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Abstracts

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An exploratory analysis of physiological and physical characteristics in national soccer referee

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Objective: The objectives of this study were to define the different performance variables in national soccer referees and to classify the referees observed according to these performance variables in order to create a common profile.

Method: Data from 50 national referees of the Federation First Division League (Group 1) of the 2022-2023 season were collected using the GPS system (WimuPro, Realtrack, Almería, Spain). An exploratory factor analysis was performed using principal components analysis (PCA) on 2 performance indicators with orthogonal rotation (varimax). In this sense, factor analysis is a statistical method to identify groups of variables.

Results: It has been obtained that 79% of the variance of age and mean heart rate predict the performance of national referees. Only 7% of the variance of the distance covered in the match could be the performance of the national referees.

Conclusions: The main findings of this study showed that through the PCA analysis, the metrics that most explained the performance of national referees were age and average heart rate, in an analysis of more than 20 performance variables

Keywords: PCA, Football, Referee, GPS, Age, Heart Rate, Distance.

Analysis of small-sided games 3 versus 3 in football in terms of playing space, directionality with goalkeepers and coach feedback

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Objective: Small-sided games (SSG) are a frequent method in football training programmes and their design has been analysed in the scientific literature. The aim of this study was to examine 3 versus 3 SSG in order to analyse differences in mechanical and physiological demands of amateur football players.

Method: Football players (21.59±4.35 years, 72.74±9.01 kilograms and 178.16±0.93 centimeters), completed 93 recordings in the MD-4 sessions using CatapultSport OptimEye-S5 devices, synchronised with Polar system. Training structure was similar for all measurements. Tasks consisted in 3 sets of 2 minutes and 1 minute of recovery. Statistical analysis was performed with JASP software.

Results: RPE, Total Distance (TD), velocity bands (VB) (11-14/14-17/17/17-21 km/h), maximum velocity (MV), high metabolic power efforts (HMPE) and meta-energy in 40x30 showed larger results (p<.001) than in 30x20 and 20x20 meters. 20x20 showed larger results for VB (0-11), Total Accelerations and Decelerations (p<.05) compared to 40x30. The presence of goalkeepers in 30x20 showed larger scores in MV and Accelerations +2.5m/s2 (p<0.025; ES>0.75) but lower scores in RPE, TD and VB (0-11/11-14) (p<0.032; ES>0.7). In 40x30, the absence of goalkeepers showed larger scores in RPE, TD, mean heart rate, VB (11-14/14-17), HMPE, metaenergy, TRIMPs, Player Load, work/rest ratio and changes of direction +2.5m/s2 (p<0.045; ES>0.86).

Conclusions: Dimensions and presence of goalkeepers significantly modify the response of amateur football players. Coach's feedback, at least in the smallest space 20x20, seems not alter players response. Therefore, SSG should be analysed from the complexity of its design.

Keywords: Time-motion Analysis, Training, Small-sided games, Football players, Dimensions, Goals.

Assessment of Spatiotemporal characteristics of gait, trough the Phyphox® App

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Objective: Spatiotemporal characteristics from human locomotion can provide effective clinical metrics to assess motor control and brain function. Mobile apps such as "Phyphox" app can assess time series data of stride time. This pilot study aims to assess the temporal structure of variability in stride-to-stride time

Results: A positive correlation was obtained between the ventilatory parameters of S_INDEX and PIF, and the Critical Swim Speed after warm-up (Spearman_S_INDEX=0.592, Spearman_PIF=0.591, R2=0.233; p<0.05), after 400m (Spearman_S_INDEX=0.658, Spearman_PIF= 0.636, R2=0.280; p<0.05), and after 100m (Spearman_S_INDEX=0.616, Spearman_PIF=0.610, R2=0.221; p<0.05).

Conclusions: There is a direct correlation between specific parameters of inspiratory spirometry with influential factors of performance in swimmers, i.e., Critical Swim Speed. Our results suggest that both the S_INDEX and the PIF evaluation could be useful indicators of the level of sports performance of swimmers, providing coaches with useful and feasible tools to use during training.

Keywords: Peak Inspiratory Flow, Critical Swim Speed, Swimming, Fatigue, Performance.

The impact of technology on quality and member´s behaviour in different fitness business models

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Objective: During COVID-19 there was a digital acceleration (i.e., Wearables Fitness Technology (WFT) and On Demand Training (ODT) and emergence of new business models (IHRSA, 2022). Technology improves service delivery to members (Pedragosa et al., 2022). This study aimed to measure the technology impact in quality and members behaviour in different business models: Traditional Fitness Centres (TFC) and Fitness Boutiques (FB).

