incidence of unstable situations appeared to differentiate teams based on match location and outcome. Operational definitions for unstable situations were devised as opposed to perturbations as these proved more problematical. This methodology is being tested for reliability so that future studies can identify the mechanisms that determine perturbations (on and off the ball activity) and then areas of strength and weakness in teams.

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Road to the finals: Fixture congestion impacts on successful performance in NBA: A study case of 2014/2015 finals

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ABSTRACT

Introduction


Fixture congestion has received increasing attention within the research community in different team sports such as football (e.g., Folgado et al. 2015). However, in basketball this topic has not been consistently addressed in the past. This study aimed to analyse the impact of fixture congestion on the performance of top-level basketball teams.

Methods

Official statistics of 162 games of the teams participating in NBA 2014/2015 finals were retrieved from the official NBA website (<http://www.nba.com> (2016)). The following variables were considered in this study: number of games won and lost, field goal percentage, number of offensive and defensive rebounds, assists and steals. The analysis was carried according to three fixture cycles: (i) two consecutive games; (ii) one day interval between two games; (iii) two or more days between two games.

Results

The data analysis showed that the frequency of games won or lost was significantly dependent on the fixture congestion cycles ($\chi^2(2, N = 162) = 7.98, p < 0.5, \phi_{\text{Cramer}} = .22$). A smaller number of games lost occurred with a two or more days interval between games ($n = 2; 6.45\%$), comparatively with the two successive games ($n = 13; 32.5\%$) and one-day interval between games situation ($n = 28; 30.77\%$). There were also differences on field goal percentage, $F(2,159) = 3.29, p < 0.5$) between the fixture congestion cycles, with greater efficacy for the two days of interval or more ($M = 49.10, SD = 5.09$) than for two successive games ($M = 47.01, SD = 5.89$).

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Discussion

These results suggest that fixture congestion may interfere with shooting efficacy and competitive outcome. Apparently, when games occur with a minimum of two days of interval of time, shooting efficacy increases while chances of losing a game decrease.

Conclusion

In conclusion, fixture congestion appeared to impact on the performance of top-level basketball teams. This preliminary work stimulates further investigation to re-address this topic by using larger datasets in order to confirm the observed results.

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Influence of pitch zone and game result in the 7vs7 game area dimensión in Spanish professional football: Extrapolating from match analysis to SSGs design

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ABSTRACT

Introduction

The tactical implications in relation to SSGs are determined by the constant interaction between team-mates and opponents (Davids, Araújo, & Shuttleworth, 2005), especially between the nearest players to the ball. The demand of these interactions are determined by the dimension of the rectangle of game in which the SSGs is developed and with the relative space for each player, known as Individual Playing area, and can be calculated by dividing the pitch size by the number of participating players (Hill-Hass et al., 2009).

During a football game there appear momentary playing situations in which only those closest players to the ball are effectively involved in the action. In these situations direct interactions are also generated among team-mates and opponents closest to the ball. The dimension of the relative rectangle of the pitch in which these nearest players to ball are involved could be extrapolated to the design of SSGs.

The aims of this study were to examine 1) the width and depth dimensions of the playing area and 2) spaces of individual interaction in momentary situations of 7v7 interaction generated during the competition, and 3) the influence of the pitch zone where the ball is and where the action unfolds on the dimensions, and 4) the influence of the momentary game result, period of the game, venue, and the different teams in the dimension of the 7v7 game situation.

Methods

Data were collected from twenty-five Spanish La Liga matches of the 2007–08 season, and notated post-event using the Amisco® system. The length, width and Individual Playing Area of the rectangle that included the 7 players nearest to the ball of each team were collected for the study. A total of 8,727 7v7 game situation

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were recorded. The rectangle of the playing area that formed by the 7 players of each team nearest to the ball were selected every 5 seconds of the game.

Results

The results showed that the dimensions of the areas proposed for training drills 7vs7 in previous studies are larger than those in competition. An important result is that the rectangle is larger in width than in length.

The influence of the zone of the pitch where the actions are developed was significant, showing differences between the wide zones and the central zone ($p < 0,001$). The influence of the result, venue, and the period of the game were not significant. Differences were observed among teams analysed.

Discussion & Conclusion

Ball position on the pitch influences players' distribution in the 7v7 situations. In the same way, previous studies also found similar differences in players' distribution in 4v4 situations (Caro, 2014).

Further research should investigate deeper the analysis of the influence of different styles of play on the 7v7 situations.

The findings of this study should be considered to adapt the SSGs design with the aim to improve the use of these drills for tactical preparation of the players.

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Quantifying movement demands in elite female beach volleyball: A positional analysis

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ABSTRACT

Introduction

The aim of this study was to quantify the physical demands of beach volleyball (BV) competition, with reference to the specific positional variations in performance, during elite championship match play.

Methods

12 professional female BV players (age: 24.0 ± 1.6 years; height: 176.0 ± 4.0 cm; weight: 68.4 ± 3.2 kg; playing experience: 11.5 ± 6.4 years) were equipped with a commercially available 10 Hz GPS device containing an inertial measurement unit (Minimaxx S4, Catapult Sports, Australia). Players were categorized by position (blockers: $n=6$, defenders: $n=6$) and data collection occurred over 26 official national championship matches, during a single competition, with a total of 44 sets used in the match average analysis. Distance covered (m), meterage per minute ($m \cdot \text{min}^{-1}$), Player Load (A.U), and both moderate (20 – 40 cm) and high-intensity Jump volume (> 40 cm) were included in the analysis.

Results

The results revealed little positional differences in physical loading between blockers and defenders. Defenders and blockers covered similar average distances (845.0 ± 342.9 m and 767.6 ± 292.2 m respectively, $p>0.05$), however defenders did so at a greater relative intensity, $p<0.05$ (32.6 ± 3.1 and 29.9 ± 3.7 $m \cdot \text{min}^{-1}$ defenders and blockers respectively). Player Load values were similar between positions, with defenders having only slightly higher values than blockers (107.3 ± 49.3 and 98.3 ± 38.4 A.U. respectively $p<0.05$). However, blocker analysis revealed greater moderate and high-intensity jump volumes (24.4 ± 11.0 and 10.0 ± 6.5 respectively $p<0.05$) when compared with defenders (17.5 ± 13.9 and 5.1 ± 5.3 moderate and high intensity respectively, $p<0.05$).

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Discussion & Conclusion

Although the movement demands appear similar between positions, in elite female BV, there appears to be a greater locomotive intensity demand for the defenders. In addition, there appears to be a significantly greater vertical loading component for blockers which has implications for different approaches to physical preparation and recovery. Further analysis is necessary to better understand the physical demands associated with player role, however the current data may assist coaches in developing individualized programs that better meet the overall and positional specific demands in female Beach Volleyball.

Situational ruck analysis and its effects on momentum and success in International Men's and Womens Sevens

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ABSTRACT

Introduction

One of the most frequent contests for possession associated with rugby sevens is the ruck. There has been no research on the patterns of rucks in sevens or the effects of momentum from the ruck. The aim of this study was to examine the link between ruck location, team momentum and success.

Methods

Footage from all men's (N=63) and women's (N=35) IRB Sevens World Series Cup knockout matches played during 2014 were analysed. Data was collected via computerized notation. Situational ruck opportunities were divided into four categories based on the location of players with the assumption that each ruck would consist of three attacking players. These were wide rucks (4&0); mid to wide rucks (3&1); mid rucks (2&2) and an "other" group for all other situations. Comparisons between winning and losing teams were examined through a series of Mann Whitney U Tests and Independent t-tests ($p < 0.05$). Tests of association between variables were performed using a Chi Squared test of independence.

Results

Winning women's teams crossed the advantage line resulting in positive momentum significantly more than losing teams (W(64.37%) v L(49.59%), $p < 0.01$, $r = 0.31$). Losing women's teams were significantly more likely to be tackled on (W(16.22%) v L(23.83%), $p < 0.05$, $r = 0.21$) or behind the advantage line (W(19.41%) v L(26.61%), $p < 0.05$, $r = 0.22$) resulting in neutral and negative momentum respectively. Losing men's teams were significantly more likely to be tackled on the advantage line resulting in neutral momentum (W(16.11%) v L(22.79%), $p < 0.05$, $r = 0.20$).

Situational analysis identified that *wide rucks* were most commonly used in both genders with *mid to wide rucks* second, *mid rucks* third and *other rucks* used the least. Winning women created significantly more positive momentum from wide rucks than losers (W(59.49%) v L(42.36%), $p < 0.05$, $r = 0.29$) and scored more

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tries from wide rucks (W(0.91) v L(0.26), $p < 0.01$, $r = 0.44$) and mid rucks (W(0.53) v L(0.2), $p < 0.05$, $r = 0.31$). Losing women's teams used *mid to wide rucks* (W(1.97) v L(3.17), $p < 0.05$, $r = 0.31$) significantly more than winners and also failed to reach the gain line from *mid rucks* (W(12.28%) v L(27.6%), $p < 0.05$, $r = 0.22$) more often resulting in negative momentum.

Winning men showed that attacking from *mid rucks* led to positive momentum significantly more often than losers (W(79.17%) v L(54.6%), $p < 0.01$, $r = 0.30$). Winners also scored significantly more tries from wide rucks (W(0.69) v L(0.39), $p < 0.05$, $r = 0.21$) and other rucks (W(0.35) v L(0.11), $p < 0.05$, $r = 0.26$). Positive momentum is associated with three or more passes in men's sevens and four or more passes in women's sevens.

Discussion & Conclusion

Momentum has been shown to be an important aspect of success in Sevens. Situational analysis has identified that wide rucks are most commonly used and winning women use wide rucks whilst winning men use mid rucks to gain positive momentum. Higher numbers of passes are associated with positive momentum. This study may assist coaches in developing strategies for creating positive momentum in Sevens.

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Characterization type of goal achieved in final stages of futsal championship


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ABSTRACT

With nearly thirty million people practising it around the world (FIFA, 2012), there is a lack of research in futsal from the academic point of view (Moore et al., 2014), particularly in areas such as sport management or match analysis. The objectives of this study were: 1) to know the types of goals scored in the final stages of futsal 2) describe the percentage of goals scored depending on different variables of the game. We analysed 63 qualifying matches for the title between 2010 and 2014. Variables and sub-variables of the game according to the specific literature, for analyse the finalization in futsal were described. We recorded and analysed a total of 536 goals. We made a descriptive study (frequencies, average, etc.) of the variables studied. The variables analysed were: 1) set pieces, 2) fouls without wall, 3) type of attack, 4) numerical superiority 5) numerical inferiority and 6) counterattacks. The results shown that 31% of the goals in the qualifying matches for the title achieved in positional attack or pressure output, followed by the counterattack (26%), and set pieces (25%). Within the set pieces the highest percentage of success it had the corners (34% of the goals), followed by throw-ins (26%) and second plays (21%). In the faults without wall the 76% of the goals were achieved in 10m shots and the 24% remaining in penalty. As to attack, 66% of goals are scored through positional attacks, 34% in output of pressure. 85% of the numerical superiority goals are achieved through the 5vs4, by 15% through the 4vs3. Meanwhile in numerical inferiority the 94% of the goals was in the defence 4vs5 for the 6% of goals was defending 4vs3. Finally, in the counterattacks 61% of the goals are achieved in transition, by 39% after recovery the ball. The results of this study show the description of the goals scored in the final stages of the Spanish futsal league (LNFS). In relation to our initial objective, i.e., to know the types of goals scored in the final stages of futsal and describe the percentage of goals scored depending on different variables of the game, we observed that most of goals were achieve it in open play (73%) of the total goals, for an 27% in set pieces. The sum of positional attacks and counterattacks are more than half of all goals (56%). Additionally, we have provided a general description of the six large types of goals in futsal: 1) set pieces, 2) fouls without wall, 3) type of attack, 4) numerical superiority 5) numerical inferiority and 6) counterattacks. This study has allowed us to learn more about the current state of this topic. It may serve as a starting point for future research studies on game analysis in futsal. The coaches have the information of how the teams scores their goals.

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Portance of type of goal to determine success in futsal

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ABSTRACT

With nearly thirty million people practising it around the world (FIFA, 2012), there is a lack of research in futsal from the academic point of view (Moore et al., 2014), particularly in areas such as sport management or match analysis. The objectives of this study were 1) to determine if there are significant differences in the type of goals scored between championship winners and candidates, 2) analyse the relationship between the type of goals according to the type of game and 3) final result of the game. The variables analysed of the goals are: set pieces, faults without wall, type of attack, numerical superiority, numerical inferiority and counterattacks. We analysed 63 qualifying matches for win the title between 2010 and 2014. We recorded and analysed a total of 536 goals. To understand the relationship between the types of goals and winners, candidates, type of match and final result, the Chi-square of Pearson test was performed, considered differences to 95% ($p > 0.05$). The results show no significant relevant differences. There are only differences between the champions and candidates in relation to the numerical advantage. Between winners and losers there are differences in the numerical disadvantage variable. There are no differences regarding the type of game and the type of goals scored. We can say that, the type of goals does not determine the difference between the champions and candidate's teams.

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Tactical strategy on landing areas and shots outcomes by Malaysia top players in international squash competitions

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ABSTRACT

Introduction

Convincing performances and achievements by Malaysia top players in several world championships had lifted Malaysian player at par with other world figures in squash. The purpose was to establish and verify tactical strategies used at international level via notational analysis.

Methods

50 matches involving Malaysian player from several international competitions were observed and analysed. Notational analyses were based on observation of the ball landing area and rally outcomes.

Results

Total number of shots performed was 17369 shots and mean total shots and SD per game was 347.38 ± 635.77 . Total rally outcomes performed was 2823 shots and mean total number of outcomes performed per game was 55.12 (SD=55.32) shots. Playing area was divided into 16 areas and Area 13 has recorded the highest number of ball landed (24%) during rally. In contrast, Area 15 was the least favoured area to deliver the ball during rally with only 22 shots. Rally outcomes were categorized as winners, errors and lets. There were more winners produced (55%) compared to errors (25%) and lets (20%). The most effective area with the highest number of winners was Area 1 (297 shots). Interestingly, the most ineffective area with the highest number of errors was also Area 1 (151 shots).

Discussion

This finding recognized that there were possible winner and error outcomes occurred in specific or similar areas. It signifies that although the area was recorded high rate in delivering success during rally, it also could be catastrophe area due to the player's errors.



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Conclusion

Findings of this study could portray practical feedback to the players and coaches to understand key areas that need to be emphasized to enhance the performance and boosting players to higher levels.

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Increasing scoring certainty in soccer: Evidence from playing skills-related differences

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ABSTRACT

Introduction


The notion of opposition interaction states that the analysis of performance for invasion games must consider the interaction between the two opposing teams to be more valid (Gréhaigne et al., 1997). Therefore, goal scoring in soccer can be considered to be a result of the process of creating complete penetration against the opposition defence. Applying this concept, we managed to distinguish between goals scored under *high degree of defensive control* (lower scoring certainty) and those scored under a more favourable *low degree of defensive control* (higher scoring certainty) conditions in the opposing team. Thus, the aim of this study was to investigate the relative influences of playing level, offensive skills and fatigue on creating penetration prior to goal scoring in soccer.

Methods

The sample included 2600 team possessions ended with a goal from seasons 2011, 2012 and 2013 of the Norwegian top professional league (1951 goals) as well as seasons 2011-12 and 2012-13 of the UEFA Champions league (649 goals), after excluding 192 (6.9%) goals from the penalty kicks. The sample was further distinguished into goals scored under *high* (984 goals) and *low* (1592 goals) degree of defensive control at the moment of finishing. Kappa correlation coefficients were used to test inter-observer reliability for observational variables, while Chi-square analysis was applied to determine if there was an association between goal scoring factors and the probability of scoring goals under low degree of defensive control. Multiple logistic regression procedure was also used to determine odds ratio in which the dependent variable was whether or not a goal was scored under low degree of defensive control. We used a significance level of $P < 0.05$ in all tests.

Results

Kappa correlation values, ranged from 0.43 to 0.95, showed acceptable levels of inter-observer reliability for all observational variables used (Altman, 1991). Multiple logistic regression analyses revealed that only variables of offensive skills had influence on whether a goal was scored under a more favourable condition (low degree of defensive control); with scoring from outside the 16 m area showing the greatest influence

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compared to scoring within the 5 m area (OR=4.91, 95% confidence interval: 3.48 to 6.93, P=0.001). The factors of playing level (P=0.241) and fatigue (P=0.081) showed no significant effect.


Discussion & Conclusion

The results suggest that, regardless of the level of play and time of scoring, goal-scoring certainty may improve by 56% up to almost five times if soccer teams employ certain types of playing skills compared to others. These skills include the ability to perform five or more passing sequences compared to four or less (i.e. outplaying the opposition), to use four or more finishing touches compared to one touch (i.e. running with the ball and dribbling), and the ability to shoot from outside of the 16 m area compared to from within the 5 m area of the pitch (e.g. scoring from direct free kicks).

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Water polo shooting speed by playing positions and field zones: Hungary vs Spain at the 15th FINA World Championships

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ABSTRACT

Introduction

Water polo shooting motion is of significant interest since it can differentiate teams' success. This study aimed to evaluate shooting speed and its success (by specific playing positions and field zones) comparing Hungary (World champion) and Spain (5th ranked) at Barcelona'2013 World Championships.

Methods

231 shots were videotaped (from qualification round for quarterfinals until final match), shooting speeds were measured with radar (Stalker Pro, USA) and field of play schematization was used. Descriptive statistics, data normality, Mann-Whitney and Kuskall-Wallis tests were applied.

Results

Shot speeds differed according to playing position in total sample and within each team, mostly between 2nd and 1st offensive lines on the center forward ($P < .001$). This was fully observed in Hungarian team, but in Spanish team differences occurred mainly between left winger and center back, and between center back and center forward.

Discussion & Conclusion

When comparing teams shooting speeds were similar, independently of shots outcome, although it was observed a trend of Hungarian team for better efficacy scores than Spanish team in all playing positions (especially in the left driver, right driver and center forward: 41.0 ± 24.7 vs $32.0 \pm 24.0\%$; 29.0 ± 15.0 vs $11.0 \pm 12.5\%$ and 65.0 ± 23.5 vs $29.0 \pm 26.3\%$, respectively). Furthermore, min-max efficacy mean values of



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Hungarians right drivers and center forwards were $\geq 50\%$ per game, tendentiously higher than Spaniards (20.00–50.00 vs 0.00–25.00% and 42.8–100.0 vs 0.00–50.00%, respectively). Shooting speeds were different by shot location in total sample ($P < .001$) due to differences between field zones two (2m to 5m in left corridor) and eight (5m to midfield in central corridor): 17.37 ± 2.51 vs 20.18 ± 2.57 m.s⁻¹ ($P < .001$). This variable also differed by field corridors in total sample ($P = .019$), mainly due to Spanish inequality speeds between central and left corridors ($P = .012$). Hungarians showed a trend for lower mean speed values in central and right corridors, but their shot efficacy was $> 50\%$, in contrast with Spaniards ($55.6 \pm 16.3\%$ vs $31.8 \pm 13.2\%$ and $33.3 \pm 20.2\%$ vs $13.8 \pm 10.5\%$, respectively). Shooting speeds differences by field zones were observed before (Alcaraz et al., 2012), corroborating current results. Higher shooting speeds are expected when shots are from the 2nd offensive line, which does not mean that a successful outcome it is guaranteed. Spaniards tended to show fragility in achieving success by drivers and center forwards, whose importance is well-known for even tactics and man-up plays. Rather than speedy, center forwards shots need to be accurate, particularly when performed against elite goalkeepers, one of distinguished factors for successes of winning teams. Furthermore, when facing excellent opponents' defensive performance, it is vital to create offensive difficulties in all zones and playing positions, which likely was shown by Hungarians, revealing greater homogeneity on shot attempts, shot speed and success. Current study highlights possible teams weaknesses that coaches' should be alert to better plan and improve team's performance.

Acknowledgments

To the Royal Spanish Swimming Federation and Fédération Internationale de Natation.

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The variation in use and integration of PA between team and individual sports in an Irish context

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ABSTRACT

Introduction

The aim of this paper is to examine the variation in use and integration of performance analysis (PA) across different sports. This analysis is important because it facilitates an understanding of the potential differences that exist between the needs of coaches in individual and team sports, and the PA support they are currently receiving. PA is seen as an integral support for elite athletes, thus understanding the patterns and gaps in PA support is essential to planning future PA provision in Ireland.

Method

A sample of 12,500 (minimum level 1 Coaching Ireland qualified) coaches were selected to complete an online-survey with 538 respondents across 37 sports. The coaches were categorised as team (54%), individual (43%), or a multi-sport mix (3%). Responses of the coaches in the seven largest sports (72% of cohort) were also isolated. Coach's responses to a number of questions relating to how they used and integrated PA were analysed. Chi Squared test was used to test association between variables.

Results

Team sport coaches used more PA (53% versus 47% individual sport coaches) and were twice as likely to have access to analyst-support (36% versus 16%, $p = <0.001$). Individual sport coaches' main PA use was for technical analysis (61%), while team sport coaches accessed match data first (68%). Coaches from team sports had significantly more access to video ($p = 0.00$) with 50% using it monthly or more, compared to 26% in individual sports. They were also more likely to use PA to inform training on a regular basis (69% versus 47% individual coaches, $p = >0.001$). Knowledge was significantly more of a barrier to the use of PA for individual sport coaches (29%) than their team sport peers (18%, $p = <0.008$). The proportion of the cohort represented by the seven largest sports and the PA usership per sport were as follows: Gaelic Games (27%:49%), Athletics (15%:39%), Soccer (9%:56%), Rowing (6%:68%), Hockey (6%:50%), Rugby (5%:81%), Basketball (4%:55%).



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Discussion

Results indicate that PA use and integration varies greatly between sports, and particularly between team and individual sports. Our analysis revealed a pattern of relative sub-optimal use and integration of PA in individual sports, where coaches using PA did not have widespread access to video, and less than half those surveyed did not use PA to inform their training on a regular basis. Further research is required to explore these findings through qualitative interviewing with coaches and educators. The high use of PA in rugby is perhaps indicative of the strength of the professional game in Ireland and the ability for centres of excellence to facilitate the dissemination of sports science practices such as PA, in a top down model.

Conclusion

Coach educators and designers of PA service provision may need to target the PA knowledge base of coaches, particularly in individual sports on the effective integration of PA into coaching practices. Team sport coaches are potentially more likely to need support to manage and maximise the impact of performance analyst support.

A case study of individual possession and team attacking statistics in elite hurling

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ABSTRACT

Introduction

While hurling is one of the oldest team sports in the world, little research has examined its technical or tactical game demands. Soccer research has shown total individual possession to be limited to just one minute, illustrating the importance of each touch and decision made (Dellal, Wong, & Moalla, 2010). This study provides a first insight into the decision making demands placed on elite hurling players. The aims are to investigate the number and time in possession per field position and examine the most prevalent forms of attacking play.

Methods

The case study was conducted on the 2015 All-Ireland Hurling Final using broadcast video. The game was coded using SportsCode Elite v. 10.3.14 (Sportstec, Australia) by a skilled operator. An intra-operator reliability study was conducted with a percentage error >5%. Players completing the match's full 73 minutes were included ($N = 24$) and categorised according to position (see table 1). Variables were defined as follows: *Possession*: when a player had the ball in his hand or on his hurley. *Duration of each possession*: recorded from the instance he received the ball in his hand until he struck/hand passed/lost possession. *Attacking in open play*: the ball entering the opponents half of the pitch not from a set piece or puck out. The means of attack were categorised into long strike (40m+), short strike (<40m), solo (carrying the ball on the hurley), or hand pass (striking the ball with the hand).

Results

Findings illustrate a trend of more possessions for midfielders and half forwards (Table 1). Of the 72 entries into the opposition half in open play, 71% were played via long strikes, 19% soloed, 8% via short strike and 1% hand passed.



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Table 1. Variation in possession statistic means and standard deviations (SD) according to position played. (s = Seconds)

Position	No Players	Mean Possessions (SD)	No. in Possession	Mean (SD) Time (s)	Mean (SD) Time (s) per possession
Goal Keeper	2	3 (1)	4.5	(0.7)	1.9 (0.2)
Full Backs	6	6 (2)	16.0	(7.2)	2.7 (0.8)
Half Backs	5	8 (2)	13.0	(5.7)	1.7 (0.6)
Midfielders	3	12 (8)	26.3	(8.5)	2.6 (1.2)
Half Forwards	4	11 (4)	26.0	(10.9)	2.2 (0.7)
Full Forwards	4	8 (4)	17.5	(10.1)	2.2 (0.7)
All Players	24	8 (4)	17.9	(9.7)	2.3 (0.7)


Discussion & Conclusion

While the sample size is small, the findings provide a first snapshot of possession statistics in hurling. As elite players have a limited number of possessions (ave. 8) and time in possession (<3 seconds), training skill efficiency may be a key priority for coaches. Given that the majority of the game is spent without possession, behaviour off the ball is an area which warrants further investigation. The study also highlights the importance of practicing reading the flight of the ball from long strike passes into attack. Further research to investigate attack style with different teams over a season would be valuable.

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Elite water polo shot types and teams efficacy: Hungary vs Spain at 15th FINA World Championships

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ABSTRACT

Introduction


Water polo shot features may differentiate success between teams. Concurrently to shooting speed, types of shot may also influence successful outcomes. Taking into consideration that the Water Polo shot is a determinant parameter for achieving success, we aimed to evaluate shot types (considering speed and success) and teams' efficacy comparing Hungary (World champion) and Spain (5th ranked) at Barcelona'2013 World Championships.

Methods

All shots performed by both teams during matches contested from 8th stage till finals were videotaped and analyzed. Shot types were categorized in drive, bounce, lob and back shot, and shooting speeds were measured with radar (Stalker Pro, USA). Descriptive statistics, data normality, Mann-Whitney and Kuskall-Wallis tests were applied.

Results

Considering both teams together, bounce shot presented higher speed than back shot (19.00 ± 2.56 vs 15.47 ± 1.31 m.s⁻¹; $P = .017$), which is mainly performed from 1st offensive line, contrasting with bounce shot thrown from further distances to goal. When teams were compared, it was observed similar occurrence of shot types and corresponding speeds, although Hungarian team tended to achieve better mean efficacy scores than Spanish team in all types of shots particularly in bounce shot (53.1 ± 20.8 vs $29.0 \pm 20.1\%$). Furthermore, min-max mean drive shot efficacy of Hungarians overcomes 50%, which did not occur with Spaniards ($21.3-52.6$ vs $12.5-47.6\%$, respectively) even though their trend for attempting to score more frequently than Hungarian team by drive shot (70.0 ± 11.4 vs $65.0 \pm 8.9\%$, respectively). Hungary showed a

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tendency for better team absolute and relative shot efficacy ratios than Spain (30.6 ± 7.83 vs $19.9 \pm 8.6\%$ and 43.1 ± 8.90 vs $28.2 \pm 12.0\%$, respectively), a trend also seen on shot accuracy (76.5 ± 7.22 vs $74.1 \pm 15.3\%$). Furthermore, goalkeepers attained better defensive scores against shots performed by Spaniards than Hungarians, particularly on the ratios between goalkeeper defenses and total shots (regardless shots outcome) and between goalkeeper defenses and total failed shots: 45.8 ± 10.3 vs $33.3 \pm 15.3\%$ and 63.8 ± 15.9 vs $58.6 \pm 20.2\%$, respectively.

Discussion & Conclusion

The similarity between teams regarding shot type occurrence and shooting speeds by type are justified by the high performance level of both squads. However, Spanish team efficacy by shot type and on game in general, when compared with Hungary, appears to reveal fragility in overcoming opponents' defensive performance in front of the goal. This is particularly noticed by both teams' proximate opportunities to score (seen on game productivity), contrasting with Spanish relative shot efficacy achieved and opponent goalkeepers' defenses. High level defensive opponents performance likely had an important role to constrain Spaniards.

A framework for network analysis in team sports

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ABSTRACT

Introduction

Network analysis has originally been a technique of investigating complex structures in the field of sociology such as friendship or acquaintance networks. Recently, it has also been applied for the evaluation of individual and team performance by the style of interaction of players in team sports. However, data mainly originate from football matches so far, preventing a comprehensive evaluation of the method in the context of performance assessment in team sports. Thus, the aims of this study are to give a methodological research framework, first, to fully exploit the potential of network analysis methods in sports, and second, to apply network analysis to a wide range of team sports.

Methods

Existing studies generally focus on two performance categories, individual and team performance. As for individual performance especially centrality measures such as weighted (in-/out-) degree and betweenness have been calculated (Clemente et al., 2015), team performance has mostly been evaluated by measures of centralization and density (Grund, 2012). To provide a more comprehensive exploitation of the potential of network analysis in team sports, this study will consider five team sports (football, basketball, handball, rugby7s and water polo). Therefore, data of the final matches of the men's tournaments at the 2016 Summer Olympics were collected to compare the outlined individual and team network parameters across team sports.

Results

On an individual level, we can identify the most dominant player in each sport by in-/out-degree and betweenness. The point position in water polo has the highest centrality scores respectively (e.g. 38% share of total aggregated in-/out-degree) followed by the center back in handball and point guard in basketball. On a team level, water polo shows the highest score of in-degree centralization, meaning the most uneven distribution of involvement in plays, followed by handball whereas rugby7s has the lowest score.

Discussion & Conclusion

The results are based on only a limited set of matches, aggregated data of the opposing sides and the total aggregated adjacency matrix of each team ignoring units of attack. Therefore, the results mainly serve as a first comparison of centrality measures on individual and team level of various team sports as well as a better



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understanding of crucial players within the respective sports based on network analysis. More matches should be considered in future studies, filters for successful plays introduced and a wider range of centrality measures applied.

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World League Volleyball 2015: Counter-attack is a discriminant analysis factor

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ABSTRACT

Introduction

The Match analysis have been assuming a key role in the coaching process. The aim of this study is to determine if the complex II or Counterattack (block, defense, setting and attack) is a factor to win the final world League Volleyball, in the high level teams.

Methods


Thirty six national teams according 178 senior men matches are played during two months and the semi-finals and finals are played by four games and four teams: Serbia, France, Poland and States united of America, on 18 and 19 of July 2015 World League, on Brazil composed this sample. The data recorded and analysis was performed by Data Volley in software. The discriminating function analysis was used to identify indicators that contribute most to establish the maximum difference between wins and losses. Values of linear composites $|SC| \geq .30$ were considered relevant (Tabachnick & Fidell, 1996). The significance level was set at 5%. The statistical procedures were performed by the SPSS software version 23.0.

Results

Regarding the results, the variables that contributed most to the discrimination between the Complex II or Counterattack and defeat and victory were: Service point (SC=.98), the block point (SC=.57), attack error (SC=-.39), and service error (SC=-.31).

Discussion & Conclusion

The Service point, and block point variables were associated with victory. The variables, attack error and service error, were associated with defeat. According the last World League 2015 disputed in Brazil, the high level Volleyball teams are very balanced, principally in semi-finals (3-2 and 3-2). Since these results suggest that is more important trying make more risks in the service to can make more points, and have a good

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strategy in block organization, by other hand according set number, not to make so mistakes in the service and attack if they won't to win. According our results the teams have more success during complex II or counterattack in the final, have more probably to win the match and the competition, principally in balance teams, because is a discriminate variable.

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Influence of plyometric training in lineal speed and the jump in female soccer players

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ABSTRACT

Introduction

There are many sports where the final performance is conditioned by the acceleration that athletes get in acyclic short-term actions. This indicates that the performance is determined by the production of strength and ability to generate in the shortest time possible. (González Badillo and Gorostiaga, 2002).

In the example of football, a professional player covers an average distance of between 8 and 12 kilometers. 10% of this distance is covered at maximum intensity, performing a sprint every 90 seconds. 96% of these sprints are performed at a distance of less than 30 meters, being 49% covered in less than 10 meters (Wisløff, Castagna, Helgerud and Hoff, 2015).


The main rationale for this work is based on the increase in running economy by improving neuromuscular characteristics. There is clear evidence that the force has a high correlation with time in the sprint of 10 m ($r = 0.94$, $p, 0.001$) and 30 m ($r = 0.71$, $p, 0.01$) (Wisløff, Castagna, Helgerud and Hoff, 2015). It also seems to be demonstrated the correlation between the maximum power and acceleration capacity in 30 meters ($r = 0.82$) (Balsalobre, Tejero, Campo and Alonso, 2012)

Method

It has been proposed to perform an intervention protocol of 5 Microcycles training plyometrics in order to generate an acute effect in 19 professional female soccer players, running an initial and final evaluation at the beginning and end of the intervention protocol, in order to assess the acceleration capability (test 0-30 meters) and jump (CMJ test and SJ Bosco).

Results

The highest percentage of improvement has been achieved in the CMJ (60.16%), followed by SJ (45.52%). According to the equation Cohen, the interpretation to be performed on these two results must be very large, as they are well above 1.

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In contrast, the percentage of improvement in speed 30 meters has been very small, so this is an insignificant increase.

Tabla 1. Descriptivos y contrastes para diferencias de medias post-pre. Contraste T-student para muestras relacionadas.

Variables	Media	Desv. Tip.	Media	Desv. Tip.	Diferencia post-pre	% cambio	p	Efecto del tamaño
	Pre-test	Pre-test	Post-test	Post-test				
Fase de vuelo en CMJ (ms)	8,9325	2,2803	22,4191	3,2579	13,4866	60,16%	0,000*	4,7961
Máxima potencia en SJ (W)	11,6906	2,948	21,4582	2,6374	9,7676	45,52%	0,000*	3,492
30 m sprint (s)	4,9354	0,3331	4,9062	0,2795	-0,0292	-0,60%	0,6858	-0,0949

Significativo $p < 0,05^*$. Efecto del tamaño calculado con la d de Cohen.

Fuente: Elaboración propia.

In short, there is an increase in the middle of the three parameters investigated during the study, although this increase is higher in the explosive explosive and elastic force, and much lower speed.

Discussion and Conclusions

After analyzing the results, the sample has obtained a definite improvement in the SJ and in the CMJ, which is consistent with other studies and investigations of similar nature, albeit with a percentage improvement in them more demure. However, the percentage of improvement in speed has been less pronounced due to the high degree of familiarity with this action.

In order to continue this line of research, it is proposed to make the same protocol intervention in competitive period where the athletes are in their optimum form, which the athletes have prior knowledge of the technical execution of the tests and evaluate the speed at a distance of less than 30 meters.

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Required shooting efficiency to win World Cup and World Championship Biathlon races during the 2015-2016 season

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ABSTRACT

Introduction

Biathlon is a winter sport combining cross-country skiing and shooting. The latter of the two is rifle shooting on round targets placed 50 m from the biathlete. There are different race formats but all, except sprint races that have 10 targets, consists of a total targets of 20 divided in to 4 rounds (five targets per round). Every second shooting round is performed in either a prone position or in a standing position. The biathletes get penalized if they miss a target which adds to the race time. As the winner is the one with the shortest total time, a missed target influence the possibility to win the race. To date the information of the shooting statistics is presented for each biathlete only using the ratio of hits/total shoots on target. However this information lacks a measure to estimate the shooting efficiency to win a race in the World Cup or Championship races on a senior level.

Methods

Shooting statistics was obtained from the IBU Datacenter from winners of the World Cup and Championship senior races during the 2015-2016 season for each competition (27 races, n targets= 880) for men and women. The shooting outcome was classified as binominal (miss/hit) to calculate the probability (π) of numbers of hits it requires to win a race. The probability (π) was calculated for total, for prone and standing shooting separately. Estimation of the margins of error was used to assess the spread of the hypothetical true probability. To calculate the margin of error a formula was used were π is replaced with p (Severini, 2015):

$$\frac{2\sqrt{p(1-p)}}{\sqrt{n}}$$



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Results

The winners shooting efficiency were for men and women in total: $\pi = 0.93$ (0.91-0.98) vs. $\pi = 0.96$ (0.95-0.98). For prone shooting men and women showed an efficiency of: $\pi = 0.94$ (0.90-0.97) vs. $\pi = 0.97$ (0.95-0.99), and for standing shooting: $\pi = 0.93$ (0.90-0.97) vs. $\pi = 0.96$ (0.93-0.98). The results for sprint racing were for men and women: $\pi = 0.97$ (0.94-1.00) vs. $\pi = 0.97$ (0.94-1.00). One biathlete (all-time best) was studied separately to highlight how well the shooting ratio could explain the outcome for a single racer. The biathlete displayed an overall: $\pi = 0.857$ (0.816–0.897) where the shooting ratio explained 40% of the outcome. The four times the shooting ratio was above the men's total π the athlete reached the podium at all occasions.

Discussion & Conclusion

To win a biathlon race at this level the results suggest a success rate of at least 18 hits and 19 hits (20 targets), for men and women respectively. Binominal distribution showed that likelihood to find a winner with less hits for men and women are 14.1% and 16.3% respectively. In sprint races the biathlete need to achieve a perfect shooting score to win independent of gender.

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Body fat versus body mass index as correlates healthy aerobic fitness control body weight program among the soccer players

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ABSTRACT

Introduction

The question of ideal body weight historically is a subject of study that raises more questions than answers [1]. However, there are more accurate methods available to determine the ideal body weight. Where among health care professionals, the best-known method for assessing body size is the body mass index [2]. While weight is not the best indicator in the case of athletes due to increased bone and skeletal muscle. Since BMI is a limited perfect measure to interpret the body fat. Where It is important for the metabolic physician to know the ranges of BMI in terms of the weight category.

Methods

Our aims are to include the level of aerobic fitness, to evaluate the influence of body weight on aerobic fitness to control the body weight program among 160 male soccer players their age category under 19 years, tested based on cooper test as a physiological parameter to esteem VO₂max, and weight-height to calculate the BMI and body fat as anthropometric measurements. Whereas our background confirms, that Body weight is easily measured, but not always the best indicator of body composition changes [3] whereabouts VO₂max level is related to lower body Fat percent [4].

Results

The most important finding of our study concerns within the correlation body fat and height as the best predictors of the VO₂max level. Whereabouts the lower body fat percent is the best predictor of the adjusted aerobic fitness control body weight program among the soccer players.

Discussion

To esteem the adjusted body weight, we need to detect the excess body weight in the form of fat that Anita Bean, et al [5] are reported as a distinct disadvantage in every practised sport.



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Conclusions

Our findings support the hypothesis that BMI alone should not be used to determine an ideal body weight. From the moment that the level of VO₂max is the best predictor of the body composition, our proposal requested to develop equation more studies are needed to prove this hypothesis.

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The action of the middle blocker according to the opposing offensive organization in volleyball

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ABSTRACT

Introduction

In modern Volleyball, the block action differentiates the world-class teams (Junior, 2013; Sterkowicz-Przybycien et al., 2014). The purpose of this study is to understand what determines the action of the middle blocker in the moment that precedes the technical procedure of the block.

Methods

The sample consisted of 4895 actions from 24 middle blockers, from the 1st male volleyball division in the Portuguese league on season 2013/2014.

Results

The chi-squared test analysis allowed us to establish that there is a relationship between the actions and the attack zones ($\chi^2=109.956$; $p \geq 0.001$), as well as between the actions and the type of setting, in each attack zone ($\chi^2=3523.678$; $p \geq 0.001$ in all of them).

Discussion & Conclusion

Thus, we have verified that the action performs block but does not make contact with the ball is the most frequent. We have also established that there is a strong tendency for the middle blocker to attempt to carry out the block in zones 3 and 4, to the detriment of the attack performed in defensive zones.

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Sterkowicz-Przybycien, K., Sterkowicz, S. and Zak, S., Sport Skill Level and Gender with Relation to Age, Physical Development and Special Fitness of the Participants of Olympic Volleyball Tournament Beijing 2008, *Journal of the Croatian Anthropological Society*, 2014, 38(2), 511-516.

The effects of the 2015 long corner rule change on match variables and patterns of play in elite men's field hockey

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ABSTRACT

Introduction

Current field hockey rules, published by the International Hockey Federation (FIH), became effective at international and national league level from 1st January 2015 (FIH, 2014). One of the new rules changed the procedure for restarting play after the defending team unintentionally plays the ball over the backline. The restart, commonly known as a long corner, was deleted, with the restart now taken on the 23m line, parallel with where the ball crossed the backline (FIH, 2014). This rule was introduced to open up play and increase passing options for the attacking team, as the previous longer corner restart was described as inefficient and ineffective, as the ball often became trapped in the corner of the pitch (FIH, 2014). The aim of this study was to establish whether the 2015 long corner rule impacted match variables and patterns of play in elite men's field hockey.

Methods

English National League, European Hockey League and FIH international matches were analysed, with N = 179 restarts from 2014 before the rule change (BRC) and n=168 restarts from 2015 after the rule change (ARC) being analysed. The research used a hand based notational system and was quantitative, observational and descriptive based. The main areas examined were: mean restart phase durations (the time between the ball leaving play and the restart being taken); first phase outcomes, either positive (circle entry or penalty corner) neutral (another restart, a free hit, or side line hit awarded) or negative (possession lost); and the number of different player interventions and zones the ball was touched within during the first phase. All variables were found to be non-parametric. Mann-Whitney U, Kruskal-Wallis H and Chi-squared tests were used to find significant differences ($p < 0.05$), with post-hoc Holm's sequential Bonferroni adjusted Mann-Whitney U tests used when appropriate. Spearman Rank Order and Pearson correlation tests were used to find significant correlations ($p < 0.05$).



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Results

The main finding was a significant increase of positive first phase outcomes from 19% BRC to 26.8% ARC and a significant decrease of neutral first phase outcomes from 31% BRC to 19.6% ARC. The number of negative first phase outcomes remained similar with 50% BRC and 53.6% ARC. The mean restart phase durations significantly increased from 5.8 ± 2.4 s BRC to 9.2 ± 3.5 s ARC. A significant positive correlation ($r=0.91$; $p<0.01$) was found between number of players zones both BRC and ARC. Number of players significantly increased from 2.7 ± 2 BRC to 3 ± 1.8 ARC. Number of zones significantly increased from 2.3 ± 2 BRC to 2.5 ± 1.7 ARC.

Discussion and Conclusion

It was concluded that the rule change successfully met the aims of the FIH (2014) to open up play and increase the attacking team's passing options, because of the significant increase in positive restart outcomes. The significantly increased restart phase durations may not add to the excitement of the sport, but these added seconds are balanced by the significantly increased number of players and zones in passing moves, the significant reduction of repeated restarts, and the significant increase of circle entries.

The efficacy of FIFA and UEFA national team rankings

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ABSTRACT

Introduction

Ranking systems in soccer are used to seed teams when making draws for international soccer tournaments. European football teams are ranked within the FIFA World Rankings as well as by the UEFA national team ranking coefficient. It is the latter ranking technique that was used to seed teams prior to the draw of the Euro 2016 tournament. The purpose of this study was to create a model of match outcomes in terms of each ranking system and then use these models to produce predictions for Euro 2016.

Methods

Each simulator simulated the tournament 100,000 times and progression statistics for each team were accumulated. No one team has any more than a 25% chance of winning the tournament according to either model. There was one point for each pool match (36 in total) and one point for each knockout stage match (15 in total). The proportion of the mark awarded for a pool match depended on the proportion of simulated tournaments where the correct result was predicted. Where a match was won by either team, half marks were also awarded for predicting draws. Where a match was drawn, quarter marks were awarded for predicting a win to either side. The proportion of the mark awarded for each knockout stage match was the proportion of simulated tournaments where the winning team was predicted to progress to the next stage.

Results

The model based on FIFA World rankings gives Belgium (21.1%), Germany (16.5%) and Spain (13.5%) the highest chances of winning while the most likely teams according to the UEFA ranking coefficient based model are Germany (20.9%), Spain (13.6%) and England (9.9%). These models were evaluated against the actual results of the Euro 2016 tournament to give each an accuracy score out of 51. The simulator based on UEFA national team ranking coefficients had an accuracy score of 22.92 which was marginally better than the 22.45 for the model based on FIFA World rankings. Both models scored fewer than 5 / 15 for the knockout stage matches which was not as successful as the accuracy levels for the pool matches.



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Discussion & Conclusion

International soccer tournaments are very difficult to predict prior to commencing because no single team has more than a 22% chance of winning the tournament.

The structure of the factors determining high efficiency of archery

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ABSTRACT

Introduction

Nowadays, archery is an Olympic sport. High level of archery can only be achieved provided that the body's functional systems are in good condition, and tactical training and excellent technical skills of archery have been acquired. The performance of the archers depends on many factors, which also include their behavior during the competition [2]. Modern conditions of competitive struggle raise demands for archers' mastery. During contests, archers experience great static and psychological pressure. All of the above influences archery efficiency [1, 3]. In modern conditions an effective system of archery training management has to be created in order to improve archers' sport mastery and psychological condition. Schemes, aimed at scientific support of the training process and achievement of archers' optimal physical condition, are becoming especially important.

Methods

Tackling these problems is closely connected with identifying the factors determining high archery efficiency. In order to determine the ranking structure of these factors, a survey was conducted among 28 coaches and highly qualified sportspeople from Saint Petersburg who have had work and performance experience of more than 10 years.

Results

Among basic factors determining high archery efficiency the respondents mentioned an ability to maintain the correct stance at the time of aiming and to control their breathing, and well-developed skills of bow drawing with a focus on its retaining. The respondents also noted such factors as archer's psychophysiological preparedness aimed at holding the bow in a drawn position, and a high level of static endurance. Well-developed skills and abilities of coordinating their breathing and holding the bow in drawn position, as well as the archer's psychological stability for overcoming their fear of bad shot, have great significance for providing high archery efficiency. Important factors are an ability to relax muscles of the arms and muscles of the whole body after launching an arrow and a high level of attention concentration during archery.



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Conclusion

The results of this study suggest that there is the need to take into account the identified factors to develop the effective methods of training archers.

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The specifics of peripheral circulation of trail runners of the senior age groups

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ABSTRACT

Introduction


Nowadays the environment of competitive struggle lays down strict requirements on the condition of veteran trail runners' cardiovascular systems. One can judge about the condition of runners' cardiovascular systems by hemodynamic parameters. At the same time, modern strategies of cardiovascular disease prevention among sportsmen are based predominantly on assessment of systemic hemodynamics, without taking microcirculation into account. The existing methods for diagnostics of veteran sportsmen's cardiovascular systems do not allow apprising the hemodynamic parameters of peripheral circulation properly [1]. Research objective is to compare the dynamics of microcirculation parameters in the conditions of hypoxic gas environment and in the conditions of middle altitude.

Methods

Seven runners from Russia and Italy in the age group between 50 and 60 were examined in the conditions of middle altitude. The same runners were examined in the conditions of hypoxic gas environment. For that purpose, they stayed in a hypoxic chamber with 16% oxygen concentration for 720 minutes. Peripheral circulation was studied with the help of laser Doppler flowmetry on the distal phalange of the second finger of the sportsmen's right hand. All the examinees had the microcirculation parameter assessed, the same as standard deviation of the erythrocytes flow vibration in peripheral denominations. In order to assess the intensity of vasomotor reactions of microcirculatory vessels, the coefficient of variation (VC) was used.

Results

The runners in the conditions of hypoxic gas environment showed decrease in the microcirculation parameter in the conditions of short-term exposition (360 minutes) with its following compensatory increase (720 minutes). The initial data characterizing a fall in peripheral circulation was received as a result of the sportsmen's biomicroscopy at the middle altitude. Meanwhile, VC showed a reverse trend of the increase in vasomotor activity of microvessels from 12.4% to 18.2% at the stage of the maximum training load within one month in the midlands in the hypoxia environment with a consequent reduction in preparation for the start. It was found that peripheral vascular resistance of the arterial bed is preconditioned by arterioles. It was also

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revealed that prevalence of different regulatory mechanisms depends on the diameter of these blood vessels. Insufficient amount of incoming oxygen following the decrease in metabolic activity and short-term inhibition of microcirculation preconditions the arteriolar dilatation. It is accompanied by accumulation of under-oxidized metabolic products that lead to lower pressure in arterioles. The growth in the coefficient of variation that we have revealed characterizes stronger vasomotor reactions of micro vessels and proves the mechanism described above.

Conclusion

In the conditions of hypoxic gas environment, the sportsmen demonstrated two-stage dynamics of the changing microcirculation parameter: an initial fall and the following increase up to the initial positions. Similar results were registered with the sportsmen involved in a contest at the middle altitude. That testifies that assessment of the peripheral circulation can be used as the basis for determination of veteran sportsmen's readiness for long-term trail running in the conditions of middle altitude.

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Medal-winning enhancements of performance

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ABSTRACT

Enhancements that win medals and studies on strategies or factors affecting medal winning depend on whether the sport is non-interactive, interactive non-match-play, or match-play. Athletes in non-interactive sports vary in their performance time or distance from one competition to the next, typically by 0.5-2% in track and field, cycling, rowing, canoe and winter sports (1). Simulations show that the smallest important enhancement of one extra medal every 10 competitions for a top athlete is achieved with a change in performance of 0.3 of the variability (2). Factors producing such changes can be studied in laboratory or field tests, or even in competitions, but dozens of athletes and/or multiple repeated tests or competitions are required for adequate precision (3). Factors affecting medal-winning in interactive non-match-play sports, such as mass-start cycle races, can be studied only in competitions. In such sports finish time is a poor measure of performance, but the logarithm of the finish rank of the athletes can be analysed in the same manner as the performance score in non-interactive sports (4). Again, large numbers of athletes and competitions are required. In match-play team or combat sports, the smallest important enhancement would win one extra gold- or bronze-medal match every 10 matches (1). Factors producing such enhancements apply to earlier matches in the tournament or season, and there are often enough matches to provide reasonable precision in logistic-regression analyses (e.g., 5). With team sports the Holy Grail is an analytical method for identifying the changes in match performance indicators and fitness tests of individual athletes that would result in their team winning more matches.

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Future anxiety and personality traits and among practicing and non-practicing students of sports activities

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ABSTRACT

Introduction

The research has become significant to determine the athletes' personality traits from non-athletes and identify the similarities and differences between them and the level of future anxiety to help them and highlight the role of sports activities, according to the distinctive characteristic of athletes.

Methods

Used the descriptive approach. The identified the research community represented by the students of the Studies in selected the sample intentionally, (60) students practicing in sports activities, 60 students non-practicing. Research Tools Freiburg Personality Scale, to construct the future anxiety scale.

Results

The effectiveness of professional future anxiety scale concluded by the researcher. There are no differences between practicing and non-practicing activities in the level of (nervousness, aggressive, excitability and calmness, and control) traits (There are differences in the level of social trait. There are differences between practicing and non-practicing activities for favor of non-practitioners in the level of (depressive and prevention) traits and the level of future concern.

Discussion & Conclusion

The high level of (nervousness) dimension distinguishes individuals who suffer from physical, kinetic neurological and psychological disorders.

The high level of (Aggressive) dimension distinguishes individuals who are engaged in aggressive physical or verbal actions, such as attack, the lack of calm and not control themselves.



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The high level of (excitability) dimension distinguishes individuals who have a high level of excitability, severity of tension, a weak ability to confrontation, and lack of patience and anger.

The high level of (Depressive) dimension distinguishes individuals with depression, a sense of dissatisfaction and unhappiness, fear and a tendency to attack the self.

The high level of (Social) dimension distinguishes individuals who are able to interact with others and characterized by fun, active and promptitude.

The high level of (Calmness) dimension distinguishes individuals with self-confidence and lack of confusion and stay away from aggressive behavior.

Conclusions

1. The effectiveness of professional future anxiety scale concluded by the researcher.
2. There are no differences between practicing and non-practicing students of sports activities in the level of (nervousness, aggressive, excitability and calmness, and control) traits.
3. There are differences between practicing and non-practicing students of sports activities for favor of the practitioners in the level of (social trait).
4. There are differences between practicing and non-practicing students of sports activities for favor of non-practitioners in the level of (depressive and prevention) traits), and the level of professional future concern.

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The competitive behavior and its relationship to the kinetic satisfaction for volleyball players

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ABSTRACT

Introduction

The research derives its importance from identifying the kinetic satisfaction and its relationship to the competitive behaviour of volleyball Players. This will contribute to identifying some psychological aspects that will help, in the event of interest in them, reach advanced level of the players' performance during the sports competitions. To identify kinetic satisfaction and competitive behaviour among volleyball Players, and to identify the relationship between kinetic satisfaction and competitive behaviour.

Methods

The researcher used the descriptive approach with survey method.

The study population has been identified of volleyball Players in Port Said Governorate. The sample consists of 30 players. Data Collection Tools, Kinetic satisfaction scale, Competitive behaviour scale. The distribution of motor satisfaction scale and competitive behaviour.

Results

1. Kinetic satisfaction was high volleyball Players, under discussion.
2. Competitive behaviour level was high among volleyball Players, under discussion.
1. There is a real correlation between kinetic satisfaction scale and competitive behaviour level among volleyball Players, under discussion.

Discussion & Conclusion

The researcher attributes that the players, under discussion, have kinetic satisfaction toward the physical, technical and tactical skills, which emerged during the high scores on the scale.

The researcher attributes the positive relationship between the kinetic satisfaction and competitive behavior to kinetic satisfaction, which represents a major aspect of importance for volleyball Players because it is closely linked to their performance in competition and in training. This makes coaches oblige to identify the



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factors that help to create a state of satisfaction among these players to be able to provide the appropriate atmosphere for the success of training process. Thus, they achieve the desired objectives in achieving the desired victories. Coach plays an important role in enabling player to gain pleasant satisfactory experiences. If the training is familiar with the best methods of teaching skills in the field of physical education, this imposes the time and effort to be economized, achieve better results, and player gets a comprehensive and pleasant learning experience.

The researcher suggests that the level of players' performance is probably regard to their kinetic satisfaction which gives a great motivation for the player to improve his technical level, especially the skills performance and the application of playing plans set by the coach. Therefore, the coaches should instill and develop the spirit of satisfaction among their athletes.

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Parameters, which define archers' preparedness for competitive struggle

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ABSTRACT

Introduction

Modern conditions raise demands for archers' level of preparedness for efficient competitive struggle. Specific nature of archers' contests implies that the former should demonstrate sportsmanship according to different readiness parameters. [1]. Therefore, it is essential to know the parameters, which indicate archers' preparedness for efficient competitive struggle. Available scientific data suggests that during formation of archers' preparedness for contests a lot of attention should be paid to complex appliance of technical, tactical, moral, psychological, and physical trainings [1, 3]. However, experience shows that not all archers have a high degree of readiness for the effective competitive activity. [2]. Many archers have a great difficulty coping with the psychological and physical stress during competitions. This adversely affects the performance of the archers. [2]. Insufficient readiness for the effective competitive activity calls for the new approaches to the organization of training.

Methods

The aim of this research is to substantiate the indicators characterizing the readiness of archers to the effective competitive activity. In order to identify these indicators the performance results of the sportsmen of high qualification in the Russian championships and other major international tournaments were analyzed. The poll of coaches and athletes was conducted, and the correlation of individual readiness indicators for the competitive activity of archers with the results of their performances during competitions was carried out.

Results

In the course of the study, the rank structure of the indicators of readiness for the competitive activity of the archers was found and the impact of these indicators on the success of the performances of athletes during competitions was determined. The ranking results of archers' preparedness parameters give evidence that the main parameters are sportspeople's moral and psychological preparedness (correlation coefficient is +0.73), and well-developed skills of smooth aiming, arrow launching, and shot completion ($r = +0.68$). Correct positioning and transition to holding the bow ($r = +0.63$), and well-developed skills of an archer's correct arm and body positioning ($r = +0.49$) fit into this group too. For efficient competitive activities it is essential for a



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shooter to breath correctly and hold their head in the right position relative to their shoulders ($r=+0.47$), as well as use wind and other unfavorable environmental factors competently during the contest ($r=+0.43$). To a lesser extent, the efficiency of competitive struggle is influenced by the well-developed skills of loading an arrow and steadiness when taking the shooting position ($r=+0.38$), as well as the skills of correct bowstring gripping and exact positioning of feet and legs ($r=+0.35$).

Conclusion

The research gives evidence that the revealed factors of archers' preparedness for competitive activities allow determining more precisely the orientation of pedagogical activities when sports people are trained for contests.

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Specifics of changes in biochemical composition of blood among trail runners of the senior age groups during training in the conditions of middle altitude

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ABSTRACT

Introduction

Nowadays long distance trail running contests are become more and more popular. The mountain range with numerous passages in high altitude (> 2500 m), is held in difficult weather conditions (night, can wind, cold, rain or snow). Such conditions require a very good training from the runners. Changes in biochemical composition of blood during training in the conditions of middle altitude can serve as the important parameter of the runners' readiness for contests in mountains. It is not only physical exercise, but also mountain environment which impacts these parameters. [1]. Research objective is to define the character of the change in biochemical composition of blood among runners of the senior age groups during training in the conditions of middle altitude.

Methods

In the research, seven runners from Italy and Russia in the age group between 50 and 60 were examined as they were preparing for a 55 km running contest in the conditions of middle altitude. Two months before the start, they had their blood sampling done in the conditions of plain land. Then they were examined in 40 days under the impact of the maximal physical exertion in the conditions of middle altitude. The final blood sampling was done at the final stage of their preparation for the contest, when their sport activities decreased to a great extent. During all the stages of the preparation for the contest, complete blood count was done and the dynamics of changes in the blood composition was studied. The average value of each blood parameter as well as the error in mean were calculated. The intensity dynamics of changes in all the blood values under the impact of maximal physical exertion and the conditions of middle altitude was studied.



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Results

It was found out in the research that, in the conditions of middle altitude and maximal physical exertion, the runners showed a fall in the main blood values with their following compensatory growth before the start, with decrease in exercising. The most prominent was the dynamics in change of leucocyte values from 4.51 ($10^3/\text{mmc}$) to 3.77 ($10^3/\text{mmc}$) after the maximal physical exertion with their following compensatory increase to 4.75 ($10^3/\text{mmc}$) before the start. The situation with hemoglobin values was alike: fall from 15.2 g/dl to 15,1 g/dl, and further growth up to 15.6 g/dl. A similar picture was observed in erythrocytes and neutrophils values. It was found out that the increase of these blood values before the start by 3.5 – 7.2% in comparison to the initial values may indicate a high degree of a sportsperson's readiness for a trail running contest.

Conclusion

In the conditions of middle altitude the sportspeople showed two-stage dynamics of change in the blood values: initial fall of the majority of the basic values (leucocytes, hemoglobin, erythrocytes and neutrophils) with their following increase up to the level exceeding the initial values. It gives evidence that such dynamics in the blood values must be the basis for determining veteran sportspeople's readiness for long distances contests in the mountains.

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Analysis sports performance using genetic analysis-inspired methods

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ABSTRACT

Introduction

Sports performance analysts have many metrics they can use to investigate athletic performance. The multifactorial nature of sport performance means that interactions between these metrics are potentially important. Methods typically used by sports performance analysts cannot handle many variables and their interactions - especially with the often small sample sizes that are available. Methods borrowed from genetics research can measure the association of large numbers of metrics with relatively few observations.

Method

The Backward Dropping Algorithm is a non-parametric method to evaluate the association between inputs and a binary outcome. The method measures the *influence* of metrics based on their overall performance in interactions with other metrics.

Results

The method provides a list of metric combinations from which the importance of individual metrics can be determined.

Discussion & Conclusion

The Backward Dropping Algorithm can provide evidence for important metrics and metric combinations. The findings can be used to support or challenge existing practices and have the potential to inform new tactics.



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Halftime duration in German professional football

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ABSTRACT

Introduction

FIFA rulebook and national regulations of DFB demand that halftime duration may not exceed 15 minutes between final whistle of first half and kick-off second half. This paper investigates empirically the duration of halftimes in soccer games.

Methods

1224 games of the first and the second Bundesliga (seasons 2013/14 and 2014/15) were examined using official match information. T-tests compare the empirical halftime duration with the hypothetical value of 15 min. Halftime durations per home team (specific effects of stadium) were tested for differences with an Oneway-ANOVA with LSD post-hoc tests for each season and division. The influence of extra time in first half on halftime duration was investigated with Pearson correlation coefficients. In the same vein, the hypothesis of more homogenous durations of halftime plus extra time compared to halftime duration alone was checked according to Levene.

Results

The average duration of halftime is $\bar{x} = 16:25,9$ in the first league and $\bar{x} = 16:06,9$ in second league. In 96,7 % of the first and 90,7 % of the second league games halftimes lasted longer than specified in the rule books. The distribution of half time duration is bimodal in both leagues. Local peaks are at minute 16 and 17. In the first and second league a highly significant exceedance of halftime-duration with strong effect was proved (1stL: $p < 0.01$; Hedges $g = 1,87$; one-sided / 2nd L: $p < 0.01$; Hedges $g = 1,36$; one-sided). Between several teams we find highly significant differences in average duration of halftimes for each league and season, except for second league season 2013/14. There is a moderate to high negative correlation in the first league ($r = -0.380$; $p \cong 0$) and a high negative correlation in the second league ($r = -0.688$; $p \cong 0$) between duration of halftime and additional time of first half. In the second league we found a highly significant Levene-test ($p \cong 0$). The variance of the sum of additional time and halftime is less than the measured halftime duration, indicating a compensatory relationship between half time duration and extra time of first half.



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Discussion & Conclusion

The results show, that rules regulating halftime duration are habitually violated in professional football. There are significant "stadium" effects, especially in first league. Much of excess halftime over 15 minutes can be explained by compensating extra time of first half. Results are in agreement with a tacit convenience to start the second half 62 min after kick-off.

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Investigation of static and dynamic balance performance of 10-12 years old girls who doing and dont sport regularly

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ABSTRACT

Introduction

It has been shown that motor fitness, which includes balance and coordination, is a part of physical health-related component at all ages, especially in childhood and adolescence. Children's neuromuscular system has not develop sufficiently. Because of that their injury rates related to falls and sports participation are elevated. Therefore, there is a need to detect and take precaution for injury risk identification in sport participants using low cost, reliable testing methods. The aim of this study is to evaluate the static and dynamic balance performance of female students aged between 10-12 years who regularly engage in volleyball and do not any sports branches.

Methods

A total of 24 female students voluntarily participated in this study. Twelve subjects (age $12,75 \pm 0,45$ year, height $153,08 \pm 3,6$ cm, weight $46,83 \pm 6,77$ kg and training age $2,25 \pm 0,45$ year) regularly performed volleyball training at least 2 years (four days a week) while the others (age $12,58 \pm 0,51$ year, height $151,75 \pm 6,61$ cm and weight $41,67 \pm 4,94$ kg) did not any sport activities. The height and weight of the subjects were measured and static and dynamic balance were determined bilaterally by One-leg Standing Balance & Star Excursion Balance Tests (SEBT), respectively. SEBT scores were obtained for anterior (ANT), posterolateral (PL), and posteromedial (PM) directions, and for an overall composite (COMP) score. Dominant leg, non-dominant leg, both leg static balance and dynamic balance leg averaged scores were compared between groups using Mann-Whitney U.

Results

According to the findings, dominant leg, non-dominant leg, both leg PL and COMP scores and non-dominant leg static balance score were found higher in the group that did regular volleyball exercises.



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Discussion & Conclusion

Consequently, it can be said that doing sports on a regular basis has a positive effects on the static and dynamic balance of young female children.

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Network analysis of passes in international netball

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ABSTRACT

Introduction

Network analysis has been used to describe player co-operation in team games including soccer (Clemente et al., 2015). The purpose of the current investigation was to compare passing activity during 3 critical matches played by England and their opponents during the 2014 Commonwealth Games.

Methods


Network graphs were produced for all 6 team performances and Table 1 summarises the main variables.

Results

Chi square tests of independence revealed no significant difference in player touches ($\chi^2_{12} = 19.9$, $p = 0.068$) or passing interactions ($\chi^2_{16} = 23.2$, $p = 0.107$). However, there were significant differences between England's opponents for both touches ($\chi^2_{12} = 38.0$, $p < 0.001$) and passing interactions ($\chi^2_{16} = 36.7$, $p = 0.002$). This suggests that tactical approaches used differ between the World's top 4 international netball teams.

Table 1. Touches and pass interactions for England and their opponents.

Variable	England Performances			Opposition Performances		
	v Australia	v N Zealand	v Jamaica	Australia	N Zealand	Jamaica
Touches						
GS	54	45	37	24	51	35
GA	52	29	42	108	80	104
WA	84	61	73	105	89	80
C	135	107	126	118	138	141
WD	71	56	54	34	72	42
GD	58	69	47	46	48	53
GK	38	44	23	20	26	14
Total	492	411	402	455	504	469
Succ pass %	94.7 _{+3.1}	93.7 _{+9.8}	92.8 _{+3.4}	93.8 _{+2.9}	94.0 _{+5.3}	95.1 _{+2.9}

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<u>Passes</u>						
C > GA	28	22	34	55	48	55
C > GS	37	31	28	18	30	30
WA > GA	19	13	19	46	43	27
C > WA	34	16	27	34	26	25
GA > C	21	8	17	35	23	34
GA > WA	13	8	13	43	25	31
WA > GS	24	28	21	23	18	19
GS > C	30	19	12	9	19	9
Other	286	266	231	192	272	239

Discussion & Conclusion

Network analysis of opposing teams may provide useful information for defence coaches of international netball squads.

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Domestic and international netball performance analysis: A comparative reflection

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ABSTRACT

Introduction

Netball is a fast paced and dynamic sport played on a court split into thirds, with territorial positional restrictions. At both domestic and international level, the sport is largely under researched and has had limited performance exposure, remaining an amateur sport for most. Despite this, netball has had significant performance analysis support invested at both a domestic and international level in England. The current research seeks to understand the similarities and differences between the implementation of domestic and international netball performance analysis.

Methods

Reflective practice is a means of reflecting on one's performance usually employed by sports coaches seeking to develop their pedagogical approaches (Gilbourne *et al.*, 2013). A form of reflective practice, the researcher has maintained a reflective diary through a longitudinal period spent working in both domestic and international netball environments. Delineating such entries has provided informed and meaningful findings on the integration of the discipline at both domestic and international level.

Results

At the domestic level performance analysis support remains standalone with little or no integration with other disciplines. The analysis performed focuses predominantly on 'traditional' performance indicators on a single performance basis. At the international level a larger emphasis is placed upon the integration of other sport science disciplines to support performances in a multidisciplinary manner. Forms of longitudinal analysis and performance profiling of more advanced performance indicators is also apparent at the international level. However, results appear attributed to individual coaches and their coaching philosophies, rather than to specific environments. Rather than resource and means, willingness and inclination appear to determine the levels of coach interaction with performance analysis.



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Discussion & Conclusion

Those who do engage with performance analysis at either level have typically cited they do so in order to build a more informed, objective picture of performance. Further, coaches cite that the output provided by performance analysis allows them to 'back up' or 'confirm' their gut feeling on performance decisions, which attains to the findings of (Gesbert *et al.*, 2016) who discovered coaches utilise such feedback in addition to coach intuition and gut feeling. Those who do not engage with the discipline cite the knowledge base they hold being of superior and higher regard. On the basis of such intuition, these coaches formulate their coaching decisions which are uninformed by objective data. Such coaches often utilise video analysis to review footage which may subconsciously aid in the coaching process. Stemmed to enrich decision making, it appears that performance analysis is ill defined and under used within netball. The researcher therefore recommends a more empathetic coach-analyst relationship whereby the coach may become better educated as to the benefits analysis might bring in checking and challenging coaching decisions as part of their coaching process.

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Participation in other sports during the stages of development of young soccer players

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ABSTRACT

Introduction

One of the most popular models of sport talent development, the Developmental Model of Sport Participation (DMSP) (Coté 1999) divides the development of a sports talent into three stages: sampling years (6-12 years), specializing years (13-15 years) and investment years (over 16 years). Throughout these stages, aspects such as the quantity and quality of practice, as well as the role of context (family, friends and coaches) are very important (Tranckle & Cushion, 2006) in the development of the young athlete. In this way, Coté and Fraser-Thomas (2008) studied how the involvement in other sports evolved, obtaining the conclusion that as an athlete progresses in the formative stages to reach the elite, the number of sports decreases. Thus, the aim of this study was to check the involvement of young football players in other sports.

Methods

The sample consisted of a total of 201 soccer players belonging to a professional football club, distributed in the sub-10 (15.92%), sub-12 (10.95%), sub-14 (19.90%), sub-16 (18.40%), sub-19 (23.38%) and sub-23 (10.95%), the average age of 13.81 years and the standard deviation 3.09. Statistical analysis was performed using the SPSS program v. 22.0.

Results

First of all, a descriptive analysis, segmented by categories and using the average as statistical analysis was performed and it found that the youngest players practice 0,63 sports in sub-10, 0,66 in sub-12, 0,39 in sub-14, 0,38 in sub-16, 0,13 in sub-19, and team players sub-23 0.10. Using the same statistical and sample segments in the same way, it was found what the most popular sports in each category are: swimming and athletics in the sub-10, tennis and basketball in sub-12, paddle tennis and tennis in sub-14, paddle tennis and athletics in sub-16 and sub-19, and paddle in the sub-23 category. Secondly, an inferential analysis was performed through a Pearson bivariate correlation between the category of equipment and the number of sports practiced, resulting in a negative correlation (-0.253) and a p-value significant ($r = 0.000279$).



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Discussion & Conclusion

These findings indicate that as a category increases, the involvement in other sports significantly decreases, coinciding with the findings by Côté and Fraser-Thomas (2008). Therefore, we conclude the need for specialization in a single sport to achieve the level of excellence necessary to become a talent in a sport.

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Defending corner kicks in the English Premier League: Near post guard set-ups

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ABSTRACT

Introduction

Previous research conducted on corner kicks has investigated the outcomes of corner kicks in relation to different delivery types of corner kicks (Schmicker, 2013); the status of the match (De Baranda & Lopez-Riquelme, 2012); the area of the delivery (Pulling, 2015) as well as defensive tactics (Pulling, Robins and Rixon, 2013). However, there has been no previous research that has analysed the actions of defensive players who are positioned close to the near post when defending corner kicks. The aim of this study was to analyse near post guard defensive set-ups when defending corner kicks within the English Premier League Season 2015/16.

Methods

A total of 750 long corner kicks were sampled from 79 English Premier League soccer matches during the 2015-2016 season. The type of near post guard defensive set-up (zero, one or two guards in zone A and/or zero, one or two guards in zone B) (see figure 1) and the main outcome of the corner kick were recorded onto a specially designed Microsoft Excel spreadsheet (Microsoft Corporation, Excel 2010, Redmond, WA).



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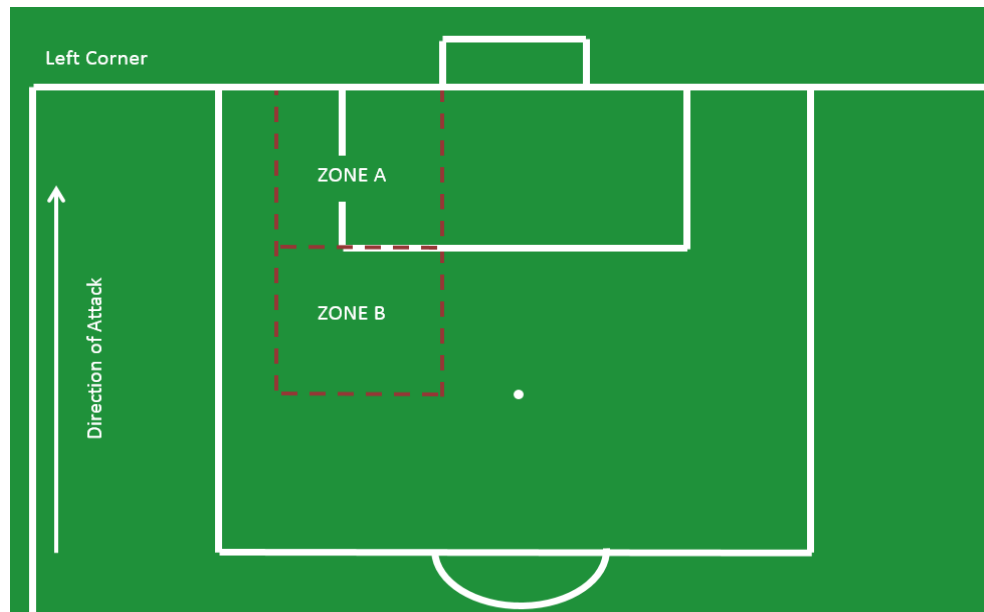


Figure 1. Zones for near post guards.

Results

The most common near post guard set up was to place two defenders in zone A and zero defenders in zone B (27.5% of total corners). The near post guards cleared the ball on 236 occasions (31.5% of total corners).

There was no significant association between the type of near post guard defensive set-up and the number of attempts at goal ($\chi^2_4 = 1.645$, $p = 0.801$). However, when teams positioned one guard in zone A and one guard in zone B the defensive team only conceded one goal from 148 corner kick deliveries (0.7%). When there was one guard in zone A but no guards in zone B the defensive team conceded eight goals from 159 deliveries (5.0%).

There was a significant association between the type of near post guard defensive set-up and the number of clearances performed by the guards ($\chi^2_4 = 30.445$, $p = 0.001$). When the defensive team placed one guard in zone A and no guards in zone B, the guard cleared 16.4% of the corner kick deliveries. When the defensive team had two guards in zone A and two guards in zone B, the guards were able to clear 51.1% of the deliveries.

Discussion & Conclusion


It is evident that near post guards play an important role when defending corner kicks as they regularly perform defensive clearances (31.5% of total corners). The findings enforce the need for performance analysts and soccer coaches to consider the defensive set-ups utilised in the near post area when defending corner kicks. Future research should investigate the impact of the positioning and movement of attacking players on different defensive set-ups during corner kicks.

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Scale to evaluate the technical- tactical offensive performance of men's junior volleyball

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ABSTRACT

Introduction

The scales in sport performance are indispensable tools institutionally designed to evaluate diverse individual and collective indicators, having repercussion in an accurate decision making.

Methods

Given the national and international shortage of scales to control the technical and tactical offensive performance of men's junior volleyball, this paper aims to set them. The study includes six men's junior national championships (aged 16-18), and by processing 11 762 spike actions, 7 079 block actions and 12 645 serve actions are set the scales from percentiles 90, 75, 50 and 25.

Results & Discussion

As specific objective, the research demonstrates differences among certain scales of the technical and tactical performance for the junior volleyball in regard to other aspects set for seniors, instituted in Morales (2012a, 2016a), which brought about significant differences according to the Mann-Whitney U test with the effectiveness system in the Spike and Serve techniques ($p=0,046$ and $p=0,007$, respectively) and those non significant in the Block technique ($p=0,975$). On the other hand, by using the statistical system of evaluation for the "Quality" technical and tactical performance, were determined significant differences between the scales of the junior and senior performance in the Spike and Block techniques ($p=0,017$ y $p=0,001$, respectively), and non-significant in the Serve technique ($p=0,970$). The aforementioned allows deducing that the differences among scales can be established according to the model of observational and statistical control used, justifying the creation of independent scales for the junior category in regard to the senior one, given the existence of different biological and methodological determinants that become specific evaluation tools.



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Conclusions

Furthermore, the paper establishes scales for two additional evaluation systems, besides the two already established, expanding the range of applicability of the research.

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Continuous selection at youth International age groups does not influence success at senior UEFA European Football Championships

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ABSTRACT

Introduction

European football associations fund youth international level football with significant amounts of money in the belief that continuous youth age group experience may lead to greater success at UEFA's European Football Championships (UEFC), held quadrennially. However, the importance of returnee players (players without continuous youth international experience) is unknown. The aim of this research was to quantify the different player-types selected in a squad and the affect they have on a nation's success at UEFC between 2012-2016.

Methods

Squads for every nation at the UEFC in 2012 (16 nations) and 2016 (24 nations) were collected; a total of 920 players (368 in 2012, 552 in 2016). Each player was assigned to one of three groups: Survivor (youth international UEFC appearance in every age group), Newcomer (no youth international age group experience), and Returnee (missed at least one youth international age group). Squads from the prior youth international UEFC were obtained from 2002 until 2015 for Under 17s, 19s and 21s. Nations were assigned a tournament end result ranking at the 2012 and 2016 UEFC; lower score indicated better tournament result. A linear regression was completed to determine if any player grouping contributed to a nation's success at UEFC. Additionally, youth international appearance totals (caps) were calculated in order to determine if these had any effect on success.

Results

Of the 920 players, there were 593 newcomers (64%), 9 survivors (1%) and 318 returnees (35%). A typical UEFC squad contained 0 ± 0 survivors, 8 ± 2 returnees and 15 ± 2 newcomers. Only returnees were statistically significant in predicting a team's success at UEFC ($P = 0.03$). An average UEFC squad consisted of the following youth international caps: 3 ± 0 caps at U17, 3 ± 0 caps at U19, 6 ± 2 caps at U21 and 9 ± 1



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caps at first team level prior to 2012 at UEFC. There was no significant evidence that youth international caps effected a squad's success at the UEFC.

Discussion & Conclusion

Continuous selection throughout youth international programmes does not influence a nation's success at UEFC. Successful squads predominantly consist of players who either haven't made a youth international cap or intermittently collected caps. A limitation of the research is UEFC squad selection is depending on player availability and injury status, potentially affecting success at the tournaments. Additionally, the effect of players playing up an age group may potentially account for some of the returnees which could be interpreted that these players prosper in this added challenge of jumping up an age group early. Current form and fitness levels should be considered as a greater asset in national team selections over incumbent experience. Although there is significant investment towards this pathway the evidence suggests players with non-continuous youth international experience should be considered equally.

Anger as a predictor of sport performance level

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ABSTRACT

Introduction

Anger is a primary, normal, universal and adaptive emotion that everyone experiences in their daily life (Deffenbacher & McKay, 2000). In sport, in contact sports anger is understood as a facilitator of athletic performance, and unlike in other more technical sports this surplus energy is understood as a depressor of performance (Martinet & Ferrand, 2009). In another previous study, it showed that contact athletes who compete at international level had lower levels of anger than those who practice sport regularly and non-practitioners (Menendez-Santurio & Fernández-Rio, 2015). Therefore, the aim of this study is to determine if anger influences in the level of competition of athletes from different sports.

Methods

Participants

The total study sample consisted of 502 subjects. Of the total subjects, 153 are women (30.5%) 349 were men (69.5%) and with an age between 18 and 64 years old ($M=27.76$; $SD=9.11$). Of the total, 282 athletes were not federated (56.2%), 220 were federated (43.8%) and 53 were professional athletes (10.6%).

Variables and instruments

- Level of Competition. To assess the level of competition a sociodemographic questionnaire *ad hoc* was taken.
- Acquiescence and dishonest participants. The Oviedo Scale of Infrequency Response was used (INF-OV) (Fonseca-Pedrero, Lemos-Giráldez, Paino, Villazón-García & Muñiz, 2009).
- Anger. To assess anger, the Trait-State Anger Expression Inventory was used (STAXI 2) Spanish Version (Spielberger, Miguel-Tobal, Casado & Cano-Vindel, 2001).

Process

There were contacted coaches and athletes, online and in person. The sampling was carried out through the "Google Drive" application. In which research questionnaires were recorded.



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Results

Firstly, to know the mean differences in the variables of anger, a *t*-test was realized for independent samples, in which the sample is divided into two groups: competition at the international level ($S=45$) and competition with other levels ($S=457$). The results showed significant differences in trait anger ($p<.05$; $d=.18$) and temperament ($p<.05$; $d=.18$). In both, athletes with international success had lower levels of anger than athletes who compete at other levels.

Finally, to determine the predictive value of each of the statistically significant variables in the *t*-test, a binary logistic regression was performed using the introduced method. The results show that, trait anger ($OR=.949$; $p>.05$) and temperament ($OR=.941$; $p>.05$) don't predict compete at any level (International, national, regional and local).

Discussion & Conclusion


The conclusions of this research were:

- Athletes who compete at the international level have lower levels of trait anger and temperament than other athletes.
- There are not a predictive relationship between trait anger, temperament and the level of competition.

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Classification of javelin throwers using the sport results and Kohonen's maps

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ABSTRACT

Introduction

Dynamical systems theory (DST) has the power to potentially unify existing sub-disciplines such as sports biomechanics, notational analysis, motor control, physiology and psychology under one macroscopic platform. Many researchers confirm growing significance of the process of modeling with regard to the utilization of Artificial Neural Networks (ANNs) in the optimization of selection and training processes. The aim of this study was to present the results of analyses conducted by means of complementary analytic tools in order to verify their efficacy and the hypothesis that Kohonen's neural models may be applied in the classification process of javelin throwers.

Methods

A group of 35 javelin throwers, aged (21 ± 0.5 yr.) took part in this research. Laboratory tests determining power, body mass and body composition, specific field tests evaluating basic motor abilities and technique as well as mathematical modeling were used for data collection. The data were collected twice, first, initial evaluations were carried out and then, the same tests were repeated after a 12 month training period. For the purpose of verification of usefulness of Kohonen's Neural Models, statistical analyses were carried out on the basis of results of the javelin throws from the full run up.

Results

Based on calculated regression equation coefficients (st. error B), it can be stated that such qualities as: body height, 5 m sprint, cross step with assuming the throwing stance and standing quintuple jump have considerable influence on predicting the dependent variable Y - distance of the javelin throw for the studied subjects. The colour saturation scale was used in addition to numbering the neurons representing particular cases. This scale was created upon identifying the map areas by means of familiar results of the dependent variable Y - distance of the javelin throw (very good: 71-67.02m; good: 67.01-61.56m and average: 61.55-54.9m). The classification table created on the basis of learning sets for Y – results of javelin throws, in the



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Kohonen's network can be useful in assessing new objects, not presented during learning. This results from evident, clear ordering of explained variable value corresponding to particular neurons - one point to large areas of the map containing neighbouring neurons corresponding to approximate values of the explained variable.

Discussion and conclusions

Recent theoretical contributions to the theory of talent in sport have clearly shown that a complex and longitudinal framework is necessary to successfully address talent identification and the talent promotion issue in most sports. This paper aimed at finding out whether the talent development outcome can be modeled by means of the nonlinear mathematical method of artificial neural networks. The results of this research confirm that Kohonen's Feature Map can be used for optimization of javelin throwers sport classification and prediction of sports results. On the grounds of analysis of standardized Beta values one can say that the biggest predictability for the distance of the javelin throw was shown by such qualities as: body height, 5m sprint, cross step with assuming the throwing stance and the standing quintuple jump.

Reasons of maintenance in sport performance

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ABSTRACT

Introduction

Get high levels of athletic performance and keep them is a greedy goal to very few athletes (Elferink-Gemser & Visscher, 2012). Following Visscher, Elferink-Gemser & Lemmink (2009), the variables that affect athletic performance, can be divided into personal and environmental variables. In this case, reasons of maintenance in sport are among personal variables. Therefore, the aim of this research is to know what reasons of maintenance in sport (be with friends, compete with other athletes, and improve your health and / or physical appearance), are linked to have more international successes.

Methods

Participants

The total study sample consisted of 502 subjects. Of the total subjects, 153 were women (30.5%) 349 were men (69.5%) and with an age between 18 and 64 years old ($M=27.76$, $SD=9.11$). Of the total sample, 282 athletes were not federated (56.2%), 220 were federated (43.8%) and 53 were professionals athletes (10.6%).

Variables and instruments

- Level of Competition and Reasons of Maintenance in Sport. A sociodemographic questionnaire *ad hoc* was taken.
- Acquiescence and dishonest participants. The Oviedo Scale of Infrequency Response was used (INF-OV) (Fonseca-Pedrero, Lemos-Giráldez, Paino, Villazón-García & Muñiz, 2009).

Process

There were contacted coaches and athletes, online and in person. The sample was carried out through the "Google Drive" application, in which research questionnaires were recorder.

Results

Firstly, to find out the reasons of maintenance in sport performance, a descriptive analysis was performed, finding out that the reasons for "Improve your physical and technical skills" ($S=28$; 73.7%) and "Be with



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Friends" ($S=28$; 73.7%) were the most prevalents; followed by "Compete with other athletes" ($S=26$; 68.4%); and finally, "Improve your health and/or physical appearance" ($S=22$; 57.9%).

Finally, to determine the predictive value of reasons to maintenance in sport performance, a binary logistic regression was performed using the introduced method. The results showed that to have more motivation in sport to "Compete with Other Athletes", is more likely to have international successes ($OR=2.480$; $p<.05$). In the other hand, "Improve your Physical or Technical Skills" ($OR=.228$; $p<.01$) and "Improve your Health and Physical Appearance" ($OR=.234$; $p<.01$), are more likely to don't have international success.

Discussion & Conclusion


The conclusions of this research were:

- "Improve your physical or technical skills" and "be with Friends", were the most prevalents reasons in the sample.
- The motivation in sports to "compete with other athletes", is linked to have international successes.

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Bench press results prediction by means of ANN and regression models

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ABSTRACT

Introduction

The flat bench press is one of the most popular strength exercise performed by athletes of different sports disciplines. In order to analyze particular motor activities, precise data related to basic variables are necessary. It is hypothesized that the neural network modeling will better identify the potential of athletes in the flat bench press, compared to a typical regression model. The investigation was intended to determine whether regression models or ANNs predict sports results more precisely and so better support and optimize the athletes' selection processes in the flat bench press. An attempt was made to resolve the question which variables are most informative and can be qualified as explanatory of the regression and neural models.

Methods

The study group consisted of 80 international level athletes, aged 20 ± 3.5 years. The data of 40 athletes, which were entered into the neural net and regression models, were obtained from the one year measurements. The data set was subdivided into three series: learning series (24 cases), validation series (8 cases) and test series (8 cases). Then, to enhance the model, 20 new training cases were added, and estimated again (40 cases – learning series, 10 cases – validation series and 10 cases – test series). Predictors were confirmed by regression and neural net models for the testing group, comprising a group of 20 athletes, of the same age and training experience as the construction group, and whose results were not used to build the models. The results of predictions for this one group were verified by comparing the model-generated predictions with the actual results achieved by the same group one year after. The most important variables were marked during the electromyography measurements. Measurements identified 8 variables.

Results

The regression model for the bench press results had the following form:

$$Y\text{-SRBP} = 72.1 - 181.1 * \text{LHTBpeak} + 123.2 \text{LHTBmean} + 113 * \text{ADpeak} + 89 * \text{ADmean}$$



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Using the same variables the perceptron models (MLP) were constructed with the structure: 8-3-2-1 - the NRMSE for the learning series was 0.114, and for the validation and test series 0.133 and 0.118, respectively.

Discussion & Conclusion

In order to test the comparisons of the results that were used to build the regression models and the neural networks, 20 athletes, whose results were not built into the models, were tested. Their bench pressing results were measured and the quality of the predictions was verified after training. The analysis of the results shows that the neural models' algorithms are superior to the regression models, as far as prediction is concerned. The absolute values of the models' error were different by 39.18 kg favoring the neural model. The optimal set of variables that are most informative and usable as the explanatory variables of the nonlinear regression models and neural models consists of: activity of the long head of triceps brachii, mean activity of the long head of triceps brachii, peak activity of the anterior deltoid and the mean activity of the long head of the anterior deltoid.

Critical moment and tactical-strategical implications related with goalkeeper as an outfield-player from the futsal coach's point of view

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ABSTRACT

Introduction

The critical moments of game aim to identify the psychological impact that is generated by certain moments and incidents in teams and players performance (Carvalho and Araujo, 2013). Initially, some researchers in basketball studied the psychological momentum through consultation with coaches. But in order to build an idea of criticality of sports games, there remains a need for conceptual and methodological convergences of coaches' opinion over the issue of critical moment. (Ferreira et al, 2014).

Methods

In this study, 129 professional and semi-professional futsal coaches complete a semi-structured and closed questionnaire, was constructed and validated in order to investigate the opinion of futsal coaches about the concept of unfavorable critical moment (CM) in futsal, and the coincident use of goalkeeper as an outfield player (5 vs 4) with the CM, which is a decisive step towards theoretical and methodological convergence.

Results

The results revealed that the futsal coaches attach the importance to the maximum difference of 2 goals, the last 8 minutes of the match as maximum exponents of criticalness and the fifth fault as precipitant factor of an unfavorable CM in matches of maximum equal state. Besides, it was manifested that the interactive effects of match score, time and faults could cause the unfavorable CMs and the use of goalkeeper as an outfield player (5 vs 4) is a common practice to solve these situations.

Discussion & Conclusion

The importance of the final moments and its relationship with points or goals difference and the possible implication of players' psychological states as decisive factors were found in the context of basketball



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(Ferreira et al, 2014; Navarro et al, 2013.) The coaches' decision to attack with goalkeeper as an outfield player (5v4) was confirmed by Barbosa (2011) and Ganef et al. (2009), proving that the use of 5v4 appears in the final periods of those games where teams have unfavorable score (1 goal or more).

Coaches can use this information to set targets for training and preparing for different competitive circumstances.

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The defensive retreat in team handball: Analysis of the Men's European Championship 2014

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ABSTRACT

Introduction

The evolution of Handball made offensive transitions became very fast, promoting imbalances in defensive retreat, making it important to approach this phase of the game (Picon, 2005). Defensive retreat is considered the first phase of the defense, which begins at the moment of ball loss. At that time, all attacking players immediately become defenders, aiming at a conservative view, prevent or hinder, delaying the counter attack of the opposing team. Some authors and coaches claim, as the main concern, back as quickly as possible to a nearby area of their goal, in order to avoid the counter-attack, while others add that, simultaneously, should be made pressure on the ball carrier and on the path of the ball, preventing its progression and delaying its decision, thereby trying to recover as soon as possible the ball or at least hinder the progression of the opponent. With the fast replacement of the ball after goal, it has become necessary also in this situation a fast response to this specific transition in order to ensure an effective opposition.

Methods

This study intend to analyze the defensive retreat in high-level team handball, looking for behaviour patterns in during this phase of defense in final stage of the Men's European Championship 2014. It was used Observational Methodology and built, validated and subsequently used a mixed ad hoc instrument, field format with categories systems to collect the data (Anguera y Hernandez Mendo, 2014). For data analysis, we used the prospective and retrospective sequential analysis and the technique of polar coordinates (Prudente, Garganta & Anguera, 2010). The sample was composed of all (n = 724), defensive game sequences occurred in 16 games of the final stage finals from Men's European Championship 2014.

Results

The main results shows that, by prospective sequential analysis, is significant (≥ 1.96 ; $p < 0.05$) the probability of the ball steal and the technical fault in the attack inhibit the recovery of the ball during the retreat phase (3.58 and 2.18, respectively). The polar coordinates analysis shows that is significant: 1) the defensive retreat start after losing the ball by technical fault is associated to an active retreat (2.79; 63°) and to the counter



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attack interruption without the ball recovery (2.88; 40°), inhibiting a passive retreat (2.26; 239°); 2) the loss of the ball by shot outside is associated to non-recovery of the ball (2.7; 82°); 3) the loss of the ball from ball steal is associated to a passive retreat (3; 49°) and the occurrence of 7m (2.78;82°) inhibiting an active retreat (3.47; 223°).

Discussion & Conclusion

Given the results obtained it is possible to state that the way teams loose the ball influences the behaviour in defensive retreat: technical fault promotes a more proactive and active attitude, while the ball loss by steal or shot outside promotes a more passive retreat, probably due to the player that steals the ball wins a vantage to the opponents difficult to revert and the second situation promotes a long pass to a player in counter attack by the goalkeeper.

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Acute effect of energy drinks on anaerobic power: A meta-analysis

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ABSTRACT

Introduction

The literature indicates that energy drinks (BE) increase the energy level to improve the perception of attention and/or mental status of alert and performance. However there are studies that contradict the evidence. The aim of this study was to examine the effect of energy drinks on physical performance using a meta-analytic approach.

Methods

A literature search was conducted based on ten electronic database searchers and cross-referencing. Studies must met the following criteria for inclusion on this study: experimental studies that assess anaerobic capacity (power), used an energy drink as a treatment on humans, published in English or Spanish, and present descriptive statistics.

Results

Eleven studies, representing 19 effects size (ES) 193 males and females, met the criteria for inclusion. With the random effect model and using a between-group design, the overall ES was 0.05 ($p = 0.70$; CI95% = -0.14 a 0.24; $Q = 0.00$; $I^2 = 0\%$). Moderating variables indicated that participant's age is significantly related with the ES ($r = 0.501$; $p = 0.029$).

Discussion & Conclusion

In general, overall ES indicated that there is no difference between placebo and drink ED on physical performance.

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Study VO₂max of the Ecuadorian population

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ABSTRACT

Introduction

The study of VO₂max as physiological variable serves as an indicator of cardiovascular performance, being influenced by various factors that should be investigated to support decisions making. The paper describes and relates the VO₂max values existing in the Ecuadorian population, considering the variables sex, age, rural and urban areas, provinces and ethnic groups.

Methods

A representative sample of 5411 male subjects and 4874 females between 5-18 years of age were studied, using the Course-Navette test by experts ISAK II; obtaining VO₂max scales from the application of percentiles 5, 15, 25, 50, 75, 85 & 95.

Results & discussion

Some relevant data determined that the male has a higher VO₂max than women on average (49,8291 ml / kg / min and 47.5217 ml / kg / min, respectively), these being significantly different according to the Mann-Whitney test ($p = 0.000$), while the average VO₂max was higher in rural than urban areas (48.7705 ml / kg / min and 48.7187 ml / kg / min) without exist asymptotic significance level ($p = 0.883$). Moreover, of the 23 Ecuadorian provinces studied, Cañar had the highest rate (59.4188 ml / kg / min) and the lower was Orellana (39.8686 ml / kg / min), being the whole of the highland provinces (+ 2000masl) the highest VO₂max on average (51,249 ml / kg / min), and there is a significant difference when comparing all provinces according to Test Kruskal-Wallis ($p = 0.000$). A progressive decrease of VO₂max from 13 years of age is demonstrated, there is a significant difference in the categories established ages ($p = 0.000$), as well as significant differences in the eight ethnic groups analyzed.

Conclusion

Research characterized the VO₂max of the Ecuadorian population, fulfilling the target of the investigation.



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Gaze behaviour that gives a badminton player an edge over its opponent

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ABSTRACT

Introduction

Expert sports people are better at anticipating the actions of their opponents and tend to use earlier visual cues than non-experts (Singer & Janelle, 1999). Vickers (2011) provided evidence that gaze control is critical for skills requiring precise cue selection and optimal timing.

A common method to study human vision is through eye tracking. An eye-tracker provides data about the observer's gaze patterns and focus points (Bergstrom, 2014; Blomqvist, 2006). A small, low power, infrared light emitting diode (LED) illuminates the eye. The LED generates a corneal reflection which is used in conjunction with the pupil through specialized image-processing software to identify and locate the point of gaze.

The objective of this research is to determine the specific gaze behaviour that gives good badminton players an edge over their lesser-skilled opponents.

Methods

The gaze behaviour of three badminton players who represented their country on international level, three senior league players and three junior players were recorded by using the Tobii Glasses 1 eye-tracker. Players of different ages, experience, and gender were included in the study. Two singles games per pair of players were recorded with each player wearing the eye tracker for one game. Qualitative frame-by-frame analysis was done to determine if the gaze behaviour of good and lesser-skilled players differ. For this paper, a specific stroke, namely a clear shot to the forehand of the opponent, was analysed.

Results

It was found that each player exerted the same behaviour every time that the same kind of shot was played. The gaze of lesser-skilled players, including senior league players, were focused on the shuttle until it started to descend. Thereafter, their gaze moved to several scattered focus points between the shuttle and the racket



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head of the opponent where it stayed until the shuttle got there. This pattern was repeated until the opponent hit the shuttle.

The gaze of the international players were also focused on the shuttle until it started to descend, but thereafter their gaze moved to the racket head of the opponent and stayed there until the shuttle came into their peripheral vision. Their gaze then moved back to the shuttle until the opponent hit the shuttle.

Discussion & Conclusion

By keeping their gaze at the racket head of the opponent, the good players could see the racket-, arm- and body angle of the opponent and they could anticipate the next shot that the opponent would probably play. The player could then prepare for the opponent's next shot and move to another position on the court in time if necessary.

Abernethy (1999) found that the anticipatory skills of sportsmen can be enhanced with practice. By coaching lesser-skilled players to take a page from the gaze behavior of good players, they could end up having more time to get into position and play their shots.

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"Live high, train low" changes in Oxygen consumption in athletes from individual sports: A Meta – analysis

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ABSTRACT

Introduction

"Live high, train low" (LHTL) is defined as a training protocol which is performed in lands 1500 meters above sea level. With this protocol, the body experience more physiological adaptations than it does while training at lower altitudes. According to previous studies, this protocol can increase the aerobic capacity. The purpose of this meta-analysis is to find the effects of the LHTL protocol on the maximum oxygen consumption of athletes from individual sports.


Methods

Eight (8) studies were included and three (3) groups were analyzed: (1) control group (CG) which trained in the regular altitude, (2) immediate effect experimental group (IEEG) with one test after the treatment ended and (3) extended effect experimental group (EEEG) with one test after the treatment ended and a second test around two weeks after the first test.

Moderator variables included: gender (male and mixed groups), sport level (elite and college), type of method (natural and artificial), type of training (intervals and aerobic), training intensity, type of sport, age, total training sessions, days and daily hours exposure to hypoxia and altitude.

Results

The effect size (ES) for the IEEG was 1.53 (95% confidence interval (CI) from 0.60 to 2.45, $p=1.99$). EEEG had an ES of 0.183 (95% CI from -1.78 to 2.14, $p=1.15$). CG had an ES of 0.183 (95% CI from -1.78 to 2.14, $p=1.15$). The altitude was the only variable with significant ES. Due this, the Shapiro-Wilk test was carried out and it showed a non-significant ES (0.595, $p=0.195$).

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A second analysis without the studies that represented a bias was performed. Significant differences in the sport level were found in this second analysis: the sub-elite athletes showed bigger ES (1.660, 95% CI from 0.978 to 2.342 $p=0.008$) than the elite athletes (ES= 0.565, 95% CI from -0.271 to 1.401, $p=0.008$).

Discussion & Conclusion

The improvement in VO₂ Max is given by elevation changes that increase erythropoiesis. Thus, the LHTL protocol seems to be a useful technique to improve the maximum oxygen consumption immediately after the athlete is exposed to height. After that time, the improvement effects disappear. Besides, it is advisable to use the protocol with sub-elite athletes.

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Qualitative movement analysis aimed at technique correction in athletics: A case study

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ABSTRACT

Introduction


Improvement of performance in athletics requires not only improvement of physical conditions but also correction of athletes' technique to make it correct or more effective. Most previous movement analysis aimed at supporting technique correction in athletics has focused on quantitative aspects of technique. However, the results of these studies might not lead athletes to successful technique correction immediately because technique correction forces athletes not only to gain objective knowledge of the technique but also to change their motor program, i.e. the internal plan or image for the execution of techniques.

A few qualitative movement analyses of techniques in athletics have given a glimpse into the internal aspects of techniques by combining a photo sequence and a qualitative description of movement (Tidow, 1981, 1990). However, few studies have squarely addressed the problem of analysis of internal aspects of techniques in athletics. The purpose of this study was to present a typical case in which the results of qualitative analysis of technique led to successful technique correction.

Case

A male university student tried to master the flop technique in high jumping but failed and repeated the so-called "sitting jump." His peers advised him to lie back and extend his hip joints in the air but this advice did not work. His coach tried to understand why he repeated the "sitting jumps" by empathetically observing his jumps, asking him for his impression of his jumps, and reflecting on his own experience as high jumper.

By putting pieces of information gained from these efforts together like solving a puzzle, it was deduced that the student had the wrong motor program: "jump backward" when he tried to perform the flop technique and lost his sense of direction in the air. This interpretation was explained to the student, and he agreed. The step by step approach was taught to him by the coach which led him from "stand flop with both leg jump" to "flop jump" with a correct motor program: "jump forward." As a result, he could correct his "sitting jump" to the flop technique immediately.

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Discussion & Conclusion

This case revealed that the results of analysis of internal aspects of technique facilitate technique correction. The motor program that athletes have in their mind cannot be analyzed using digital analytical equipment, and there is no standardized method to analyze it. However, having a clear and correct motor program is a basis for successful technique correction, and development and differentiation of the motor program is an important task in technique training in athletics. Thus, it is concluded that future study should standardize the method to analyze motor programs and that qualitative analysis of internal aspects of technique should be established as a key research area of performance analysis in athletics.

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Analysis of the formation of motor imagery which accompanies the acquisition of technique by beginners using the vaulting box

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ABSTRACT

Background

Acquisition and mastery of technique occupy the core of vaulting box training. Essential to this technical training is not simply improvement of an externally-analysable process of movement, but an appropriate analysis of how movement is imagined (motor imagery) by the athletes performing the actions, as well as the provision of guidance corresponding to the level to which this motor imagery is formed. Appropriate analytic methods understandable to the learner are a premise for such guidance—other than verbal and gestural exchanges, however, such methods are not well-known.

Objectives

In order to analyse the motor imagery perceived by the learner in the context of gymnastics, the author conceived the 'Magnetic Doll' as a usable tool. The objective of this research was to develop a method for analysing the formation of motor imagery by learners, using the example of a beginner's vaulting box skill acquisition process, and to verify the method's effectiveness.

Methods

The present author developed and used this new tool for over five years, on over 1,100 learners. This study collated the author's own vaulting box guidance records and selected a large number of learners who were successful in grasping the process of forming motor imagery through use of the tool. A single learner, regarded as a typical sample, was then selected and the process of forming motor imagery, which accompanies the learning process, was analysed using the tool.

Results & Discussion

When the single learner sampled from the group began straddle vault practice, they were unable to attain a sense of what the issues were. When made to reproduce, using the Magnetic Doll, their own sense of how they had executed the motions and the motions that should actually have been executed, the learner



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reproduced movement processes which differed completely both from those they had originally executed and from those aimed for in the training. This suggested that the learner was unable to form appropriate images of their own movements and those aimed for in the training. Guidance was pursued based on the level to which the learner formed motor imagery and, in order to tackle individual issues, the learner was made to repeatedly reproduce their own movements using the Magnetic Doll. During repetition of this type of guidance, the learner was able to appropriately reproduce their own motions using the doll and succeeded in attaining a higher level of skill.

Conclusion

The following two points can be concluded from the above example. The first is the possibility of physically making visible the process of forming motor imagery, using the tool. The second is the possibility of using the tool to guide motor imagery formation more accurately than before. There is a specific ability required of the instructor who uses the doll and performs this analysis, however, and the clarification of the specifics of this ability remains as an issue for the future.

Descriptive study: Analysis of different game variables in tennis games during a national tournament in Costa Rica for young players (U-14, U-16 and U-18 males and females)

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ABSTRACT

Introduction

The number of tennis players has increased during the last decades in Costa Rica. The country has a grade one tournament which is part of the World Junior Tour from the International Tennis Federation: Copa del Café. Having a better development of the sport especially on the junior players is one of the reasons why it is important to apply the Human Movement Sciences resources to analyze the sport characteristics during a game in these categories

Methods

Subjects were 36 young players from 12 to 18 years old, 18 women and 18 men. The players participated in the third junior national tournament from the Costa Rican Tennis Federation (FCT) in the U-14, U-16 and U-18 categories. The data from each game included: forehand strokes, backhand strokes, serves, double faults, winners, unforced errors, strokes per point, played points, games, points per game, duration of points, duration of the full game and effective time of the game. Descriptive data is provided as well as the results from 2 ways ANOVAS (13).

Results

Eleven variables showed statistical significance in the differences between genders and categories. In addition, a game profile was made for the two genders in the three age categories showing the competition tendency for each category.



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Discussion & Conclusion

The descriptive game profile during the competition for the six categories showed statistical differences in eleven of the thirteen studied variables. This finding can be used to develop training protocols for Costa Rican tennis players in the Junior division and to understand how the competition works in each category.

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A review of spatio-temporal metrics in invasion game sports

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ABSTRACT

Introduction

A team's tactical behaviour is often quantified using metrics that relate to player locations at a given time. This spatio-temporal data is easily translated into many metrics that describe the point, line and surface relations of players and the ball over time. This study reviews the spatio-temporal metrics used in invasion game sports.

Method

A review of six online databases provided 355 publications from which spatio-temporal metrics were extracted.

Results

A generalised summary of extracted metrics and metric specifications was compiled. Combining metrics and metric specifications creates all extracted metrics and some new suggestions. The compilation is presented in a table that contains the associated literature from the review as further reading.

Discussion & Conclusion

Three conclusions were drawn from the review. Firstly, spatio-temporal metrics don't suffer from the same lack of consensus on definitions as other sports performance analysis metrics. Secondly, some metrics might not be generalizable to all invasion game sports. Third, the structure of the location and time data constrains the metrics that could be used.



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4.65 and 4.55 m: Midpoint mark for approach run phase to eight steps hurdlers

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ABSTRACT

Introduction

There is clear evidence that the high hurdle step length increases progressively (as in the sprint races) until the penultimate stride. However, the distribution of the step length has barely been treated experimentally. This is why theoretical references provided by Schmolinsky (1981) and Hünckelkemkes (1990) are used in various athletic technical manuals. As the distance to the first hurdle is limited to the hurdlers who perform eight steps in the approach run phase, poor distribution of the length of these strides often ends with short take-off distance (even causing a fall). To avoid this issue some athletes implementing an approach run phase with seven steps, which has not always resulted in an improved final result or an available solution to all athletes. Hence, the aim of this study is to provide a reference to help coaches and athletes to solve the problems of using eight steps in this phase of the race.

Methods

All the races were filmed during the 44th Spanish Indoor Championship and 12th IAAF World Indoor Championship (Valencia 2008) and analyzed with 2D-DLT (Abdel-Aziz y Karara, 1971). The best result of the athletes who performed an approach run phase of eight steps (Males: n=55; Females: n=51) was included in the study. The trials were further divided into two groups, in both genders, according to the official times achieved during the competition.

Results

International-level male athletes presented a shorter fourth stride ($p > 0.01$) and a longer ($p > 0.05$) take-off distance (2.05 ± 0.03 m) than national-level male athletes (1.97 ± 0.03 m).

Discussion & Conclusion

With the aim of providing a simple and practical reference to control this phase, a 4.65 m mark (for males) and a 4.55 m mark (for females) are proposed. These values represent a 10 cm difference with the same



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midpoint presented by the theoretical models of Schmolinsky (1981) and Hücklekemkes (1990). With this division of the approach run phase in two parts coaches can have a cue to remember, which is related to the ability to anticipate the visual setting of the athletes (as it is done with the passing reference in jumping disciplines). A performance improvement could be expected when transferring this methodology to hurdles and using the 4,65 and 4,55 m midpoint marks.

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Analysis of point-by-point performance in tennis: An example of Novak Djokovic

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ABSTRACT

Introduction

Tennis is an individual sport that requires a specialized training and match preparation for every player. Former studies in tennis have tried many approaches to analyze player's performance using descriptive statistics (e.g., match time, rally duration, game number, points per game or points per game) and normal match statistics (e.g., first and second serve percentage, aces, double faults or net points won). Although helpful in providing general information of match characteristics and evaluating player performance, there is little consideration over how an individual player behaves on point-by-point basis according to different match situations. Whereas situational variables related to success on match or tactical level have been widely studied in team sports, limited studies have been done in tennis.

Methods

Using data of Novak Djokovic in four Grand Slams from the 2011 Australian Open to 2016 Wimbledon, this study was aimed to assess predictors of point outcome (win/lose) related to year, tournament types, round, set, quality of opposition, game status, serves and running distance. A total of 29729 points played by Novak and his opponents were recorded (excluding unfinished matches) through classification tree analysis (exhaustive CHAID), before which a K-Means cluster was employed to cluster quality of opposition, serves speed and rally length.

Results

The results showed that the performance of Novak was influenced by tournament types (level 1): similar in hard courts (Australian Open and US Open), where he won 7987 (56.6%) of 14122 points; and similar in clay (French Open) and grass court (Wimbledon), where he won 8527 (54.8%) of 15553 points. Also, it was revealed that he played stably despite of different opponents, rounds, sets or server. However, when faced with different game status (level 2: winning, losing, equal score, breaking opponent and facing breakpoint), his performance was affected and high percentage of points won was achieved when he was winning and breaking opponents' service game. A similar percentage of winning a point appeared when the score was equal while less points would be won if he was losing or being broken by his opponents. On serve level (level



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3), his performance remained uninfluenced whatever the first or second serve when he was winning, but when playing second serves when the score was equal or breaking opponents, Novak exhibited a dominant performance, winning more points. Additionally, by analyzing matches containing rally length, it was found that a medium (8.23 ± 1.87) or long (16.68 ± 3.97) rally enabled him to win more points in situations of winning and breaking opponent, but a short rally length (2.22 ± 1.50) could increase his possibility of winning a point if he was losing or being broken.

Discussion & Conclusion

These results will give insightful ideas for coaches and players when planning the individual game strategy, allowing more appropriate tactics under different game status.

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Footwork on jump shots in basketball

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ABSTRACT

Introduction

Jump shot has been one of the most important skills in basketball. It has been shown that a total number of 83,408 jump shots were performed, which is the highest among the six shot types, in 2009–2010 NBA regular season (Csapo, Avugos, Raab, & Bar-Eli, 2014). Movements performed before shooting plays an important role in basketball shooting (Okazaki, Rodacki, & Satern, 2015), and different footwork on jump shot may also have an influence on the shooting result. How is the specific execution of jump shot manifested in the basketball games and what are the effects of the various types of footwork on the result of jump shot? The purpose of the study was to examine the prevalence of different types of footwork on jump shot and its influence to the shooting accuracy.

Methods

Eight basketball games from the quarterfinals of the 2014-2015 University Basketball Association of Taiwan were downloaded from the YouTube website for analyses. All the field goals taken were recorded and categorized as one of the three types- jump shot, others and fouls. Jump shots were further classified as “step”, “turn” “jump stop”, “stride stop” and “step back”. Simi Scout 2.0 was used for data recording, Micro Soft Excel 2013 was used for data organization, and IBM SPSS 21 was used for statistical analyses. Kappa statistics was used to evaluate the between and within raters' reliability. Kappa values were all over .8. Non-parametric statistical tests were applied to data analyses.

Results

The results showed that in average, 35.44 jump shots, 33.25 other types of field goals, and 7.44 fouled field goals occurred per team/game. Step occurred 32.26 times per game, whereas jump stop 14.00, stride stop 8.38, step back 3.88 and turn, 3.5. For the shooting percentage, no significant differences were found for any comparisons among different types of jump shots.

Discussion & Conclusion

The finding of the study confirms that jump shots play a significant role in the field goals attempts of basketball games. When categorizing the different footwork of jump shots, there were significantly more step than any



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other type of jump shot, while step back and turn were the least ($p < .05$). Jump stop reported significantly more than stride stop between the most and the least ($p < .05$). These data has not been reported in the literature and may provide useful information for players and coaches for training preparation. Future study may extend the scope and analyze games of different levels and different gender in order to obtain a broader perspective of the prevalence of the jump shot footwork in basketball.

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Exploring the attacking strategies and the skill combinations among different weight divisions in womens Taekwondo competitions

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ABSTRACT

Introduction


Taekwondo is originated from Korea, purposed to self-protection and military operations. Taekwondo duels are an open sport where the organization of the attacking skills is a crucial aspect in scoring points. The common scoring attacking skills include the push kick, round-house kick, axe kick, 360° round-house kick, and punch. The combinations of specific responding skills have often been the key to the victory therefore are the emphases of practice. Taekwondo competitions are divided into different weight divisions, and the most effective attacking strategies and skill combinations may be different due to the stature and the body types of the competitors. The Taekwondo World Grand Prix Final is the highest level competition before the Olympic Games. The purpose of the study was to analyze the attacking strategies and the skill combinations among different weight divisions in women's Taekwondo World Grand Prix Final.

Methods

Video files of 30 matches from 4 weight divisions of female athletes of the 2015 Taekwondo Grand Prix Final were downloaded from the Internet. The number and type of attacking skills as well as the attacking results were recorded using the SimiScout software. Mixed design ANOVA was used to examine the effect of weight division and the attacking skills. A Chi squared test was also used to examine the distribution of different skill combinations in different weight divisions.

Results

The results show a significant interaction between the weight division and the attacking skill; however, different skill combinations show a similar trend of distribution in all weight divisions.

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Discussion & Conclusion

The data provided an initial analysis of the distribution of the attacking skills and the skill combination in high level women's Taekwondo competitions. Future research may extend the scope and analyze matches of different levels and further examine the scoring effect of different skill combinations.

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Analysis of shots performed during water polo matches at the 2016 Olympic Games

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ABSTRACT

Introduction

In Water polo, a key factor to score and success is shooting. Studies that analyzed variables related to shots and goals (e.g., Argudo, Ruiz, & Alonso, 2009) used efficacy coefficients that aimed to explain the relationship between tactics, as well as the quantity of goal attempts and their effectiveness. Efficacy coefficients add information about shot variables and allow coaches to modify tactical planning for future competitions if necessary. The aim of this study was to analyze shot and goals (in even, power play, and penalty micro situations) and the relationship between efficacy coefficient values according to the success (i.e., winner or loser) in Olympic matches.

Methods

Sixty-one Olympic matches were analyzed (Rio de Janeiro, 2016). Data were obtained from the following public domain: <http://www.rtve.es/rio2016>. Nine variables were analyzed: i) goals, ii) shots, iii) penalty goals, iv) penalty shots, v) power play goals, vi) power play shots, vii) possession, viii) power play micro situations (due to player 3 exclusion), and ix) power play. In addition five coefficients (Argudo et al., 2009) were analyzed: i) the coefficient of shot possibility (CSP), ii) the coefficient of shot concretion (CSC), iii) the coefficient of shot definition (CSD), iv) the coefficient of shot definition in a penalty micro situation (CSDP) and v) the coefficient of shot definition in a power play micro situation (CSDPWP).

Results

The Mann-Whitney U test was carried out to establish the differences between winners and losers ($p \geq .05$). The Mann-Whitney U test showed that winning teams scored more goals ($U = 447.5$; $p < .01$), more penalty goals ($U = 1429.0$; $p = .01$), than losing team. Moreover, winners achieved higher coefficients related to goals (i.e., CSC [$U = 419.5$; $p < .01$], CSD [$U = 373.5$; $p < .01$], CSDP [$U = 1391.5$; $p < .01$] and CSDPWP [$U = 1305.0$; $p < .01$]) than loser teams.



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Discussion & Conclusion

The results of the present study are in line with Argudo et al. (2009), who found differences between winning and losing teams with regard to some coefficients (e.g., CSC and CSD). This seems reasonable due to the differences between groups in goals and penalty goals, which might also explain the differences between winners and losers in the CSDP. Finally, while differences appeared in relation to the CSDPWP, no differences were found regarding the performed power play goals and the power play shots. This seems to highlight the major ability of winners to score slightly more than losers despite having slightly fewer opportunities. Coaches should orient their training on ball shooting exercises encouraging players to pass the ball quickly (in order to disorganize defenders) and shooting to score accurately.

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Detection of behavioral patterns in taekwondo

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ABSTRACT

Introduction

The relationship between athletes' behaviors is relevant for developing defensive and offensive strategies. Traditionally, sequential analysis has been conducted to assess relationships between two behaviors (one focal and another one conditioned). The aim of the study is to analyze sequential analysis of offensive and defensive actions in Olympic taekwondo (TKD) bouts.

Methods

Seventy-five male matches of the London Olympic Games in 2012 were studied to analyze tactical actions as follow: direct and indirect attacks (DA and IA, respectively), anticipatory, simultaneous and posterior counterattacks (AC, SC, and PC), dodges (DO), and openings (OPE). Tactical actions (DA, IA, AC, SC, and PC) were used as focal behavior while every tactical action was used as conditioned ones. Five sequential analyses of 1 lag (i.e., action) anterior and posterior were conducted to the respective focal behavior. Significant patterns were determined with positive adjusted residual (AR) > 1.96 (López-López, Menescardi, Estevan, Falco, & Hernández-Mendo, 2015).

Results

DO (AR=5.63), and SC (AR=5.15) preceded DA while SC (AR=7.33) occurred later. Similarly, DO (AR=5.26), and SC (AR=4.70) preceded IA while SC (AR=4.80) and PC (AR=4.84) occurred later. No significant pattern was found for AC. DA (AR=8.22) and IA (AR=5.65) preceded SC while OPE (AR=4.67), DA (AR=5.80) and IA (AR = 6.36) occurred later. Finally, IA (AR=4.19) preceded PC while DO (AR=4.11) occurred later.

Discussion & Conclusion

This is the first study that performs a sequential analysis in Olympics in TKD. The results showed that DO and SC seem to occur before attacking actions (DA or IA) while SC also occurred after them. In addition, PC could occur after IA. The relationship DA-IA-SC reflects a clench situation where both athletes are continuously kicking the opponent. On the other hand, it seems that SC is the preferred action to counterattack after both types of attack (DA and IA) that could be due to the easier performance of SC in



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comparison with AC or PC, and the necessity of reacting as soon as possible to the counterpart's action. Clench situation makes reasonable the existence of attacks preceded and followed by SC. In the same line, the performance of OPE after SC imply a new sequence where attackers act as a way of luring opponents for kicking them (counterattack) so that attackers perform a counter-counterattack in an attempt to score. Finally, IA occurred before PC frequently. This could be due to the major time to recognize the attacking action in IA; it may allow the athlete to perform a step backward to avoid being scored and counterattack (PC). Sequential analyses in taekwondo can provide an insight for athletes' patterns. Future studies should be carried out not only with a lag but longer structures of involved action (two or more lags) so that training can be based on empirical data.

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Automatic tracking of swimming performance variables: Analysis of its validity in 50m events

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ABSTRACT

Introduction

The competition analysis is widely used in swimming competitions to evaluate the sport performance (Arellano, 2003). The athlete or coach can use the information provided by the analysis as an aid to improve performance. In swimming, video analysis is a widespread method, however, the manual tracking is time-consuming. Therefore, the aim of the present study was to validate a novel method to track automatically times (s) after recording the swimmers performances during 50m events in a 25m swimming pool.

Methods

Eighty-six individual events were recorded during a local competition. The participants performed 50m events distributed on each stroke. A typical system of 3 cameras located laterally to the swimming pool and connected to a video switcher has been used as criterion system. The swimmer's data are obtained after detailed observations of HD videos recorded at 50Hz. Start time (10m), T15m, T20m, T25m, T35m, T45m are included in the data base. The 50m times are collected from the competition results (semi-automatic timing) and additionally compared. The system is composed by 8 cameras (Basler Aviator: 83.33Hz 1080x1080pixels) and is located on the ceiling of the swimming pool and connected through Ethernet (1Gb) to a PC Work Station. A full frame added the 8 images. It was collected in real time to a sequence of frame to analyse the swimmers activity in every lane (8 simultaneously). Algorithms of image recognition allowed the event time collection: when the head crosses every 5m section and the arm stroke actions. Linear regression has been applied to test the validity of the tracked data or practical measurement related to the criterion measure plus the standard error of estimate (SEE) (Hopkins, 2015).

Results

All the results are summarized in Table 1.



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Table 1. Comparison between the results obtained by manual digitization in the different distances and the results obtained by automatic tracking using the SEE and the Pearson r.

Manual tracking	T10	T15	T20	T25	T35	T45	T50
Mean (s)	5.00	8.40	11.77	15.27	21.47	28.53	31.93
SD	0.80	1.12	1.57	1.97	2.88	3.97	4.53
Automatic tracking							
Mean (s)	4.95	8.33	11.69	15.10	21.43	28.51	31.79
SD	0.84	1.18	1.61	1.98	2.94	4.03	4.52
SEE (raw units)	0.17	0.14	0.21	0.19	0.16	0.22	0.21
Pearson r	0.98	0.99	0.99	1.00	1.00	1.00	1.00

Discussion & Conclusion

The obtained high correlation values (close to 1) and the low values of the standard error of the estimate open the possibility to use the new tool to replace the former manual data collecting and to reduce about twenty times the time of analysis.

Acknowledgements

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The variability of entropy in rugby exercises under different levels of specificity

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ABSTRACT

Introduction

To compare the variability in resisted forward and backward displacements of professional rugby players with and without a rugby ball, using an accelerometer signal entropy analyses.

Methods

Twelve professional rugby players (mean \pm SD: age 25.6 ± 3.0 years, height 1.82 ± 0.07 m, weight 94.0 ± 9.9 kg). The participants underwent a session familiarizing them with horizontal displacement with and without the ball. Afterwards, the participants completed two sets of eight repetitions of random exercises. In order to avoid confusion variables, execution rhythm and displacement were controlled using a metronome and the same rope length.

The rotational resistance device (Byomedic System SCP, Barcelona, Spain) consists of a metal flywheel (diameter: 0.42 m) with up to 16 weights (0.421 kg and 0.057 m diameter each), which can be added along the top edge of the flywheel's perimeter. The acceleration of the rugby players under both conditions was measured using an inertial measurement unit (IMU). Specifically, this was a WIMU (Realtrack Systems, Almeria, Spain).

Results

Differences were found in ApEn between the displacements with and without a rugby ball in the entire time-series signal ($p = 0.001$) and forward displacement ($p = 0.020$) The effect size for ApEn in the overall and forward displacements were >0.8 (large) but not backward displacement.



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Discussion & Conclusion

ApEn were higher for displacements with a rugby ball these algorithms can be used to establish the amount of changes under different levels of specificity in tasks. Implementation of rotational resistance device in different levels of specificity may be useful in developing physical performance and acquisition of skills.

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Performance indicators that discriminate winning and losing in elite Men's and Women's Rugby Union

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ABSTRACT

Background

Identifying factors that discriminate successful and unsuccessful performance in elite Rugby Union allows coaches to adopt effective tactical strategies for success. Previous research has identified performance indicators that determine success in elite male rugby (Bishop and Barnes 2013), but limited research exists on the female game. Female players spend less time running and experience fewer impacts (Suarez-Arrones et al. 2014) than males (Cunniffe et al. 2009). Since these impact occurrences are primarily associated with tackles, carries and rucks, differences may be expected in the tactical approaches used in men's and women's rugby. The aim of this study was to identify the performance indicators that discriminate winning and losing in elite male and female Rugby Union teams based on the 2015 world cup competitions.

Methods

The study compared the knockout stages of the men's 2015 Rugby World Cup (n=8) and women's 2014 Rugby World Cup (n=8). Performance indicators based on previous literature were coded using Sportscodel software and were expressed in terms of area of the pitch. Multiple two-way ANOVAs were used to identify statistical differences both between winning and losing teams and between sexes. In order to allow comparison between groups, effect sizes were determined using Cohen's d.

Results

An interaction effect was noted for the percentage of kicks made in the opposition 22-50m, with winners in the men's game kicking more in this area of the pitch than losers (winners = 16.3%, losers = 7.3%), whereas in the women's game losing teams kicked more in this area of the pitch than winners (winners = 9.3%, losers = 19.2%). These findings suggest winning men's teams kicked away more possession in the opposition 22-50m line with a view to gaining territory and pressuring the opposition. Successful women's teams adopted a more possession driven attacking approach in this area of the pitch. Total carries and ruck frequency were similar between winners and losers regardless of sex. In the women's World Cup a trend was noted towards a higher number of total carries by winners (98.13 carries) compared to losers (72.88 carries), with a higher



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percentage of wide carries and carries following kick receipt compared to losers. These findings suggest successful female teams appear more willing to attack with ball in hand following a kick receipt and adopt a more expansive game through attacking with wider carries in the midfield and outside channels. The percentage of lineouts won on the opposition ball was found to discriminate winners and losers, regardless of sex (line outs stolen, winners = 21.41%, losers = 11.09%). This supports previous knowledge about the importance of the lineout and the emphasis teams should place on defensive strategies which can increase the chances of stealing possession.

Conclusion

Successful men's and women's teams at the elite level adopt different tactical approaches to knockout based competitions, these findings should be used as a basis for coaches to develop appropriate tactical approaches and training methods which are sex dependent.

An exploratory study of attack variability, attack efficiency and conversion rate in elite rugby union

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ABSTRACT

Background and Purpose

Tournament and match situation as environmental constraint are changed as the importance of the game increases, that in turn changes players' behaviours according to dynamic system theory (Newell, 1986; Renshaw et al., 2010). Attacking strategies as a part of behaviour can predict the probability of tactical actions in a time series (Parazen, 1962). By looking at how tactics change over the course of a tournament, it can help develop more efficient attacking strategies. The purpose of this exploratory study was to identify attack variability and efficiency as well as conversion rate and their fluctuations over the progressive stages of a tournament.

Methods

The 4 most successful teams from the Rugby World Cup 2015 were analysed by notational analysis. Six tactical actions were used to describe the attack strategies when points were scored. Using a Markov chain method, the transition probability and transition rate was calculated as indicators of tactical variability. Attack efficiency was calculated to show the percentage of possessions which led to successful attacks, the conversion rate was also calculated to represent the number of scores per successful attack.

Results

The results showed that the "hands down the line" was the most common tactical action (probability of 0.364) in the pool stage. Clean breaks and kicks also had a high average transition rate (6.87% and -10.24%) while hands down the line and opposition error remained stable through the tournament. Conversion rate remained high but fluctuated slightly ending at 47.27% while the attack efficiency remained consistent until the final when it increased to 40.13%.

Conclusion

The results show that the tactical actions of teams vary throughout the tournament and attack efficiency and conversion rate are maintained or improved throughout the tournament. These findings support the importance of variability in attack for successful performance.



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The relationship between perceived motivational climate and satisfaction with personal treatment among young soccer players: The moderating role of coaches' supporting behaviour

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ABSTRACT

Introduction

Athletes' experiences in sport participation are influenced by several contextual factors, such as the behaviour of the coach and the motivational climate they experiences. Previous studies have generally suggested that performance-oriented motivational climate is associated with negative consequences (Keegan, Harwood, Smith & Raine, 2014).

The aim of this study was twofold: 1) to investigate the predictive value of mastery climate (MC) and performance climate (PC), and coaches' supporting behaviour (SB) on young soccer players' personal treatment-satisfaction (PT); and 2) to investigate the moderating role of SB in the relationship between PC and PT.

Methods

532 players (167 girls/365 boys, average age 15,4, $sd= 1,2$) attended a Norwegian national football tournament. During the tournament, the players filled out the PT-subscale from Athlete Satisfaction Questionnaire (ASQ; Riemer & Chelladurai, 1998), the SB-subscale from Coaching Behavior Questionnaire (CBQ; Williams et al., 2003) and the Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ; Newton, Duda & Yin, 2000).

Results

When assessing MODPROBE for SPSS (Hayes & Preacher, 2014), the total model ($F(df_1, df_2) = 68.00(3, 339)$, $p < .01$) accounted for 37 percent ($adjR^2 = .37$) of the variation in PT. Moreover, MC (Coefficient (SE) = $0.17(0.05)$, $p < .01$) and SB (Coefficient (SE) = $0.97(0.08)$, $p < .01$) was positive significant predictors of PT, whereas PC negatively predicted PT (Coefficient (SE) = $-0.17(0.06)$, $p < .01$). When investigating the



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moderating role of SB, the analysis revealed a significant interaction between PC and SB (Coefficient (SE) = 0.26(0.10), $p < .01$). More specifically, with a moderator-value 1SD above the mean (3.58), the conditional effect of PC yielded no statistical significant effect on PT (Coefficient (SE) = -0.05(0.08), $p = .52$).

Discussion & Conclusion

At high levels of coaches' supporting behavior in a performance-oriented learning environment, the negative associations between performance climate and personal treatment-satisfaction disappear.

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The use of Social Network Analysis for the Evaluation of Team Ball Sports Performance: A review

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ABSTRACT

Introduction

In recent years, Social Network Analysis (SNA) has been used to understand many physical, biological and social systems (Strogatz 2001). These systems can be represented by networks (Newman, 2003). They are defined a set of nodes (or actors) connected by edges (interactions) which are mathematically described by indices (Scott, 2011). These methods can also be extended to assess performance in team sports. A sports team, in fact, can be defined as a network consisting of vertices (players) and links (interaction between players, that is ball passes) (Davids, 2005). This study aimed to describe the use of SNA in the scientific literature with regards to the evaluation of team ball sports.

Methods

We performed a literature search using Pubmed, ScienceDirect and accessing to sectorial journals. We used the following search terms: network, network metrics, social network analysis, social network, network analysis in sport, team sport analysis, team performance, match analysis network structure, centralization, centrality, collective behaviour, soccer, basketball, rugby, water polo and handball.

Results

We found a dozen of articles which used SNA to evaluate the performance in sports like soccer, basketball and water polo from 2011 to 2015. These studies were published on sport and social science journals. SNA describes which and how many interactions between teammates occur during a match, defining indices such as: total interactions, density (the proportion of observed interactions among the potentially observable ones), outdegree centrality (number of interactions that the node directs to others), indegree centrality (number of interactions directed to a node) and centralization (distribution of the interactions in a network). These measures allow to identify the interactions between players associated with team performance. It was reported that increased interactions, such as passes between players, lead to success of a team. Furthermore, several studies found that high values of degree centrality identify the role of the most prominent



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player. Another study showed that a network with a homogenous distribution of links (passes) is associated with a greater probability of success of the team. Some studies have conducted the analysis taking into account the interactions between players in reference to the different areas of the playing field. In this regard, a study introduces a zone passing network in order to analyse passes within the zones of the playing field, moreover, it was assessed the zone of the player with higher centrality for all minutes of the match.

Conclusions

The review found more results in sports such as basketball, football, water polo. SNA can assess performance in team sports, analysing how interaction between players affect the outcome of a game. The possible applications of these investigations provide relevant information to optimize training sessions and improve tactics.

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Exploring the relationship between offensive and defensive indicators in basketball using canonical correlation analysis

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ABSTRACT

Introduction


Researches on basketball game performances have traditionally focused on utilizing indicators to predict or discriminate victories and setbacks. Few researches have discussed defensive statistics in a basketball game, not to mention the interaction between defense and offense of both teams. One solid team defense should reflect on three levels: letting the opponent team have less possession; decreasing opponent's shooting opportunities; and causing enough interference to lower the opponent's scoring efficiency. Canonical correlation analysis (CCA) is a multivariate statistical method that correlates two sets of variables to provide possible explanations of the relation between the variables. The purpose of the study was to examine the relationship between the defensive and offensive performances in basketball matches using CCA.

Methods

We extracted the data of the Mavericks' 82 games of the 2015-2016 National Basketball Association (NBA) regular season. Four defensive indicators — steal, block, defensive rebound (DRB), and offensive rebound (ORB) were selected as the predictor variable sets and six offensive indicators — possession, turnover (TO), 2-point attempt (2PA), 3-point attempt (3PA), free throw attempt (FTA), and field goal percentage (FG% overall) were used as the criterion variable sets. Four canonical functions were constructed to maximize the correlation between two sets.

Results

The results of the dimension reduction tests indicated that from the full model (function 1 to 4) till function 3 to 4 were all statistically significant, $p_s < .03$, and the first three functions each had more than 20 % variance accounted for. These information indicated that there was a significant correlation between the defensive and offensive performance indicators. And based on the standardized canonical function coefficients and the

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structure coefficients, the relevant criterion variables were primarily possession, TO, and FG%. As for the predictor variable set, DRB served as the main contributor to the correlation.

Discussion & conclusion

The study provided an example of the use of CCA in examining multivariate performance indicators in sport. With the help of notational analysis, we hope to find new indicators in addition to the box scores, which may lead us to better interpreting the relationship between the offense and defense performances in basketball.

Analysis of contextual and technical-tactical variables of penalty shots in the Spanish 2nd B Division

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ABSTRACT

Introduction

In football, set pieces gather 30-45% of goals scored during competition. Penalties require special attention and despite being the most studied set piece, they receive less attention in training. This descriptive research aims to determine the effectiveness of penalties according to contextual, technical and tactical variables.

Methods


A total of 378 penalties from the 80 teams that competed in the Spanish 2nd B Division during the season 15-16 were analysed. A notational analysis system was designed to register all the variables related to goalkeepers, penalty takers score and effectiveness. Two different analysts fulfilled the analysis and an acceptable level of error was achieved on all variables in both intra- and inter-reliability tests ($p < 0.05$).

Results

Results showed a high effectiveness (75,4%) and a low frequency (0,2 penalties/game). Regarding goalkeepers, diving towards the natural footedness of a striker to save the ball is the most used action (58,2%). Effectiveness relationship was significant with shot direction ($\chi^2=365,134^a$; $p < ,000$), being the upper third most effective area and the bottom third most used; the relationship with the final score was also significant ($\chi^2=29,483^a$; $p < ,000$), with the ability of winning points 82% of the time that penalties were scored.

Discussion & Conclusion

Individual characteristics are the most important in penalty preparation but when individual reports are unavailable, general penalty trends are very useful. This research helps goalkeeper coaches to prepare their

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players before competition and highlights the utmost importance of penalty practice, both for players and goalkeepers.

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Discriminatory power of women handball game-related statistics at the Olympic Games

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ABSTRACT

Introduction

Handball is a complex sport game that is determined by the individual performance of each player as well as tactical components and interaction of the team (Wagner, 2014). Handball is played worldwide and it has been an Olympic event for females since 1976. The major part of studies in females have been development in physical and physiological aspects (Manchado et al., 2013). While, in recent years, studies on performance analysis are common in men, not the case in women, where they are scarce or non-existent. In this context, the objective of this present study was to identify characteristics discriminating the performance between winning and losing teams.

Methods

We analyzed the results and game-related statistics of 236 women's matches played in three last Olympic Games (2008, 2012 and 2016). The data were retrieved from the official book of scores on the official Website of each Olympic Games. The game-related statistics considered were: total shot, 6 m shot, wing shot, 9 m shot, penalty shot, fast break shot, breakthroughs shot, goalkeeper (GB) total shot, GB 6 m shot, GB wing shot, GB 9 m shot, GB penalty shot, GB fast break shot, GB breakthroughs shot. These variables are: (goals*100)/shots or (save goals*100)/shots. Other variables studied were: yellow cards, red cards, 2 minutes exclusions, assists, technical foul and steals. The predictor variables influencing the final performance in the games (winning teams) were determined by means of a discriminant analysis using the sample-splitting method.

Results

The predictive model classified correctly 83% of teams (84% of winning teams) using four variables: total shoot, goalkeeper-blocked shots, goalkeeper-blocked fast break shots, technical fouls and steals (Wilks's lambda: 0.514, canonical correlation index: 0.697).



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Discussion & Conclusion

Performance analysis is popular approach to investigate the most important factors for the win of the game. Previous studies identified several important performances in winning teams, such backcourt efficiency (Guric et al., 2005) wing shoot efficiency (Ohnjec et al., 2008). Also, the current predictive model indicated that the performance of goalkeeper is an important factor for winning the game in women. Finally, technical fouls and steals were selected by predictive model. Technical fouls was a performance indicator in World Championship (Ohnjec et al., 2008). This could indicate the relevance of do not technical fouls (for example excessively rough play) and training the anticipation.

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Handball game-related statistics in Olympic Games: Discriminatory power in males

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ABSTRACT

Introduction

Handball studies in males have frequently focused on the analysis of the anthropometric, physiological and functional profiles, among others. Recently, the performance analysis studies have been published. The first studies have showed that the differencing variables between winners and losers team were: fast break goals and pivot position goals (Bilge, 2012) and efficiency of total attacks, positional attacks, shot and distance shot and goalkeepers blocked shot (Skarbalius and Pukėnas, 2012). In this context, the objective of this present study was to identify characteristics discriminating the performance between winning and losing teams.

Methods

We analyzed the results and game-related statistics of 236 men's matches played in three last Olympic Games (2008, 2012, 2016). The data were retrieved from the official book of scores on the official Website of each Olympic Games. The game-related statistics considered were: total shot, 6 m shot, wing shot, 9 m shot, penalty shot, fast break shot, breakthroughs shot, goalkeeper (GB) total shot, GB 6 m shot, GB wing shot, GB 9 m shot, GB penalty shot, GB fast break shot, GB breakthroughs shot. These variables are: (goals/100)/shots or (save goals/100)/shots. Other variables studied were: yellow cards, red cards, 2 minutes exclusions, assists, technical foul and steals. The predictor variables influencing the final performance in the games (winning teams) were determined by means of a discriminant analysis using the sample-splitting method.

Results

The predictive model classified correctly 80% of teams (85% of winning teams) using three variables: total shot, goalkeeper-blocked shots and technical fouls (Wilks's lambda: 0.581, canonical correlation index: 0.647).



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Discussion & Conclusion

In this study analysed performance among male Olympic handball players in the years 2008, 2012 and 2016. The results implied that the most predictive model (80%) for the male team performance included three variables: total shoot, goalkeeper-blocked shots and technical fouls. The current predictive model are somewhat in line with a previous study where field shots efficiency and goalkeeper performance were relevant factors for winning games (Skarbalius and Pukėnas, 2012). On the other hand, in contrast with other study (Bilge, 2012), the current model showed that technical fouls was discriminatory of winning teams. This study could help coaches to improve their game strategies and tactical decisions.

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Anxiety measurement in young tennis paddle player in different phases of the match and biofeedback training implementation

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ABSTRACT

Introduction

The present research is a pilot study aiming to measure the anxiety levels that a player suffers between the end of each point and the start of the next service/rest in order to apply biofeedback training sessions and assess whether the anxiety levels increase or decrease after biofeedback implementation.

Methods


The measurements were made in the High Performance Training Programme carried out by the Valencia Paddle Tennis Federation. One U16 player undertook this programme and the electrical conductance was measured with the Nexus system twice before the biofeedback was applied and twice after the specific training. These sessions were designed to control stress in these periods of the game.

Results

Results showed improvements both before service (Pre-intervention: stress increased 62%; Post-intervention: increased 31%) and rest (Pre-intervention: stress increased 82%; Post-intervention: increased 52%).

Discussion & Conclusion

The improvements achieved implied that the player was able to control the anxiety levels in points deemed less important, therefore the average electric conductance was greater in post-intervention measurements (Pre-intervention: 0,311mv; Post-intervention: 0885mv). This research contributes to increasing the content quality of the High Performance Training Programme of the Valencia Paddle Tennis Federation and the

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control that this organization can have over their athletes, empowering player development with a multidisciplinary approach.

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Individual player profiling based on the playing style philosophy of a high performance soccer academy: An applied perspective

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ABSTRACT

Introduction

An individual position specific player profile in a combined written, statistical and audio-visual report was created based on the playing philosophy of a professional soccer academy.

Methods

Six U16 players were analysed in a total of 18 league matches that contained a total number of 2592 actions. Profiles were created through the use of percentile ranks so that players could be compared to other players. The playing philosophy was analysed and KPIs were selected based on the club playing style and on the data obtained from the questionnaires answered by the coaches of the academy. Two different analysts carried out the analysis and an acceptable level of error was achieved on all variables in both intra- and inter-reliability tests ($p < 0.05$).

Discussion & Conclusion

Profiles were created and used to describe tactical and technical patterns of each player and to establish a baseline for each position. These profiles can also compare players from the same position, which are useful to coaches for team selection and in weaknesses detection to plan individualised training sessions. They also help clubs in player acquisition due to the knowledge of the players they provide. These profiles are therefore a useful tool that merges objective data from competition in a visual design together with video footage of players to be able to watch players in action, allowing practitioners to perfectly evaluate players.



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How can virtual reality technology help us understand performance in sport?

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ABSTRACT

Introduction

Performance analysis in sport is considered to be interdisciplinary and a wide and diverse range of sophisticated technologies are utilized to examine multiple yet meaningful aspects, that contribute to an improved understanding of an athlete's or team's performance (e.g. technical and motor skills, energy costs and decision making behavior). The most extensively adopted tool for investigating decision making behavior to date has been video playback (e.g. Muller *et al.*, 2006). However, when using such systems perception is not active, preventing exploration of data from key variables that emerge from the dynamics of the action unfolding over time and the active perception of the observer. A more recent and yet to be fully explored, immersive interactive virtual reality (VR) technology offers exciting solutions to overcome such issues where athletes and coaches can be immersed in bespoke scenarios. In addition, a highly functional VR set up offers the possibility to: precisely control the amount of perceptual information presented, reliably reproduce similar conditions across trials and importantly, allows for user-environment interaction and recreation of a 3D egocentric viewpoint (athlete's viewpoint) that can be updated in real time (Bideau *et al.*, 2010). In the past, VR has been used to understand expertise decision making behavior across a multitude of sporting scenarios (e.g. rugby deceptive movement- Brault *et al.*, 2012). Within the above context, I will describe how a state of the art virtual reality cricket simulator (VRCS - Dhawan *et al.*, 2016) can serve as a useful methodological tool to study decision making skills (perception and perception action) in cricket batters of different skill levels.

Method

Four top level and ten intermediate batters were immersed in the VRCS and confronted with realistic fast bowling simulations. Perceptual accuracy and bat swing characteristics were monitored in a two-part experiment.

Results

Several key findings (perception study: response accuracy, response bias; perception-action study: bat-ball impact and swing characteristics) related to a batter's performance will be reported.

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Discussion and Conclusion

VRCS offers an exciting way of creating bespoke 3D scenarios that help accelerate a batter's decision making skills. Similarity of results from previous studies (Muller *et al.*, 2006; Renshaw *et al.*, 2007) will also be explored, which helps support the high level of behavioral realism achieved inside the cricket simulator. Finally, despite the initial promising results of VRCS (and VR sports studies in general), a number of applied challenges along with potential solutions will be presented.

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Energy expenditure and its relationship with electrocardiography and Echocardiography determinants in adolescents soccer players in altitude

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ABSTRACT

Objective


The purpose of this study was to establish the correlation between Total (TEE) and physical activity (PA) energy expenditure (PAEE) with electrocardiography and echocardiography values in adolescent soccer player at 2600 m of altitude.

Methodology

A total of n=34 subjects (n=28 male, n=6 female) soccer players between 13-17 yr, who lived in Bogota (2600 m) minimum for one year, were cited at the same day and hour. Using the QAPACE questionnaire we determined the TEE and PAEE in the last year. Complete sport medical evaluation and 12 derivation electrocardiography was performed. Voltage of S wave in V1 and V2, R in V5-V6, Sokolow index and Qtc were analyzed. A pediatric cardiologist performs a TT echocardiogram, and established the values of Left ventricular end-diastolic (LVIDd) and Left ventricular end-systolic diameters (LVIDs) and ejection fraction (EF).

Results

The average age of the population was 16 ± 1.1 years in men, and 15.4 ± 0.8 years in women. Weight 55.3 ± 4.0 kg in men, women 48.8 ± 10.7 kg, height 166.1 ± 10 men and $156.8 \text{ cm} \pm 3.3$ cm women. Body mass index (BMI) was $19.8 \pm 2.1 \text{ kg/m}^2$ in males and females $19.8 \pm 1.4 \text{ kg/m}^2$. Significant difference was evidenced in the voltage of the S wave in lead V2 between men and women ($p = 0.0137$). Echocardiographic findings of LVIDd in the male population was on average 47.9 ± 3.8 mm and the female population 40.9 ± 3.0 mm, existing significant difference $p = 0.002$; Male LVIDs was 29.2 ± 3.0 mm and 23.7 ± 2.6 mm in women, with

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a significant difference ($p = 0.0002$). Regarding EF there were no differences, 70.1% men and 69.3% women. The absolute TEE was $3855 \text{ kcal} \pm 753.4$ men and women 3264.8 ± 294 Kcal. There was no correlation between TEE and electrocardiographic variables; there was correlation between energy expenditure in physical activity (PAEE) and the LVIDd ($r^2=0.485$ $p=0.0037$), the TEE and the LVIDd ($r^2=0.601$; $p=0.0002$) and TEE and the LVIDs ($r^2 = 0.404$; $p=0.0179$). There are differences in the voltage of the S wave in lead V2, between men and women.

Discussion

Blimkie 1980, describes that adolescents between 10 and 15 years who were more physically active and had a high aerobic fitness, had a cardiac dimensions greater than those adolescents who had a low level of PA. (1) Maron 1986, makes the hypothesis that there was a critical threshold in exercise intensity that could induce cardiac adaptations (4) Eisenman 2000, in the Quebec Family Study, describes a slight association between the level of vigorous physical activity, energy expenditure ($200 \text{ kJ} \cdot \text{kg} \cdot \text{day}^{-1}$, equivalent to $47.8 \text{ kcal} \cdot \text{kg} \cdot \text{day}^{-1}$) and the dimensions of the heart, in women between 16 and 18 (3). Hietalampi, 2012, found a direct association with the level of PA of the subjects, specifically in the ventricular mass and thickness of the rear wall, suggesting that in healthy adolescents, moderate and vigorous PA leads to increased ventricular mass and increased thickness of the rear wall (2).

Conclusions

There is a significant difference on left ventricular diameters between genders. These results suggest the hypothesis that might be a relation with energy expenditure and Left ventricular diameters.

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Physiological demands of basketball referees according to the gender and role played during competition

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ABSTRACT

Introduction

Referees are an important component in the basketball competition. They are responsible of the control of the games and also of the application of the official basketball rules (FIBA, 2014). In order to make a good call on the court it is necessary find the right position in each action of the game (Schweizer, Plessner & Brand, 2013). Referees need to have a good physical condition in order to follow the game (Matkovic, Rupcic & Knjaz, 2014). Also, it is necessary to pay attention to the gender because as some authors have established previously, their answer can be different in front of the same stimulus (Vaquera, Mielgo-Ayuso, Calleja-González & Leicht, 2016). To our knowledge, this is one of the first studies that analyze the role played for the basketball referee during the game.

Objective

The present study analyzed the physiological differences in basketball referees depending on the gender and the role played for the Referee during official games.

Methods

The design is comparative and transversal with natural groups (Ato, López & Benavente, 2013). The shown is 6 National Level Referees from the Castilla and Leon Basketball Federation. The dependent variables are: heart rate, time spent in heart rate zones, total distance covered, number of sprints and meters covered in the speed zones. T-test for independent shown, to know the dependent variables depending on the role played and the Referees gender.



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Results

There are no significant differences depending on the role played for the referees in any of the variables analyzed. There are differences depending on the gender in; MaxHR ($t(24) 7,729$; $p \leq .05$); MinHR ($t(24) 8,427$; $p \leq .01$); HR3 Zone ($t(24) 9,247$; $p \leq .01$); Number of sprints ($t(24) 17,828$; $p \leq .01$); V4 Zone ($t(24) 9,374$; $p \leq .05$).

Conclusions

The Referees studied in the present study showed similar internal load values independent of their role played in the competition. The physiological values are different depending on the gender of the Referees. It is necessary to establish different training programs for male and female basketball referees.

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Laterality at racket sports

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ABSTRACT

Introduction

One hand has a dominant preference over the other hand in skills performed single hand. However, bilaterally learning becomes important in sports branches which bilateral development provides advantages. Hand preference and foot preference have great effects on properly strength transfer between hand and foot by kinetic chain in racket sports. From this point of this, it could be said that hand and foot preferences determine sports performance. The aim of this study is to determine of dominant hand and foot and also evaluate the distribution of hand and foot preferences used in the 5 basic racket sports skills of athletes from different racket sports.

Method

A hundred and fourteen female and male athletes competing in badminton (n=36), tennis (n=48) and table tennis (n=30) were participated in this study. The hand and foot preferences were determined by “Waterloo Handedness Questionnaire–Revised” and “Waterloo Footedness Questionnaire–Revised, respectively. Hand and foot preferences of the 5 basic racket sports skills were determined by a questionnaire. The distribution of hand and foot preferences and selected 5 basic racket sports specific skills (basic racket grip, serve, forehand stroke, backhand stroke and strong stroke) were presented in tables. Hand and foot preferences according to training age were analyzed by using Kruskal-Wallis test.

Results

From the total badminton players, 14.3% preferred left foot, 80.0% preferred right foot and 5.70% preferred both two feet equally, 8.60% preferred left hand and 91.4% preferred right hand. From the total table tennis players 10.0% preferred left foot, 86.7% preferred right foot and 3.30% preferred both two feet equally, 3.30% preferred left hand and 96.6% preferred right hand. From the total tennis players 14.6% preferred left foot, 79.1% preferred right foot and 6.20% preferred both two feet equally, 10.4% preferred left hand and 91.6% preferred right hand. There was no statistically significant difference between determined hand and foot preferences with WHQ-R and WFQ-R, respectively ($p>0.005$).



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Discussion & Conclusion

Consequently, sports specific skills will be learned fastly and get automatically with giving tactical tasks at games by training planned according to the determined laterality preferences. It is thought that determining the laterality preference will be important issue to develop coordination and balance at skill excellence stage in sports.

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Analysis of the effectiveness of the use of instep weights (powerinstep) in runners

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ABSTRACT

Introduction

The goal of this study was to analyse the effectiveness of the use of weights placed on the instep of athletes running shoes (Powerinstep) in long series, regarding the effect of biomechanical and certain athletic performance variables on two everyday runners groups with similar training methods.

Methods

The sample used was composed of 19 subjects (9 male and 10 female). The control group (without weight) was made up of 4 subjects and the experimental group had 15 subjects (4 had 50g weights on each foot, 5 had 100g, and 6 had 150g). The weight given to each athlete depended on their body weight.

There was a pre-test and a post-test done to each athlete with a training period of 14 weeks in between. These tests were: Bosco test (SJ, CMJ, ABK) and the Leger test (UMTT). The analysed variables were: height (cm) in SJ, CMJ, and ABK; time (s) in the Leger test; maximum and average heart rate (bpm); contact, flight, and step times (s) of both left and right feet; step length (m) both left and right feet; stride length (m); the elevation of the centre of mass (cm) during left and right steps and the strides.

A comparative analysis (Wilcoxon test) of the variations between the pre-test and the post-test was done, both in the intergroups (control vs. experimental) and the intragroups (between the 3 subgroups of the experimental group).



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Results


The differences found in the variations of the control group were not statistically significant ($p>0.05$). Neither were they in comparing the variations of the intragroups between the subgroups of 50g, 100g, and 150g weights ($p>0.05$). With this, it can be deduced that the weights given to each athlete regarding their body weight were correct.

Statistically significant differences were found in the variations of the experimental group regarding the length of the stride ($p=0.005$), increasing this one, as well as the length of the left step ($p=0.004$). However, it has to be taken into account that the length of the step can be considered an improvement, but only if it is regulated to fit each athlete's ideal step length in relation to their trochanteric length, and if it is also associated with an increase of their driving force.

Discussion & Conclusion

Likewise, given the limitations of the sample for significant changes to be given over time, tendencies of the changes in the average percentages were analysed. Even if they did not offer statistically significant differences, they did offer results to take into consideration. This way, variations with higher percentages were found, and they were technically positive for the experimental group in 12 of the 18 analysed variables. The most noteworthy ones were: SJ (increase in the height of the flight 5.99%), Leger test (increase in the time 5.78%), length of both right and left steps (increases 5.99% and a 10.85% respectively), and the length of the stride (increases 8.11%).

Physical and technical activity of soccer players in relation to playing position in the Spanish First League

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ABSTRACT

Introduction


During the last decades, the interest in getting all the information necessary to understand the variables in the physical level of performance in a soccer player when playing in an official competition has increased steadily. This is currently possible due to the last advance in technology.

Methods

The aim of this research has been, firstly, to describe and compare physical demands (i.e. Total Distance Covered (DT), Distance Covered in the first half (DT1a), Distance Covered in the second half (DT2a), Total Number of Sprints (NST), Sprints in the first half (NS1a), Sprints in the second half (NS2a), Total Sprint Distance (DST), Sprint Distance in the first half (DS1a) and Sprint Distance in the second half (DS2a) made by the BBVA Competition soccer players in the 2013-14 season in relation to their specific position (i.e. goalkeeper, central defenders, external defenders, central midfielders, external midfielders and forwards) and secondly, to describe physical demands in relation to their specific position during the first or second halves of the match. Data have been collected by means of MediaCoach analysis system in relation to every match and player in the BBVA Competition using especially the ones related to those who had played 11 entire matches (n=232).

Results

The Spanish players went over an average of 9268 ± 960 m, in sprint 448 ± 156 m and an average of sprints per match of 25.27 ± 7.3 . The MANOVA made among groups showed a significant difference based on their specific position ($\eta^2 = 0.078$, $F = 62$, $p = 0.0001$) on the variables (i.e. DT, NST y ST). For these three variables

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(DT, NST y DST) the mixed ANOVA showed significant differences between each match half. To sum up, physical demands in a soccer match are different depending on the specific position of the players, being the central midfielders the ones who go over the longest distances during a match. However, the ones who go over the longest distances sprinting are the external midfielders and external defenders. Regarding the two halves of the match, soccer players go over distances around 4% longer during the first period of the game in comparison with the distance during the second half.


Discussion & Conclusion

These data will have to be used by soccer professionals to plan and adapt the training load and sessions to which soccer players are subjected depending on their specific position in the field.

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Analysis of the new 3x3 competition in basketball

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ABSTRACT

Introduction

One of the most interesting proposals in the sports scientific field is to analyze the impact that competition make on athletes. So, it's necessary to interpret the parameters analyzed to draw practical conclusions. Although the literature analyzed show multitude of data about the characteristics of the effort in basketball, little is known about the demands of the new 3x3 competition. Therefore, it is required to study if it causes the same kind of demands and thus can be trained under the same methodology or, in contrast, if it is a totally different sport. For all the above, the aim of this study is to describe the physical and physiological profile of basketball players through a registration system and by monitoring physical activity and movement in real time in official 3x3 matches.

Methods


The research was carried out with 4 teams of the regional selection of Extremadura at 2016 3x3 U18 Spanish Championship (2 male and 2 female teams). Each team had 4 players, for a total of 16 players and played 3 matches, for a total of 12 matches. Two types of variables were analyzed: internal load variables (Average, Maximum and Relative Heart Rate) and kinematic variables (Impacts, Steps and Jumps per minute). In addition, real playing time was registered to evaluate more realistically the different variables. Each player was equipped with a Heart Rate band (Garmin®) and a system for registration and monitoring of physical activity and movement in real time (Wimu®). The software used for these analyzes was Quiko®.

Results

The average length of a match was 17.49 minutes. Yet in this sport at least 3 matches were played per day, for a total of 52.47 minutes. Breaks were carried out between games. As for the physiological variables, Average Heart Rate was 173.42 bpm, Maximum was 193.72 and Relative was 89.5% of the Maximum. In the case of kinematic variables a mean of 31.48 impacts (1.79 impacts / min), 705.81 steps (42.15 steps / min) and a total of 31.81 jumps (1.85 jumps / min) were obtained per game.

Discussion & Conclusion

The 3x3 competition has been described. In contrast to traditional 5x5 basketball, 3x3 competition doesn't induce fluctuations in heart rate and also, causes more impacts and jumps per minute. For a future adaptation

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to the training, it is important to note that, due to the fact that at least 3 matches are played. Because of this, the total number of impacts would be an average of 94.44, 2117.43 steps and 95.43 jumps. Individual differences among players, gender, matches and equipment should be considered. The results of this study allow coaches to hold relevant information that should be considered in this “new” sport such as: shorter but more intense training sessions, 2 or 3 sessions with longer breaks, or training tasks with active breaks. Moreover, training should be focused on some issues: constant heart rate, training in small courts and to increase number of impacts and jumps.

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Influence of the opposition in smash velocity in padel players

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ABSTRACT

Introduction

Padel is considered as an attractive sport for everyone and it is practiced by people of all physical condition. However, this sport requires a high level of physical condition in several relevant actions of the game like smash or volley. Smash shot is considered one of the most important actions and its success mostly depends on ball velocity. However, there is very little evidence about the influence of the opposition in ball velocity.

Methods

The purpose of this study was to analyze the differences in ball velocity with and without opposition. Forty four semi-professional (P) and amateur (A) padel players were assessed in two smash velocity situations— with opposition (VO) and without opposition (V). Secondly, this study analyze the differences in smash velocity according to the competitive level.

Results

The analysis of mean differences showed significant differences between VO and V in both groups. Smash velocity was higher without than with opposition for both groups; the smash velocity of the semi-professional group was 9.31% lower ($p < 0.01$; $t = 7.223$; $df = 43$) when there was opposition, whereas amateur players' velocity lowered by 16.06% ($p < 0.01$; $t = 5.291$; $df = 41$).

Discussion & Conclusion

An influence of opposition in the smash ball velocity is confirmed in padel, especially in amateur players, as it decreases the mentioned velocity. Level competitive seems to be a determining factor in the smash shot.



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Profiling half-back play in rugby union and the impact of substitutions

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ABSTRACT

Introduction

An exploratory method of quantifying the impact of individual players in rugby union was developed and applied to both half-back positions in 2015 Rugby World Cup matches with a view to firstly providing a method of profiling players, and secondly to assess the impact of substitutions.

Methods

A “non-substituted” control group were also analysed, in both the first and final 20 minutes of competition. A match impact scoring system was devised using the questionnaire responses of an expert group of professional rugby analysts and experienced international coaches. The scoring system weighted each game action in a positive or negative manner according to the impact on team performance. The game actions were classified as “attacking” (with possession) or “defensive” (without possession) and were divided by the number of seconds that each team had possession during the period of analysis.

Results

It was found that the proposed method produced valid and reliable data concerning player performance. It was also found that for the scrum-half position, the starting players produced a higher median efficacy score than replacement players 27.46, (std. dev. ± 10.06) and 20.42, (± 12.45). The best performing scrum-half group were the 60-80 minute non-replaced players 29 (± 9.0). For the out-half position, it was found that the highest median efficacy was achieved by the replacement player group 18.80, (± 11.00), with the non-replaced 60-80 minute group performing worst 14.40, (± 7.09).

Discussion and Conclusion

Future research should develop the methods applied in this study to develop player profiles for each position on the rugby field. It is suggested that these profiles should use score difference between the teams to take into account the strength of the teams involved. The concept of a weighted individual player efficacy system has been demonstrated in the sport of rugby union, but could be applied in any team sport where greater individual player performance data is required.



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Transition to attack in elite soccer

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ABSTRACT

Introduction

Since the early work of Reep and Benjamin (1968) on possessions, and shots at goal, there has been a lack of detailed, informative research in the area. The aim of this study was to investigate the influence of turnover zone, and immediate 'on the ball' player actions upon scoring goals and creating scoring opportunities (S.O.'s).

Methods

A total of 3,077 turnovers and subsequent transitions from all 29 games of the 2014-15 Champion's League knockout stages were coded. Multidimensional qualitative data using 11 ordered categorical variables were obtained to characterise each transition. Data were analysed using chi-square analysis.

Results

Winning turnovers in offensive areas increased the chance of scoring a goal and creating a S.O. ($p < .001$). Teams were almost 7 times more likely to create a S.O. from transitions initiated in the offensive zone than the defensive zone, and over 11 times more likely to score a goal; nearly half of all turnovers in the offensive zone, 49.45% ($n=45$) resulted in a S.O., and 7.69% ($n=7$) lead to goals. Teams created significantly more S.O.s and scored more goals when the first and second actions after the turnover were forward ($p < .05$); successful dribbles, runs with the ball and long passes were the optimal player actions.

Discussion and Conclusion

It was concluded that teams should press high to win turnovers and create S.O.'s, supporting some of the original findings of Reep and Benjamin (1968). It was further concluded that the immediate player actions after winning the turnover are critical to the outcome of the transition.

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The impact of 'clean' possession continuity in elite hurling

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ABSTRACT

Introduction


Despite being one of the oldest field sports in the world, little research has been conducted on the demands of match play in hurling. Clear (2016), established that total shot count was a key indicator of success at elite level and examined the construct of possessions, finding that 86% of possessions consist of sequences less than two passes. While this is valuable information, the quality of the passing sequence was not considered, thus it is not known if superior technical skill contributes to success. In hurling, high levels of technical skill are demonstrated through 'clean' possessions, defined as when the team in possession retain complete control of the ball (sliotar) at all times. This study investigates if 'clean' continuity in possession impacts the outcome of possessions and indeed match outcomes.

Methods

4260 in-play possessions were coded from 28 games in the 2015 All-Ireland senior intercounty hurling championship using NAC Sport Scout Plus (Analysis Pro Ltd., Wales) software. "Clean" possessions were coded as defined above, all other possessions were coded as being "broken." Possessions resulting in a shot were deemed to be successful. An intra-operator study demonstrated strong reliability for the system (percentage errors <5%). The data were analysed using chi squared tests and odds ratios.

Results

Results indicate that clean continuity in possession is statistically associated with successful possession outcome ($\chi^2_{(1)} = 1477.06$, $p < .001$). The odds ratio of achieving a shot between a clean and broken possession is 25.8 (95% CI 21.8 to 30.8). While winning and losing teams have very similar amounts of broken possession, winning teams had significantly more clean possessions ($\chi^2_{(1)} = 8.908$, $p = .002$, $\phi_c = .047$, $p = .003$). 44 goals and 527 points were scored from clean possessions ($n = 1525$), compared to 29 goals and 160 points scored from broken possessions ($n = 2735$). Shot efficiency was not affected by the type of possession continuity.

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Discussion & Conclusion

This research establishes the role of 'clean' continuity in possession as a key indicator of success in hurling. It shows that teams demonstrating higher skill levels with clean sequences are likely to create more shots and ultimately win more games.

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Millfield School: Developing the next performance analyst?

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ABSTRACT

The panel at the latest ISPAS International Workshop in Ireland engaged the discussion on how we as Performance Analysts can support the development of Performance Analysis, how can we get the best people for the right job. It is not uncommon to only discover the profession of performance analysis while undertaking a module in a Sports degree, or even after graduating. How different would it be if people knew about the discipline before leaving school and choosing further education? How can we create better future Performance Analysts?

As the Performance Analyst at Millfield School, a leading sports school in the United Kingdom, I work alongside a number of the 27 sports offered. My role stretches from filming and producing match reports for the 1st XV Rugby team to creating technical analysis for year 9 tennis players along with streaming live a Hockey match.

Data and video analysis feedback has given our coaches more clarity in their individual and team coaching sessions helping them understand and improve technique, tactics and movement of their sport. Match footage alone is an excellent tool students use to evaluate their own and the team's performance. It is now a norm for the 1st team Rugby XV, Netball VII and the Girls Hockey VI to have access to footage of all home matches. They are also lucky enough to receive data analysis post match reflecting on the coaching cues from the week. It's now an integral part of the coaching and team development.

We can stick to just filming matches and producing data analysis, however if the students don't understand what they have been presented, they aren't using this resource to its fullest ability. Educating and applying the importance of Performance Analysis doesn't need to stop at the coaches. By taking it to the next level and involving the students more, it can open them up to many opportunities.

I have acknowledged this fantastic opportunity we have at Millfield and have begun working with a group of students who are keen to learn more of performance analysis and its full benefits.

The insight into Performance Analysis received while being part of the 1st XV rugby team or while



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participating in that performance analysis workshop will be valuable to those venturing out to become elite athletes, coaches or to pursue a career in sport. Imagine the benefits of having students starting out in sports degree already with a passion and drive for performance analysis.

On a final note, can we do more to encourage students to pursue a passion and interest in performance analysis? How can external performance analysts at institutes and clubs contribute to student's development at an early age? With Performance Analysis now being offered in the new BTEC Sports course, what does the future of Performance Analysis in schools hold?

Concordance between direct and indirect $\dot{V}O_{2\max}$ in U20 soccer players

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ABSTRACT


The aim of this study is to establish the concordance between direct and indirect measurements of $\dot{V}O_{2\max}$ in laboratory and field tests.

Methods

Fourteen National-level, under 20 years old soccer players participated in the study. The physical characteristic are (mean \pm sd): age 18.4 ± 1 yr and body mass, 72.4 ± 4.2 Kg and height, 180 ± 7 cm. Laboratory test was performed in treadmill, running to exhaustion. Player warmed-up on the treadmill for 10 min at $5.0 \text{ km}\cdot\text{h}^{-1}$. The test started at $7.0 \text{ km}\cdot\text{h}^{-1}$ with two degrees of gradient, followed by an increase of $1.0 \text{ km}\cdot\text{h}^{-1}$ every minute. This was followed by 3 min of active recovery at $5.0 \text{ km}\cdot\text{h}^{-1}$. The field test was performed a week later, with an initial warmed - up of 10 minutes, the Yo-Yo intermittent recovery 1 test (YYIR1), consist of $2 \times 20\text{m}$ shuttle runs at increasing speeds, interspersed with a 10-second period of active recovery. The test ended when the subject was unable to complete the distance on two consecutive occasions. This was followed by 3 min of active recovery. The measured maximum oxygen uptake ($\dot{V}O_{2\max}$), obtained in both field test as well as that obtained in the treadmill test, equipped with an ambulatory gas exchange measurement device (Cosmed K4b²) and maximum heart rate (HR_{\max}), was continuously monitored with a short rate telemetry HR monitor (Polar RS800CX).

Results

The HR_{\max} in treadmill was $188.6 \pm 6 \text{ b}\cdot\text{min}^{-1}$; HR_{\max} in YYIR1 test $188.8 \pm 5.8 \text{ b}\cdot\text{min}^{-1}$; estimated $\dot{V}O_{2\max}$ in treadmill $60.0 \pm 3.9 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$, direct $\dot{V}O_{2\max}$ in treadmill $55.5 \pm 4.2 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$, estimated $\dot{V}O_{2\max}$ in YYIR1 test $56.9 \pm 1.6 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$, direct $\dot{V}O_{2\max}$ in YYIR1 $54.9 \pm 6.6 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$. The Lin's concordance correlation coefficient between HR_{\max} achieved in treadmill and HR_{\max} in YYIR1=0.357; for direct $\dot{V}O_{2\max}$ in treadmill and direct $\dot{V}O_{2\max}$ in YYIR1=0.638; estimate $\dot{V}O_{2\max}$ in treadmill and estimated $\dot{V}O_{2\max}$ in

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YYIR1=0.142; estimated $\dot{V}O_{2max}$ and direct $\dot{V}O_{2max}$ in treadmill=0.229; estimated $\dot{V}O_{2max}$ in YYIR1 and direct $\dot{V}O_{2max}$ in YYIR1=0.283.

Discussion

The current study and the data reported by other authors (Castagna, 2006; Martinez-Laguna, 2014), showing a significant correlation between $\dot{V}O_{2max}$ in laboratory and field test, however the Pearson product-moment correlation coefficient measures the strength of a relation between two variables, not the agreement between them (Altman, 1983), unlike of the concordance correlation coefficient, which is used to evaluate the agreement between paired readings (Lin, 1989). The finding this study show a degree of concordance was below of 0.90 (poor strength of agreement).

Conclusions

The results suggest that there is no concordance between direct and indirect measurements of $\dot{V}O_{2max}$ and HR_{max} in treadmill and YYIR1 test. So it could be concluded that both, the treadmill protocol and YYIR1 test, are not good predictors of indirect $\dot{V}O_{2max}$ and HR_{max} achieved in those test, therefore can not be applied between them.

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A developmental study to investigate an individual rating system for elite Gaelic football

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ABSTRACT

Recent studies have begun to examine the match demands of elite Gaelic football, however these have generally investigated from a team perspective. This aim of this study was to develop a valid and reliable system for assessing individual performance in Gaelic football.

The individual performances of 31 players from one team were analysed over the course of 7 games, played in the senior Division 1 National Football League competition 2016, using SportsCode V8 software. Five categories were used to rate individual performances; score attempts, gaining possession in open play, use of possession in open play / in set piece, defensive actions, and on-pitch time for each player was noted. There were multiple sub-categories and outcomes within each category (Table 1). All variables were defined by an expert coaching panel and weighted according to the pitch area, score-line and time in the match when they occurred. The sum of positive and negative actions was divided by the time on pitch to calculate player ratings. System reliability was tested via an inter-operator comparison of the performance of 4 players showing a correlation of 0.981. After the competition, the 4 coaches of the team were asked to select their top 10 players ranking them 1 –10.



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Table 1. Categories and subcategories of variables used to rate individual performance in elite Gaelic Football.

Score Attempts	Gaining Possession	Using Possession	Using Set Piece	Defensive Actions
Goal	High ball challenge	Foot pass complete	45 scored	Free conceded
Point	Won clean	Foot pass turnover	45 unsuccessful	Free con. & scored
Wide	Lost clean	Hand pass complete	Free retained	Free won
Save/drop short	Won Break	Hand pass turnover	Free lost	Forced turnover
Hit post	Lost break	Opening pass	Throw in won	Block
Inside op score zone	Compete assist team	Assist to score	Throw in lost	Opponent scored
Shot under pressure	Compete lost	Ground kick	Side-line ball ret.	Pass intercepted
Score under pressure	Pick up loose ball	Carry at speed	Side-line ball lost	Pressure
Miss under pressure		Free conceded	Penalty scored	Pressure effective
Miss outside 45		Free won	Penalty unsuccessful	Pressure ineffective
Score outside 45		Blocked	Free scored	
Goal chance missed		Dispossessed	Free unsuccessful	
		Ball out of play	45 conceded	

The results of the coaches' ranking were similar to the system ranking. With the exception of one player, all of the system's top 10 ranked players were identified by the coaches as top performers, ranking in various positions. Two additional players were consistently in the coaches' top 10 rankings but ranked at 16 and 17 in the system. The team won 3 of the 7 games and there was a trend for these to coincide with a high collective team score.

This pilot study shows that individual performance in Gaelic Football can be reliably and objectively rated and that the ratings map well with the opinions of team coaches and match outcomes. An analysis of the roles of the two players ranked consistently higher by the coaches than the system offer an opportunity to modify and improve it. One of these players was a 'man-marker' whose negative role meant more limited opportunities for game involvement. Success in this role could be quantified by an analysis of his opponent's performance. Indeed the system could be used for the measurement of opposition performance to identify individual and collective strengths and weaknesses.

Designing curriculum development for Performance Analysis at postgraduate level


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ABSTRACT

The place to start with a postgraduate course of this nature is to consider what has to be included and then decide whether you have the staff to deliver the modules. Hughes and Bartlett (2008) discussed the interplay of motor learning, biomechanics and notational analysis as being the fundamentals of Performance Analysis, so it would seem logical to introduce these as the Core modules. The definition of these modules is 30 hours of class contact, usually over one semester - there are different definitions all over Europe, despite the Bologna agreement, but the important point here is to establish the relative amounts of the subjects. To enable the students to specialise in motor learning, biomechanics and notational analysis, a second advanced module is suggested as an option - these are mutually exclusive - but the students must do one of them?

So the final student choice could be an interesting one, and this where the programme designer can get quite creative in providing subject material. Different common options have been inserted, but Game Theory might be a brave proposal. Another option might be to have half modules to enable more topics.

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The analysis of official data for soccer World Cup 2002-2014

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ABSTRACT

Introduction


The sport science has been investigated the enhancement of performance in different ways. Especially, the performance analysis of sport has been improved and applied its knowledge into the field of sports. The academic approaches to analyse the performances that the artificial intelligent(AI) techniques were newly concerned in past years. Among the AI techniques, the Self-Organised Map(SOM) is a way to visualise data including the maintaining of variables' features (Kohonen & Somervuo, 2002; Choi & Ko, 2010; Sohn & Choi, 2013). However, the visualisation of the official soccer World Cups' data has not been investigated yet, even though the official data has been developed and expended widely. This study, thus, keened to investigate methods using the SOM for the visualisation of data.

Methods

the samples were totally 512 cases such as home & away team's data and 20 variables from 2002 to 2014 soccer World Cups were selected and gathered into Microsoft Excel 2010. And a R programme with SOM package was used to design the Sammon's mapping and Self-organizing map projection. Sammon's mapping techniques were designed as 3-dimensional structure and a size of the Self-organizing map was [10 10]. Also, the Bland & Altman plot was used to determine the function of prediction in the SOM that 75% of data was used for the training and 25% of data was used for the prediction.

Results

After the training of Self-organising map, the quantisation error was 3.906 and the topographic error was 1.248. Consequently, the results of the study were as following; Firstly, the Sammon's mapping technique was unable to descript the details of data hardly when the size of data was huge. Secondly, 3-dimensional Sammon's mapping technique was able to visualize data easily with x-y, x-z and y-z coordination graphs. Thirdly, using Self-organizing map brought an advantage of visualisation for data process using comprehensive neurons which could apply variables' characteristics into the results.

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Discussion & Conclusion

This study was to compare 2 methods of AI for the visualisation of the official soccer World Cups' data. Between the methods, the Sammon's mapping was usefully spotted data on the 3D graph, but it was hard to confirm a specific data on the chart if the amount of data was huge. On the other hand, the SOM method was efficiently used to visualise the data with the original features of variables, and it could also make clusters of the official data within the cluster analysis. Consequently, the official data is able to present the performances if the AI techniques were able to be used.

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Performance Analysis based on the ratio of overseas' players in Soccer World Cups

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ABSTRACT

Introduction

The squad of soccer team for participating the soccer World Cups would present their performance directly or indirectly during a match in the World Cups. Most national teams for the World Cups, therefore, were willing to organise the national team based on coaches' selection before the World Cup seasons. The individual performances, however, have been subjectively evaluated and reviewed in the practical field (Choi, 2008; Groom *et al.*, 2011). Thus, the squad of national teams in a case of an Asian teams, has often keened to call the national players who were playing in an overseas' league.

Methods

All official data from 2002 to 2010 World Cups was used for this study that the media channel's materials were collected and arranged in Microsoft Excel 2007. The profiles of players provided by the official websites of the World Cups were collected and arranged within percentile conversion within 25 % (Q1), 50 % (Q2), and 75% (Q3) among the number of overseas' player in a nation (called Po index). For the statistical comparisons, all data was categorised into Group A to D within the percentiles, then the one-way ANOVA was utilised to determine the data between groups.

Results

There are 4 results of this study. Firstly, there was a significant difference($P<.05$) in the 10 factors (number of passes, number of successful passes, number of short passes, number of successful short passes, successful rate of long passes and number of fouls) among 23 factors.

Secondly, a winning percentage by Group A was 30.2%, by Group B 34.0%, by Group C 37.1% and by Group D 37.5 % has been presented. Thirdly, Group A accounted for the largest proportion with 58.1 percent in the case of Africa, whereas Group C accounted for the largest proportion with 54.5 percent in the case of Asia-Oceania. In the case of Europe, Group D accounted for the largest proportion with 33 percent and Group B accounted for the largest proportion in the case of North America. In the case of South America, Group A, B and C accounted for the same proportion with 27 percent, respectively.



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Discussion & Conclusion

As the result of this study shown, there might be an advantage and a disadvantage of mixing players between domestic league players and overseas' league players in one team for the World Cups. However, the quality of soccer World Cups is able to intend to a level of performances for each team, whereas the combination of players in a squad would be a scale of individual evaluation. Further research is also required which of countries' league would have better individual performance rather than team performance within a condition that the level of team performance would be influenced by outcomes of matches in the World Cups.

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Establishing individual normative profiles in rugby

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ABSTRACT

Introduction


Understanding and quantifying the impact of performance indicators in Rugby Union is a valuable exercise which can produce more effective coaching techniques, enhance individual performance and subsequently can lead to winning matches. However, little research has been undertaken which statistically analyses the role of performance indicators in match outcome.

Methods/Results

This research assessed 30 performance indicators from an International Rugby Union team for the seasons 2014/2015 and 2015/2016. Using One-way ANOVA analysis, 12 (n = 12/30) indicators were found to be significantly different across match outcome. In particular, it was found when percentage Tackle Effectiveness, Post Tackle Pressure effectiveness and percentage tackle completion increased and then games were more likely to be won. Similarly for kicking, it was found that kicking accuracy, line kicking accuracy and goal kicking accuracy were all significantly higher in games that were won corroborating international research that kicking is an integral part of rugby. Using Logistic Regression analysis, an investigation into factors which predict game outcome was also undertaken. It was discovered that both tackle effectiveness and missed tackles could predict match outcome. For every percentage increase in tackle effectiveness, it was quantified that the odds of winning a match increased by a factor of 1.993 or 19.93%. Conversely, when the number of missed tackles increased, then the odds of winning a match were significantly reduced. The final area of interest in this study pertained to the impact of performance indicators at the individual player level.

Discussion & Conclusion

One-way ANOVA analysis was performed across the 12 indicators for each player position. It was found that similar to the overall game performance, indicators like tackle effectiveness were significantly associated with game outcome for numerous player positions. However, for the Number 10, as expected, effective kicking was found to be the dominant indicator at the position level. The results of this study provide a useful

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benchmark for future game plan design and offer a novel approach to post-game assessment and dissemination of both team and individual performance.

Evolution in a basketball team sub-15 from pedagogical variable, external load variable and organization variable

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ABSTRACT

Basketball is a tactical game, cooperation/ oposition with common space and simultaneous action on the ball.

During the training season, when the coach designs the training, he does not know the level of assimilation that the tasks or the whole workout will have. The main aim of this study is to determine both the evolution of the variables that affect the training and the connection between these and the training process, in order to optimize the results of these workouts. This work can be classified as an empirical study with observational descriptive quantitative methodology, with an independent variable and fifteen dependent variables of categorical and quantitative nature.

It has been carried out an assessment of pedagogical variables, external load variables and organizational variables. In order to do so, a process of analysis of 43 tests from the 2014/2015 season, which had a total of 388 workout was made.



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The use of performance analysis and feedback within the elite Olympic/Paralympic Sports Environment

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ABSTRACT

Introduction

Performance analysis is a vitally important tool within the coaching process by virtue of a coach's need to provide purposeful information to enhance performance. Unfortunately, research is often concerned with the 'what' of performance analysis through developing the method (e.g. KPIs, reliability) and as consequence, the 'how' or use of this information appears to have become a secondary, less important aspect. Specifically, research guides the reader through the data collection aspects of performance analysis, yet fails to offer insight into how the information is utilised or how feedback sessions are structured within practice. Aside from Wright et al. (2012; 2013; 2014) and Groom (2012) there is a dearth of information outside of football investigating the delivery of information within applied environments. Before we can begin to enhance feedback, we must outline the landscape and identify what is delivered, when is information fed back, how it is delivered and, why is practice implemented like it is. Therefore the aim of the study was twofold, to; 1) outline the current feedback landscape through an understanding of the what, how, when and why of practice and 2) explore the role and utilisation of the performance analyst.

Method

Twenty (Age; 29 ± 5) Performance Analysts (PAs) working within Olympic/Paralympic sport completed a questionnaire (lasting ~84 minutes) consisting of themes related to the; 1) use of competition/training video/data, 2) analysis process, and 3) feedback process. The questions incorporated both open/closed aspects and designed to enable context cross-comparison whilst offering flexibility for the participant to provide additional information behind their practice where appropriate.

Results

Participants undertake all types of analysis at varying consistency, however Pre/Post-competition is the focus. 'Coach mostly with PA input' was the primary method of deciding what aspects to analyse, however



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the Performance Director was a secondary decision maker. 'Coaches' Experience/Philosophy' and a lesser extent the 'PA's Experience' are the main influencing factors. Majority of participants (79 %) maintain consistency within specific areas of feedback but each may differ from one another. 42 % of participants review feedback annually whilst 42 % did when they learnt of new methods. Coaches appear to lead feedback sessions following coach/PA discussion, however PAs appeared to lead data heavy sessions. Current feedback session length was < 5 minutes but was often followed up with a 25-30 minute session. However, PAs favoured a shift towards 10-20 minute feedback sessions. 'Time' was the most frequent factor impinging on the PAs ability to feedback. Other significant barriers were the 'Receptiveness to PA/Feedback' and 'Concerns of Feeding Back Too Much'.

Discussion & Conclusion

The effectiveness of the coach/PA relationship within elite Olympic/Paralympic sport seems to depend on coach experience/philosophy. The time available for performance analysis feedback provision then dictates the duration and timing of the intervention. The knowledge identified and presented herein provides insight into what practice currently takes place within the performance analysis system, and as such, will aim to inform the wider strategy of performance analysis moving forward whilst offering practitioners the opportunity to learn processes individually and/or sport-to-sport. Whilst inter-team differences will and do inevitably exist, the move toward an optimal feedback situation seems to be approaching.

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Identifying position-specific performance indicators in professional rugby league

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ABSTRACT

Introduction

James, Mellalieu & Jones (2005) developed position specific PI's in professional rugby union. This has not been undertaken for rugby league where 13 players have different roles determined by their position. Hence, action variables and performance indicators (PI's) should reflect these different roles to provide more specific and meaningful information.

Methods

Rugby league data collected from the 2012, 2013 and 2014 Super League seasons (n=567 matches, 182 action variables) were extracted from Opta data sheets using visual basic and processed in Microsoft Excel (v2016, Microsoft Inc., Redmond, USA) coded by starting positions: full-back, wingers, centres, scrum half, stand-off, props, hooker, second rows and loose forward. Substitute were assumed to have taken the position of the player they replaced. Matches were categorised by result as an unbalanced win or loss (>12 points difference, an indication of team quality) whilst balanced games (≤ 12 points difference) were excluded. Effect sizes (Cohen's d) were calculated to determine PI's ($d > 0.19$ and > 0.49 and KPI's ($d > 0.8$) from the action variables for each positional group. Form charts (James, Mellalieu & Jones, 2005) were then created for each position calculated by totalling non-relative data for each action variable over the past 10 games and dividing by the total time played. This value was the used to calculate the percentile the player fitted into for each PI and KPI.

Results

49 PI's were identified across all positional groups, with some unique and shared variables across the groups. A form chart was produced for all positions (Figure 1).



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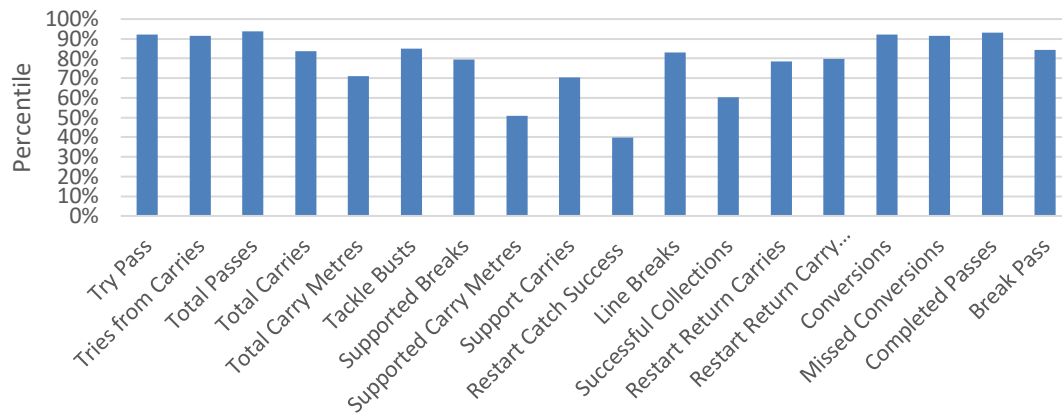


Figure 1: Example form chart for a full back

Discussion & Conclusion

A method for identifying performance indicators for each positional group was devised and used to display a performance profile using percentiles (against all other performers in the league) on form charts. This can be extended to create a team and player rating system.

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Analysis of the performance of transgender athletes

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ABSTRACT

Introduction


Despite the limited success of transgender female athletes, there is still great resistance to their presence in women's sport. Beyond the pioneering work of Louis Gooren (2) there has been little in the way of scientific study of transgender athletes until Joanna Harper (4) published her paper studying transgender distance runners in 2015. The Harper study included no data from elite athletes and the current study rectifies that limitation, as well as expanding the study beyond distance running.

Methods

Athletic performance data was acquired from one transgender sprinter, one rower, one cyclist, and three distance runners, both before and after gender-based transition. The race times from all of the runners were given an age-graded score using the WMA tables (3). The age-graded system is designed to account for both the 10-12% gender-based performance difference (1) and the decrease in performance due to aging beyond age thirty. Race times were verified using on-line race-results services such as All-athletics.com. Both the sprinter and the cyclist were former elite-level athletes in men's competition. It was not possible to use the age-graded methodology on the performances of the cyclist or the rower, but the raw data was used to make a comparative evaluation. All of the subjects had undergone at least one year of Hormone Replacement Therapy (HRT) prior to competing in the women's category.

Results

The age-graded scores of the runners collectively decreased after transition.

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Pre- transition data				Post-Transition Data				
Age	Distance	Time	AG	Age	Distance	Time	AG	
R1	27	100 meters	10.71	91.4	39	100 meters	12.54	86.6
R1	27	200 meters	21.65	89.2	39	200 meters	25.47	87.6
R2	28	half-marathon	1:16:45	77.2	33	half-marathon	1:35:21	69.3
R3	26	5 kilometers	17:08	71.8	29	5 kilometers	23:09	63.9
R4	17	10 kilometers	36:40	76.7	35	marathon	2:58:18	77.1

The cyclist had an 8 minute power meter test performed by CTS in 2011 prior to transition and in 2016 after HRT. In 2011 she had a lactate threshold of 304 watts and in 2016 her lactate threshold is 270 watts. This 11% difference is consistent with the difference between elite male and female cyclists.

The rower's times for two kilometers on the ergometer before and after 18 months of HRT were 7:01 and 7:25 respectively. The rower was 6% slower at an age when she should have been getting faster.

Discussion and Conclusions

The above data can be explained by the fact that, after one year of HRT, transgender women have testosterone levels below the mean of cisgender women (2) and hemoglobin levels equal to that of cisgender women (2).

The data presented offer further support for the recent IOC decision (5) to allow transgender women to compete against cisgender women in the 2016 Olympics after one year of HRT, as well as solidifying the conclusions made in the Harper study (4).

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Squat jump and jumping push-up performance of trained swimmers immediately before and after resistance exercise

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ABSTRACT

Introduction

When an action induces acute fatigue, it may be followed by a period of potentiated force production capability, termed as Postactivation Potentiation (Seitz, 2015). The aim of the study was to measure the effect on swimming performance of muscular contractions 5-20 minutes prior to the trials and to determine the possible causes of performance enhancement.

Methods

15 Elite Canadian swimmers volunteered to participate in this study. A repeated measures counterbalanced design was used in which swimmers performed 4 different activation protocols in 4 different sessions. Muscle performance was evaluated in each participant performing 3 maximal effort squat jumps, alternated with 3 maximal jumping push-ups. Both assessed from one ground reaction force plate. One bout of loaded conditioning exercise (CE) on the target muscles was randomly applied on the subjects after the basic muscle activation protocol (BME). Four repetitions of loaded back squat were applied when leg muscles were the target (CE-L). Four repetitions of loaded bench-press were applied when upper body muscles were the target group (CE-U). Loaded repetitions of back squat and bench press were combined applied when both limbs were the target (CE-BL). After CE, muscle performance was assessed again at 5, 8, 12 and 20 minutes, regardless the CE applied. One test condition without any CE was also given and acted as a control.

Results

Impulse in lower limbs was higher in the protocol CE-L (5min: 181.54 N·s; 8 min: 181.78 N·s), in comparison with pretest conditions (Pre: 175.18 N·s; $P = 0.05$). Impulse was also higher in CE-BL but it was achieved only after 8min of rest (181.16 N·s; $p = 0.05$) When comparisons with BME were made, the impulse in upper limbs was higher only in CE-U (50.58 N·s; $p = 0.05$), and this value was obtained at 8 minutes after load.

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Discussion & Conclusion

Improvements obtained in both limbs are in agreement with the physiological explanation of PAP. Changes happened in limbs after specific load application, but no influences were found when load applied in such limb was assessed in the other. Surprisingly, impulse was even higher at minute 8, and such effect achieved, could be related to a difference in involvement of motor units. Thus, although an improvement in performance is obtained after load application, PAP could not be considered only as an acute local effect generated by the myosin phosphorylation. This fact could suggest that some neural factors of the speed-strength behavior could be behind of the performance improvement of the system.

Acknowledgements

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Influence of the plyometric training in the performance of the handball elite players

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ABSTRACT

Introduction

The main focus of this study is to investigate how plyometric training can affect in jump capacity and strength production in “10” professional handball players.

Methods

A control Group (n=10) and an Experimental Group (n=10). In addition to regular sessions, Experimental Group had 2 plyometric sessions a week during 4 weeks. To analyze the results of this training method, all the athletes made a Pre-Test one week before of the plyometric training and a Post-Test afterwards. We used two types of jump: Squat Jump and Countermovement Jump on a contact platform.

Results

The Experimental Group has significantly improved after training, in height jump, 6'66% in SJ and 14'28% in CMJ, and in the Peak Power, 2'34% and 6'29% respectively. The Control Group didn't improve significantly.

Discussion & Conclusion

We can conclude that 2 plyometric sessions/week during 4 weeks improve jump capacity of professional handball players.

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Effect of the size of the wheel in performance in mountain bike

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ABSTRACT

Introduction

There exist few investigations that they allow to affirm if the performance in MTB XCO depends on the size of the diameter of wheel and if it has relation with the height of the subject and the difficulty of the area, it is for it that this one will be the aim of the study.

Methods

We fulfil six test maximums of twenty minutes in two circuits one with raise and another plain, so that a test is realized by every wheel in each of the circuits.

Results

The obtained results show significant differences in the percentage of watts developed during the test between 26 and 29 in a circuit of raise whereas for a flat circuit it is major you differ between 27,5 and 29. Finally a better performance is obtained by the diameter of 29 inches in a circuit by difference, though without big differences with regard to 26.

Discussion & Conclusion

Therefore, the performance with the different sizes of wheel is similar but one sees influenced depending on the difference and the technical difficulty of the circuit and not for the height of the subject.

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Pacing strategy and competitive performance of elite female 400-m freestyle swimmers

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ABSTRACT

Introduction

Pacing strategy in endurance events has a substantial impact on performance. Here we characterize pacing and identify its parameters for optimal performance in 400-m swimming.

Methods

Swimrankings.net and other websites provided 50-m split and final race times for 381 swims of 20 elite female swimmers in over 150 national and international competitions between 2004 and 2016. Plots of lap time vs lap number indicated that each pacing profile could be characterized by five parameters derived from a general linear model: linear (slope) and quadratic (curvature) coefficients for the effect of lap number to characterize the overall trend; coefficients representing deviations from the trend in the first and last (eighth) laps; and the standard error of the estimate, summarizing lap-to-lap variability and other deviations from the trend. Analyses of log-transformed lap time provided values of parameters for each swim in percent units. Race time was then plotted against each parameter for each swimmer's best swim to characterize the associated pacing profiles. In separate plots for all the swims of each swimmer, a quadratic was fitted to help identify the value of the parameter associated with the swimmer's optimum performance and to determine the deviation of the swimmer's mean time from her optimum.

Results

In the analysis of the best swims of each swimmer, the pacing profiles all displayed negative quadratic curvature, with the fifth lap being the median slowest. The first and last laps were faster than predicted by the quadratic by 5.6 ± 1.1 % and 1.6 ± 1.1 % respectively (mean \pm SD), and the lap-to-lap variability was 0.6 ± 0.3 %. The best swimmer (Kathleen Ledecy) had the most curvature, the slowest first lap and the lowest lap-to-lap variability. There were otherwise no clear associations between ability of the swimmers and the pacing parameters. Relationships between parameters and race time in the scatterplots of each swimmer's swims were also generally unclear, suggesting that swimmers usually compensated for changes in one parameter with changes in another. However, some plots showed a U shape or linear trend that allowed



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tentative identification of optimum values of the pacing parameters. In these plots it was apparent that nearly half of the swimmers could make moderate (~1%) improvements by changing the curvature of their pacing profile. Small-moderate improvements (~0.7%) might also be possible for one third of swimmers by changing time in the first and last laps by ~1.0%. Only two swimmers could make a substantial improvement by reducing their lap-to-lap variability.

Discussion & Conclusion

Our study indicates that even pacing is not the best strategy for female elite 400-m swimmers, and that a minority of these swimmers might obtain small-moderate improvements by modifying their pacing profiles. Our studies of 800-m and 1500-m swimmers produced similar findings. The method for identifying possible improvements might be appropriate to assess pacing in other sports with multiple laps, frequent competitions and relatively constant environmental conditions.

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Functional eccentric fitness exercises and muscle architecture: Preliminary study

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ABSTRACT

Introduction

Functional exercises eccentrics have entered the world of fitness and performance. The architectural characteristics of the muscles affect their function and are influenced by the mechanical stimuli and injuries. The mechanical stimuli of eccentric nature modify the muscle architecture of the BFIh, increasing the muscle fascicle length. This evidence has an impact on the prevention of hamstring injuries, since the latter decrease the muscle fascicle length, thus increasing the risk of recurrence. However, these results were always obtained using isokinetic equipment, which is not readily accessible to athletes. The changes in the architecture of the Biceps Femoris long head (BFIh) induced by an eccentric strength training protocol with Nordic Hamstring exercise (NHE) have never been studied.

Methods

Our purpose was to determine the architectural adaptations of the BFIh after an eccentric strength training with NHE, followed by a subsequent detraining period. The participants in this intervention (n = 12) completed a period of 9 weeks consisting of a first week of control and prior training, followed by 8 weeks of eccentric strength training with NHE. The architectural characteristics of the BFIh were evaluated at rest using two-dimensional ultrasound before (pretest - day 0) and after (posttest - day 56) the eccentric strength training.

Results

After concluding the 56-day eccentric strength training period, the muscle fascicle length significantly increased ($t = -7.73$, $P < .001$), as well as the muscle thickness ($t = -5.23$, $P < .001$), while the pennation angle presented a significant decrease ($t = 7.81$, $P < .001$).



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Discussion & Conclusion

The results provide evidence that eccentric strength training with NHE may cause alterations in the architectural conditions of the BFlh which. The adaptations produced by NHE may have practical implications for injury prevention and rehabilitation programs which include the changes in muscle architecture variables. This preliminary study is aimed at examining for the first time whether the eccentric NHE produce changes in the muscle architecture of the BFlh. The reason for choosing NHE is their simplicity and easy reproducibility, thus they can be easily applied to any athlete individually or collectively in prevention or rehabilitation programs, without additional equipment.

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High-Intensity Interval Training (H.I.I.T.) and adolescents: Changes $\dot{V}O_{2\max}$ and body composition

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ABSTRACT

Introduction

Scientific evidence indicates that physical activity is the main agent for combating cardiovascular diseases, which are directly related to physical inactivity. Early development of cardiometabolic risk factors in youth have been associated with increased risk of premature mortality (Andersen et al., 2004), Insufficient physical activity, overweight and obesity, poor diet, low cardiorespiratory fitness, hypertension, chronic inflammation and dyslipidaemia are evident in youth and can track into adulthood (Artero et al., 2013). Adolescence, in particular, is a key stage in the development of health behaviours. Given the rising burden of chronic disease, it is essential to implement strategies to improve the cardiometabolic health in youth. In spite of the well-established health benefits of physical activity, the majority of youth are not meeting current activity recommendations (Ekelund et al., 2011). Cardiorespiratory fitness of Spanish adolescents is lower than the average of the European Union (Ortega et al., 2005). Also, identify the HIIT (High Intensity Interval Training) as a suitable method for improving aerobic endurance and morphological component of that population (Logan et al., 2014). The purpose of this study was to analyze the effects of HIIT on aerobic capacity and body composition on a group of adolescents aged between 15 and 16 years.

Methods

A sample of 26 students divided into two groups of 4th year of secondary education was assigned randomly (by groups of class) for the control (CG) and experimental groups (EG). During warm-up phase of physical education sessions EG subjects performed HIIT training, while the CG continued with standard warm-up. The participants in this intervention completed a period of 9 weeks consisting of a first week of control and prior training, followed by 8 weeks of HIIT (based in 8 functional exercises whit a TABATA protocol). The

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aerobic capacity and body composition were evaluated using a Course Navette test and electrical bioimpedance TANITA BC-601 before (pretest - day 0) and after (posttest - day 63) the HIIT training.

Results

The results show that subjects in the experimental group increased very significantly their VO₂max and reduced their fat % ($p < 0.01$) and body weight ($p < 0.05$). The subjects in the control group only showed significant improvements in VO₂max ($p < 0.01$).

Discussion & Conclusion

The present study shows that HIIT is a suitable alternative for improving aerobic capacity of adolescents and their anthropometric characteristics. HIIT is a method of effective and economical training: it is short, attractive for participants and is easy to use in physical education sessions.

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Shot types played by the World No. 1 squash player progressing through 4 matches to the final of the British Grand Prix 2011

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ABSTRACT

Introduction

Murray and Hughes (2001) presented tactical performance profiles (rally ending shots, shot distributions and shot types) based on 5 elite matches involving upcoming opponents. Verbal feedback on the efficacy of these was positive from players and coaches. The value of this type of information is primarily based on the assumption that there is some likelihood that these patterns are representative of the player being presented. To maximise the efficacy of these profiles we should therefore consider whether an individual's profile changes when playing against different opponents, evolves throughout a match or differs in winning and losing matches. This study therefore analysed the World's No. 1 player to assess whether his shot types changed within and between matches.

Methods

All shots, excluding serve and return of serve, by the World No. 1 male player from 4 matches at the British Grand Prix Tournament in 2011 were compared using Chi-Square tests. Opponent's World rankings progressively improved through the tournament (54, 24, 4, and 2).

Results

The distribution of shot types remained fairly consistent within matches (no significant differences) but varied between matches.



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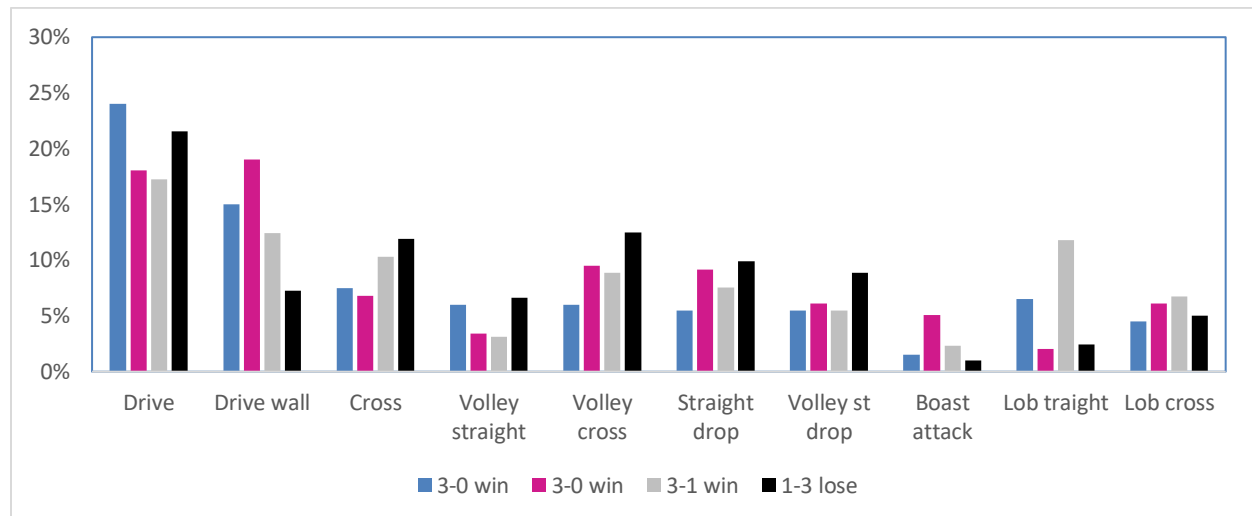


Figure 1. Percentage of shots played (if over 5% in at least one match) in match order


Discussion and Conclusion

Shot types varied between matches which was likely to be due to differences in opponent quality and tactical preferences. In this small study match outcome would also have affected the shots played. Larger studies involving more parameters e.g. shot locations and time available are required to better understand player tactical profiles.

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Relationships between 200m sprint and repeated sprint parameters of young soccer players

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ABSTRACT

Introduction

Many different tests have been developed for the evaluation of the anaerobic capacity. Some of them were based on metabolic and biochemical criteria whereas others were based on the evaluation of performance in specific tests (Paradisis, 2005). In this study, we aimed to identify relationship between two different anaerobic running tests. The purpose of this study was to investigate the relationship between 200m sprint and repeated sprint parameters.

Methods

Nineteen healthy young male soccer players (Age: 16.55 ± 2.7 years, height: 169.0 ± 6.1 cm, body weight: 62.24 ± 3.4 kg,) voluntarily participated in this study. In the study, 19 subjects performed 200-meter sprint and 40 meter repeated sprint tests. The mean time, best time and decrement time of repeated sprint test and the total time of 200-meter sprint test were evaluated. To compare the relation ship between 200-meter sprint time and the repeated print parameters Pearson Correlation Coefficients were applied. Significant level were $p < 0.05$.

Results

According to result of the study, there was a significant correlation between best sprint time of repeated sprint test and 200 m sprint test ($r = 0.5056$, $p < 0.05$). However, there was no significant correlation between mean sprint time of repeated sprint test and 200 m sprint test ($r = 0.3340$, $p < 0.05$). Moreover, there was no significant correlation between decrement time of repeated sprint test and 200 m sprint test ($r = -0.3985$, $p < 0.05$).

Discussion & Conclusion

As a results, 200 m anaerobic running performance is correlated with repeated sprint best time results (40m x 6). Therefore, in order to improve anaerobic running speed for soccer player, 40m x 6 repeated sprint training which represent soccer specific movement could be preferred because 40 meter sprint test includes turning in each 20 meter and acceleration and deceleration.



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Analytical study of the corners of the body during various repel some balls for goalkeepers handball “as a basis for the development of quality exercises”

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ABSTRACT

The research aims to identify the corners of the body while blocking some balls diverse Goalkeepers Handball "as a basis for the development of exercises the quality of the research methodology the researcher used the experimental method so as to suitability for the application of research and procedures, using the experimental design with pre and post test to two groups, one experimental and the other officer was selected sample of the research method intentional thundering of players from the Premier Club for Petroleum Refinery Company, and the strength of the research community (4) players from goalkeepers researcher used the tools and equipment.

A computer for analysis of motor program K13D balance of medical standards - to measure body weight, body Stammer balls, medical.

The most important results to find the best angle to the body while blocking some balls high and low, which is difficult for handball goalkeepers to deal with such balls with the development of appropriate training for such angles.



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Functional training is effective in improving archery sport performance

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ABSTRACT


Introduction

Archery is a sport that requires finesse and medium intensity muscular effort (Dal Monte, 1983). It is characterized by closed skill activities, i.e. movements already known and automated repeated many times as precise as possible (Tursi & Napolitano, 2014).

It is well accepted that the use of elastic bands, along with bodyweight exercises, in archery training may play an important role in improving the shooting technique (Kisik Lee & Robert De Bondt, 2005) because it allow to simulate the shooting action without bow and arrow. Indeed, Monzoni et al. (2015) recently demonstrated that athletes' performance and technique improved significantly more after a training program aimed at improving strength (using elastic bands and calisthenics) and balance (exercises performed using instable supports such as the BOSU[®]), compared to callisthenic training alone. Those results, however, were not obtained during official competitions. Therefore, the aim of this investigation was to compare, in high level archers, the effects of three different training programs on the performance during official archery competitions.

Methods

24 male athletes (age 22.8 ± 2.1 ; BMI 23.7 ± 2.1) with a minimum of 4 years of archery experience were recruited. Participants were assigned to one experimental group (EG) and to two control groups (CG1; CG2) with a balanced random order. The performance (i.e. total score of the participant) of each group was recorded during official competitions that took place just before and after the 6-month training intervention. All groups underwent a specific technical training program (3 sessions per week, 90 minutes per session). In addition, the CG1 engaged in a resistance training program based on weight machines only (3 sessions per week, 90 minutes per session), whereas the EG performed a specific training program (3 sessions per week, 90 minutes per session) using elastic bands, calisthenics and the BOSU ball, with the aim of simulating the shooting technique.

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In order to exclude the possible bias due to the differences of athletes' performance levels, the pre-training score differences among the groups were evaluated using the Kruskal-Wallis test. Thereafter, the delta scores (D) were calculated (i.e. the difference between post- and pre-training scores) for the three groups and analyzed using the Kruskal-Wallis test, followed by the U Mann-Whitney test for pairwise comparisons with the Bonferroni correction. An α level of 0.05 was considered statistically significant.

Results

No statistical differences were found among the pre-training scores of the three groups, whereas the Ds resulted significantly different ($p < 0.05$). The D of EG increased significantly more ($2.86 \pm 1.05\%$) than the D of CG1 ($1.04 \pm 1.49\%$) and CG2 ($0.15 \pm 1.22\%$), whereas no significant difference ($p > 0.05$) was found between the CGs.

Discussion & Conclusion

The results highlight that the use of unstable supports and elastic bands as tools to simulate the shooting technique within an additional specific archery training program is effective in improving athletes' performances during official competitions compared to both a specific technical training program alone and a non-specific additional resistance training. Therefore unstable strength exercise simulating the shooting technique should be part of any archery training program.

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2015 Badminton World Championship: Men vs. women behaviours

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ABSTRACT

Introduction

Observational methodology allows to analyse specific skills or behaviours in sports. The identification of the opponent's motor patterns provides an advantage in terms of reaction time, that lets the player obtain game control (Losada, Casal, & Ardá, 2015).

The main aim of this study was to assess differences between genders at 2015 Badminton World Championship.


Methods

Men and women single final matches were assessed (150 points and 967 actions) and compared in order to identify differences between them. Time and shot variables based on the study carried out by Abián, Castanedo, Feng, Sampedro, & Abián-Vicén (2014) were analysed, as well as players trajectories during the match. Variables were investigated post-event from Badminton World Federation official videos.

The main contribution of this study is classification and quantification lunges trajectories supported by 12 imaginary zones in the half-court side of the camera. These movements were classified as linear (net perpendicular movements), transverse (net parallel movements) or diagonal (movements that are neither linear nor transverse). Furthermore, laterality (right and left), direction (forward or backward) and distance (short or large) were taken into account.

Results

Results obtained hold that mean of the "rally time played" is 10.033s for women and 12.061s for men with a "total time played" (when shuttle is in play) of 772.564s and 880.473s, for women and men respectively. "Rest time" between points is 36.591s and 163.320s between sets for women, meanwhile 45.550s and 152.424s between points and sets for men, higher than allows the rules (Badminton World Federation, 2015). The "total

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number of points played" were 77 for women and 73 for men. The most executed shot (indifferently successful or not) is "net" (approximately 30%) but the most decisive one (shot that lets players win points directly) is "smash" for both genders with more than 35% of effectivity. The "shot frequency" ("number of shots" divided by "real time played") was 0.538 for women and 0.535 for men.

Regarding court movements, the most realized trajectory is "left long backward diagonal" (10% for women and men). The most successful one is "left short backward diagonal" (19.44% women and 16.22% men). Conversely, less successful patterns were: "net shot" and "static movement" (hit shuttle without change zone) together. Classifying movements in 3 groups (linear, perpendicular or diagonal), the most effective trajectory was "diagonal" (more than 55% for both genders).

Discussion & Conclusion

Work time variables were similar to Abián-Vicén, Castanedo, Abián & Sampedro (2013) findings but "rest time" shows twice for men and even more for women. We also found that more than 30% of points ends in "net shot" in contrast to Abián-Vicén et al. (2013) that shows less than 20% of "net" and approximately 30% of "smash". In terms of court movements, we could not find scientific articles with which compare our results.

In the training field, these findings may be used by coaches in order to improve athletes' performance. In research field, it could be a new way to achieve information that previously had not been taken into account and could be replicated.

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The Effect of Six-Weeks Programmed Relative Strength Training on Wrestling Athletes

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ABSTRACT

Introduction

Wrestling athletes are supposed to have basic biomotor abilities including strength/power, speed and endurance, both for cardiovascular endurance and muscular endurance (Bompa, 2009). The quality of these three components must be treated through proper training programs with strict coach monitoring, includes conditioning, specific technical training, and psychological preparation (Kent, 1994).

The study covers the athletes' initial conditions before a training program and changes on the relative strength qualities after 6 weeks. In general, this study will determine the effect of the exercises given by the coach and the extent to which adaptation is generated. This will be conducted using statistical analysis methods of data comparison, before and after six weeks training program.

Methods

The design of this study is One Group Pretest-Posttest Design (Suryabrata S, 2003:105). Operational data collection is described as the following diagram:

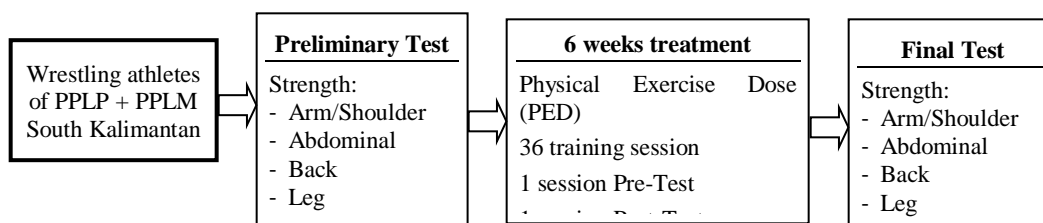



Figure 1. Operational design of One Group Pretest-Posttest.

This study involved 11 of 14 wrestling athletes of PPLP & PPLM South Kalimantan. Subjects' criteria are: male, psychologically and physically healthy, under the development program of PPLP & PPLM South Kalimantan Year 2014. Pre-test was held before the 6 weeks (36 sessions) of physical training.

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Results

After following the program, all athletes increase their relative strength (0,49-1,37) as well as decrease their body mass index (0,6-1,3). There is a positive development of hand strength, abdominal strength, back strength, leg strength, relative strength from 8,31 to 17,95 %. The lowest and the highest development are on the leg strength and abdominal strength respectively. For all variables, the result of paired correlation test almost reach one. That value means that the six week training with 36 session of practices produce very significant improvements on wrestling athletes' strengths.

Discussion & Conclusion


Based on the research result and analysis, it can be stated that there is a very significant improvement on wrestling athletes' relative strength after following the six-weeks training program. The enhancement is followed by the decrement of the weight and the body mass index of wrestling athletes.

This study can be used to evaluate a training program, and athletes individual introspection. Future study on the significance of applying this training program on boxer, lifter, martial artist and other athletes who depend on strength are possibly to be conducted.

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Performance indicators as a resource for the selection of talented football players

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ABSTRACT

Introduction

Talent is understood as the exceptional mastery of at least one particular, systematically developed skill, situating this person among the top 10% of their peers (Gagne, 2015). Within the scope of soccer, the intuition of the expert (coach, scout) has traditionally been the primary method of performance assessment (Hatun, 2012) due to the lack of appropriate and validated instruments for this purpose (Nicolairé, Catuzzo & De Mello Monteiro, 2013). However, this contrasts with the importance of this process (Fernández-Río & Méndez-Giménez 2014) for both football clubs (obtaining sporting talents future) and for families (rise in the social scale). In order to approach an evaluation of objective performance, one of the ways through which the selection of football talent has been carried out has been the comparison between players (Verburch, Scherder, Van Lange & Oosterlaan, 2014) based mainly on performance indicators (Liu, Gomez & Lago-Peñas, 2015).

This work has had two aims, first of all, to compare the performance of the players nominated for the Golden Ball, and secondly, to compare the performance of a talented football player with his teammates.

Methods

The sample consisted of a total of 103 soccer players (47.6% 0 times nominated for the Golden Ball, 23.3% nominated 1 time, 13.6% nominated 2 times; 8.7% nominated 3 times, 2.9% nominated 4 times, and 3.9% nominated 5 times for the Golden Ball). The information has been obtained from the data base WhoScored, and the competition which has been analyzed has been the 2014-15 Champions League, because it is the club competition with most international prestige in Europe. Statistical analysis was performed using the SPSS program v. 22.0. The statistical average has been used for descriptive analysis and the Pearson bivariate correlation for inferential analysis.



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Results

The comparison between players nominated gold ball pointed out that those players nominated more times scored higher in games, played more minutes and had more influence on his team (number of wins with the player on the field) and goals / shots. However, indicators such as dribbling, successful aerial duels won, penalties scored marked, successful tackles and short / long passes were similar. Regarding the comparison between a talented player and his teammates (not nominated for the Golden Ball), performance indicators such as games and minutes played, goals / shots, dribbling and penalty were those which showed greater differences. Finally, the correlational analysis showed that as the number of goals, shots, dribbles, thrown penalties and passes increased, the chance of being nominated for the Golden Ball also increased.

Discussion & Conclusion

The results warn that the exclusive use of performance indicators as a single method of selection of players must be supplemented by other qualitative tools (González-Villora, Serra-Olivares, Pastor-Vicedo & Teoldo da Costa, 2015) to measure the tactical soccer player aspect. Therefore, it might be possible to question the conclusions of previous studies, according to the statement made by Mackenzie & Cushion (2013) in relation to the influence of external factors that can skew the proper selection of the player.

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Muscular activation in elite dancers of sportdance according to the genre

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ABSTRACT

Introduction

DanceSport is the competitive form of Ballroom dance, it is the combination of art, sport and sports performance. This sport is composed of three forms: Latin, Standard and Ten Dances (WDSF, 2012). As Kruusamäe et al. (2015) indicate, these sportsmen and women acquire certain positions, causing permanent anatomical changes. Physiological adjustments result from the realized training, to anticipate injuries. In DanceSport, a high degree of incident exists in injuries, being observed in some reports that the professional dancers have a risk of injury of a 90% during their career, being a 75% more harmful in the lower extremities (Zagorc et al., 2010).

Methods

The muscles measured in the study in both genres were: Rectus Femoris (RE), Biceps Femoris (BF), Tibialis Anterior (TA) and Gastrocnemius Medialis (GE). The sample consisted of 8 couples of dancers (20.50 ± 2.75 years) and category A. The measurements were carried out in two sessions, with a difference of 24 h. In the first session we measured the Maximum Isometric Voluntary Contraction (MCVI) and realized the familiarization with the choreography. In the second session we measured the muscular activation according to the rhythm. The measurements were carried out by means of electromyography of surface (EMGs). All the EMGs measurements were gathered with the program Megawin 3.1, they were transferred to an extension file ASC, to analyze them with Matlab R2013. And analyzed by means of the program SPSS Statistics v. 22.0.

Results

The obtained percentages of activation were the following: GE with a 59.88%, followed by BF with a 15.14%, TA with a 13.49% and lastly, RF with a 12.68%. The gastrocnemius was the muscle with the higher activation, this could be due to the use of heel shoes. In women it would act in a lesser extent since they should compensate the high inclination established with the RF, but men don't use heel shoes so high, therefore there



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is a higher activation in GE in men. After having studied in depth the MCVI between genres and the averages of the analyzed muscles, we have concluded that women would activate the TA (-.589* man) in major measurement, while the muscle of major activation in the man would be the GE (.617*).


Discussion & Conclusion

As Zagorc et al. (2010) points out, this would have relation with the employment of the stiletto heel, since the ballerinas use a much higher heel and must compensate with the TA to have the anticipated weight, with the aim better executing the skill. Balance exists between agonist and antagonist, as it is observed in the correlation between the MCVI of RF and BF (.768 **). We can conclude that activation of these muscles is different depending on the genre. For it the training must be adapted for every gender.

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The use of timeouts in volleyball, depending on the team score

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ABSTRACT

Introduction

In the management of team sport competition, timeouts are one of the main tools of the coach to stop the game. It could be used on changing trends or the rhythm of the game, and also on providing relevant information to the players. So, it may have an important effect in sporting success (Permutt, 2010; Zetou, Kourtesis, Giazitzi, & Michalopoulou, 2008). The main objective of this research was to analyse the use of timeouts (TO) in U-19 male volleyball teams, depending on the score (winning, balanced or losing).

Methods

171 timeouts, requested by coaches of the 21 teams participating in the U-19 male Spanish Championship 2012, were analysed. The variables considered in this study were variables related to the use of the TO: match score (TO request when winning, in a balance score or when losing), score difference (0-1 points, 2-3 points, 4 or more points), lost rallies (0-1 rallies, 2 rallies $y \geq 3$ rallies), game period (initial moment of the set and final moment of the set); and variables related to performance after the TO: timeout effect (positive timeout effect and with no effect).

Results

The results showed that the variables significantly associated with the TO request with different score (winning, balanced, losing) were: score difference ($\chi^2=12.456$; Cramer's $V= .270$; $p<0.05$), game period ($\chi^2=7.640$; Cramer's $V =.211$; $p<0.05$) and timeout effect ($\chi^2=26.834$; Cramer's $V =.396$; $p<0.01$). Specifically, contributed positively to the association: TO request with winning or balanced score and the score difference of 0-1 points, the final moments of the set and the positive timeout effect; the TO request with a losing score and the score difference of 4 or more points, the initial moments of the set and no effect of the timeout.



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Discussion & Conclusion

These results show that teams use the timeouts in both winning and losing score. Thus, teams in a winning or balanced score often request timeout when the opposite team is close on the score, waiting and using that resource in the final moments of the set, and obtaining a positive timeout effect. By contrast, teams in a losing score use the timeouts when the opposite team starts to distance on the score (with 4 points or more). It is frequently used in the initial moments of the set, no getting an immediate effect on the game after the request. Therefore, we suggest the use of timeouts as a useful resource to stop the game, to correct errors, guiding players in the game and preventing the opposite team to catch up or to obtain distance in the score.


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How does it affect the setter intervention to the block participation in high level male volleyball?

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ABSTRACT

Introduction

The match analysis has had a very important role in the performance improvement in different sports (O'Donoghue & Holmes, 2015). Research on match analysis, despite of its amount (Valladares, García-Tormo & Joao, 2016), requires to follow deep in over different technical and tactical variables that affect performance (João, Leite, Mesquita & Sampaio, 2010). An important game action in volleyball is the set. This action is realized by a specialized player, the setter. This player is responsible of the offensive organization of the team, deciding, among other aspects, the area's set, and the tempo of the set (Palao & Manzanares, 2013). One of the main purposes of the setter is to leave the attacker in the best conditions to attack, taking into account to the opponent team. That is, to live the attacker in front of the minor number of blockers (Moreno, Moreno, Iglesias, Ureña & Del Villar, 2008). Thus, the aim of the study was to determine how different variables of the set affect to the block participation in high level male volleyball.

Methods

Sample

The study sample was comprised of 2742 game actions, corresponding to the observation of the 23 matches of the third phase in the Men's World Championship 2010.

Variables

The dependent variable was the block participation: (zero or one blockers, two blockers, three blockers). The independent variables were: area's set (zone one, zone two, zone three, zone four, zone six), and the tempo of set (first tempo, second tempo, third tempo). The statistical analysis was a multinomial logistic regression.

Results

The results showed that, both the area's set, and the tempo of set, were predictors of the block participation. Specifically, when the set was done to zone six (OR=.346, $p<.001$), instead of to zone four, decreased the frequency of two blockers in the block, instead of blocks formed by one or without blockers. When the set



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was done to zone one (OR=.351, $p=.006$) or zone two (OR=.193, $p<.001$), instead of to zone four, decreased the frequency of the blocks formed by three blockers, instead of blocks formed by one or without blockers. In the case of the tempo of set, sets done in first tempo (OR=.129, $p<.001$ y OR=.13, $p<.001$, respectively) and second tempo (OR=.362, $p<.001$ y OR=.027, $p<.001$, respectively), instead of 3rd tempo, decreased the frequency blocks formed by two or three blockers, instead of blocks formed by one or without blockers.

Conclusion

Therefore, certain set variables (area's set and tempo of set) may affect to the block participation, and this could be considered in the training process in volleyball.

Acknowledgements

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Analysis of surface swimming technique among elite sprinter finswimmers

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ABSTRACT

Introduction

Finswimming is a sport where the athlete uses one big monofin to produce the propulsion. The purpose of this study was to describe the parameters of swimming technique among elite class finswimmers.

Methods

18 elite level monofin swimmers, 10 male (age 25.3 ± 5.2 height 182.3 ± 10.9 cm., weight 88.1 ± 4.6 kg) and 8 female finswimmers (age 24.5 ± 3.7 yrs., height 171.1 ± 10.4 cm., weight 63.9 ± 5.1 kg) performed a 15 meter monofin surface swim at full speed. Swimming was video recorded with a stationary GoPro Silver 3+ underwater video camera at 60 frames/second. Recording were conducted during the 2015 and 2016 Finswimming World Championships in Yantai, China and Volos, Greece. Collected video material was analysed with Race analyser program (Estonia).

Results

The average speed of male swimmers was 3.07 ± 0.21 m/s and the kick rate 130.9 ± 15.28 kick/min. Pitching of the hands was 18 ± 3.86 cm, amplitude of the hip movement was 20.6 ± 8.77 cm while the movement of the ankle was 43.6 ± 9.72 cm. Knee bending angle during a kick was 124.7 ± 5.41 deg, hip angle at the same time was 169 ± 5.94 deg and angle of the hip at the end of a down beat was 148.6 ± 7.95 deg. Female finswimmers had an average speed of 2.68 ± 0.09 m/s and a kick rate of 118.4 ± 11.3 kick/min. Pitching of the hands was 15.3 ± 6.3 cm, amplitude of hip movements was 16.38 ± 4.28 cm, ankle movement was 42.38 ± 8.16 cm. Knee bending angle during a down beat was 121.5 ± 8.12 deg and a hip angle at the same time was 167.25 ± 6.48 deg. Angle of the hip at the end of a down beat was 148.86 ± 8.82 deg.

Discussion & Conclusion

Current study found technique parameters of elite men and women sprinter finswimmers and divided sprinters in two classes: fast sprinters (S1) and strong sprinters (S2). Further analysis is needed for confirmation.



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The relationship between physiological and mechanical load indicators and offensive team efficiency in junior male basketball

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ABSTRACT

Introduction

The aim of this investigation was to identify the players physiological and mechanical load demands in association with the offensive teamwork structure and outcomes at the junior level of basketball performance. Our previous studies have helped to develop the bases of the analytical system which allows to open the offensive teamwork structure and determine the intensity of the team activity, to find out the conditions which cause the outcomes of the team ((Bazanov, B et al. 2005; 2006). In some studies different authors have thoroughly investigated the functional demands of basketball players, but without linking them to a technical/tactical components and outcomes of the game (McInnes, S et al 1995). However, so far it has remained unexplored the players' physiological and mechanical demands in association with teams' technical/tactical performance and outcomes in real competitive game environment.


Methods

Sixteen elite male junior (age $17,4 \pm 1,2$ years; height $193,7 \pm 7,4$ cm; mass $84,4 \pm 11,1$ kg) Estonian basketball players volunteered to participate in this study.

The data were gathered from 197 ball possessions in three competitive games played in division 1 of Estonian Championship. The heart rate and mechanical activity values of each player partakes in team ball possession were obtained by the physiological status monitoring device Zephyr™ BioHarness™. The technical/tactical indicators of the team offensive activity, „teamwork intensity“and outcomes were notated to the Microsoft Office Excel table. The last stage of data processing provided the analysis of aggregated data by Data Mining method.

Results

The results of summary report showed that the offensive efficiency (points/possession) was equal to 0,90 on average with 40% frequency.

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The sample of associative rules for the team scoring (dependent variable) more than the average 0,90 (predicted value) highlights the role of the point guards' high level of heart rate (181 BMP on average) for increasing the offensive efficiency. Furthermore, the efficient possessions are characterized by the high values of mechanical activity (>1) and heart rate (165-191 BMP) of forwards accompanied by a high teamwork intensity indicator. It can be assumed that these rules are opening the sufficient conditions for a successful fast break which usually ended with lay-up.


Conclusion

Based on these results, we can conclude that the player's higher mechanical activity and heart rate values ensure a higher offensive efficiency of a basketball team.

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Effects of using GPAI on procedural knowledge in volleyball players

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ABSTRACT

Introduction

Procedural knowledge (PK) is an influential in decision-making and technical execution factor in volleyball. The aim of this study was to analyse the effects of applying an observation tool used by volleyball players to assess their procedural knowledge.

Methods

A total of 20 U-16 players (14.85 ± 0.74) participated in the research from two local volleyball teams, which were also distributed into a control group ($n = 10$; 14.70 ± 0.67) and an experimental group ($n = 10$; 15.00 ± 0.47). The dependent variable was the PK. Between the pre-test and post-test of PK, the players belonging to the experimental group observed the game through the Games Performance Assessment Instrument (GPAI) tool. In the qualitative part, these players were interviewed about their experience in the process.

Results

The experimental group showed statistically significant differences with the control group in the total score of the questionnaire on PK ($p = 0.000$) and in two of the three dimensions (attacking: $p = 0.031$; blocking: $p = 0.000$).

The score of the 'Pre-Post difference' variable shows that while in the intervention group there was an average gain of 2.70 points in the total score, the average gain for the control group was only 0.40 points.

Discussion & Conclusion

The hypothesis formulated in this study suggests that mutual evaluation of tactical decisions performed by the players themselves improves their procedural knowledge. The results of the present study confirm this hypothesis, since the players in the experimental group showed greater differences in the post-test than the players from the control group.

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Moreover, the views of the interviewed players suggest two ideas. First, their empathy with the GPAI. And second, their improvement after the procedural questionnaire was unanimously attributed in the interviews to the use of the observation instrument.

In that line of research, the literature has already confirmed that the acquisition of good procedural knowledge influences the improvement of decision-making in the game.

We have concluded that procedural knowledge (determining factor in making decisions during the game) improves after the application of an intervention program in U-16 players.

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The performance success within the competitive equestrian field: A novice and intermediate rider focused investigation

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ABSTRACT

Introduction

The aim of the current thesis was to investigate Equestrian Sports Dynamics (Motivation, Coach-Athlete Relationship, Self-Efficacy and Training- both Physical and Mental) of affiliated U.K equestrian riders upon their performance success of affiliated competition across three disciplines. It was hypothesised that the equestrian sports dynamics will have a positive significant impact upon sporting performance across the three disciplines as a whole. It is expected that Intermediates will produce a higher correlation rate between all predictor variables on the criterion variable. Novice riders are expected to produce lower results with increase differences between the disciplines. It is expected that Eventing will produce higher rates of criterion variables on the predictor variable than the other disciplines as this requires the most effort as it combines three disciplines into one (Dressage, Cross-Country and Showjumping). Eventing is also expected to produce the higher rates of Physical and Mental training as more emphasis is placed on these variables compared to Dressage or Showjumping, Dressage is expected to produce heightened Mental Training, Motivation and C-A Relationship due to the nature of the sport requiring pinpoint accuracy. Showjumping is expected to produce higher rates of motivation and least rates of physical fitness of the three disciplines due to the nature of the sport.

Methods

A hybrid questionnaire was produced from the Coach-Athlete Relationship Questionnaire, Mental Toughness Inventory, Sports Motivational Scale-28, the Self-Efficacy Scale and one's own adopted and refined questions (for the physical training research). The total participants accepted (n=236, ShowJumping=107, British Eventing=49, British Dressage=80) and the total participants rejected (n=144) were accounted.

Results

A multiple regression analysis was implemented with revealing findings. Motivation was significantly and negatively correlated with performance success on Novice Eventers and Intermediate Showjumpers. These

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proved to be the only predictors of performance success, however interestingly, it was found that the predictor variables across the disciplines and levels were for the most part, moderately and positively correlated upon each other. However, these findings were not significant.

Discussion & Conclusion

Showjumping, Dressage and Eventing (The three dominant disciplines in the Equine U.K. This suggests there is evidence for the Equestrian Sports Dynamics that do work in unison for future investigations on the relationship of these moderately correlated variables, despite non-significance. It is recommended that further investigations of these Equestrian Sports Dynamics are to be implemented to extend the understanding of this sporting phenomenon in utilising these key elements to push forward Britain's Equestrian rider performance which is to be replicated on the national and world stage.

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Difference of the speed of handball throwing during the competition in relation to efficiency: Analysis between the first and the second half

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ABSTRACT

Introduction

Throwing in handball is the most decisive action in success or failure in the offensive phases of the game. In order to study and analyse this, it is necessary to measure the throwing speed during the competition. This research aimed to achieve two objectives; the first one, to compare the average throwing speed between the first and the second half of the organized offensive phase during the 23rd World Men's Handball Championship. The second, to describe the throwing speed between the first and the second half during the 23rd World Men's Handball Championship with respect to its efficacy (goal/not a goal).

Methods

Throwing speeds were registered in 69 matches in the 2013 World Handball Championship using a radar (StalkerPro S.A., Plano), with a frequency of 100 Hz and a sensitivity of 0.045 m/s¹, fixed on a tripod behind the goal. Statistical analysis was carried out using SPSS software (version 22). The Kolgomorov-Smirnov test was used to check normality and homogeneity.

Results

The results show non-parametric variables. Subsequently, the variables were analysed with the Mann-Whitney U-test. Statistically significant differences were not found in the average throwing speed between the first and the second half of the matches of the World Championship, nor in its throwing effectiveness.

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Discussion & Conclusion

These results show that fatigue is not a variable that influences the throwing speeds along a handball match nor the precision/effectiveness in elite male handball.

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Analysis of the throwing speed in the different positions in the field during the competition

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ABSTRACT

Introduction

The studies that analyse the throwing speed in the different positions in the field in high-performance handball are scarce. These contributions are nonexistent if the analyse refers to the throwing speed during the competition. For this reason, the objective of this research was to analyse the throwing speed in the central positions during the matches at the 23rd World Men's Handball Championship.

Methods

Three thousand two hundred and fourteen throws in the matches of this championship were analysed. The throwing positions analysed were the left back, the centre back and the right back. A radar (StalkerPro S.A., Plano), with a frequency of 100 Hz and a sensitivity of 0.045 m/s¹, fixed on a tripod behind the goal, was used. Analysis was performed using SPSS software (version 22). The variables were analysed with the Mann-Whitney U-test. Statistically significant differences were not found between all the throws carried out by the teams taking part in the championship.

Results

There are statistically significant differences in the throwing speed between the best 8 teams with respect to the other 8 teams of the championship in the central position in the first half of the match ($p > 0,05$), both for the total number of throws and the effectiveness (goal/not a goal).

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Discussion & Conclusion

The best teams obtain higher throwing speed in the central position, but there is no difference in relation to effectiveness. Players may increase the throwing speed in the central position due to the concentration of a higher number of players in that area.

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