Method: Sample was composed by 83 TFC and 92 FB members (74% women; 26% men). Was applied an Instrument composed by 35 items for quality and 6 items for behaviour (Costa, 2011) and 6 items for technology (Pedragosa et al., 2022). To evaluate the statistical correlation between the technology (independent variable), the perceived quality and the members behaviour (dependent variables) was performed simple linear regression (p<0,05).

Results: In the TFCs, quality is explained 58% by technology (R2=.58), with a statistically significant for applications (p=.007). Behaviours are explained 31% by technology (R2=.31), with statistically significant for social networks (p=.024). In FBs quality is explained 70% by technology (R2=.70), with statistically significant for perception of technology overall (p=.001). Behaviours are explained 32% by the technology (R2=.32), with a statistically significant for the perception of the technology overall (p=.05).

Conclusions: Technology is a very important dimension to explain quality better than behaviours, in both Fitness Centres. FBs technology shows a higher explained for quality and behaviours compared to TFCs. Such results indicate technology as an explanatory dimension of quality perceptions and loyalty behaviours with different results by business model.

Keywords: Fitness Technology, Business Models, Quality, Members Behavioural.

The integration of ict in physical education through challenge-based learning

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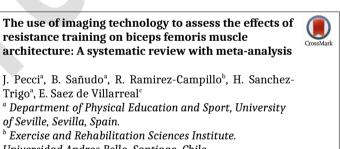*Universidad Pontificia Comillas, Madrid, España.*

Objective: In the field of education, there is a demand of new ways of teaching which bring new paradigms and educational models. However, integrating ICT in physical education (PE) can become a challenging task due to certain subject characteristics such as the eminently practical nature of the subject or the scarce weekly time devoted to it. The aim of this work was to design and implement a proposal for the integration of ICT in Physical Education through challenge-based learning, and to evaluate how the implementation of this experience could affect students' motivational outcomes.

Method: For the elaboration of the didactic unit oriented to teaching badminton in Secondary Education, several technological resources were used. A quasi-experimental design was followed in which two groups of the third year in Secondary Education, following challenge-based learning or a traditional teaching approach, were compared both before and after the badminton didactic unit in terms of their basic psychological needs satisfaction and frustration. M

Results: In this experience, a challenge-based learning proposal is designed to teach badminton in physical education. The findings suggest that the use of ICT supports students' autonomy in their learning process and facilitates teachers' provision of feedback to their students.

Conclusions: This experience represents an interesting ICT approach to an innovative pedagogical model and provides some empirical findings which reinforce the value of ICT to foster motivational context in physical education.

Keywords: Students' motivation, Self-determination, ICT, Educative innovation.

The use of imaging technology to assess the effects of resistance training on biceps femoris muscle architecture: A systematic review with meta-analysis

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Objective: To examine the effects of the main resistance training variables on the muscle architecture of the biceps femoris in soccer players

Method: PubMed, SPORTDiscus, PsycInfo, Web of Science and CINAHL databases were searched. Studies that included resistance training intervention groups and measured muscle architecture adaptations through imaging technology in soccer players were included for analysis using Review Manager software.

Results: Six studies (152 players) and 12 training groups entered the analyses. The effects of Nordic Hamstring Exercise vs. only on-field training as exercise selection variable and the effects of one vs. two days per week of resistance training as frequency variable were possible to be analyzed. Nordic Hamstring Exercise was shown to significantly improve fascicle length (p = 0.01; ES = 0.33 [0.11, 0.55]). Training two times per week showed greater ES than training once a week in all measured outcomes.

Conclusions: The conditional maintain or improvement helps the tolerance of the workload during season, allowing the improvement of sports performance in padel and not losing days of competition. However, a multidimensional assessment is necessary to control the greatest number of athlete variables. This methodology has shown positive results in biopsychosocial assessment and performance, despite the high competitive density.

Keywords: Physical Training, Assessment, Padel, Technology.

Validation of Xiaomi Mi Band 6 in maximal and average heart rate in exergames and cycle ergometer

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Objective: To validate the Xiaomi Mi Band 6 in measuring maximum heart rate and average heart rate during a cycle ergometer session.

Method: Twenty-seven community-dwelling older adults participated in this study. Each participant completed a 30-minute exercise session on the cycle ergometer and in exergames to reach 60-70% of the maximum heart rate. On the cycle ergometer, participants exercised for 30 minutes at 50 rpm. The augmented reality session was conducted with Exergames running on the Portable Exergame Platform for Elderly (PEPE). We used 4 games from this platform, Exerpong, Grape stomping, Rabelos, and Toboggan. Training session was during 30-minute, with the variation of the HR within the previously defined values. The Polar Band (PB) was worn on the chest, and the Xiaomi Mi Band 6 (XMB6) was worn on the left wrist. Average and maximum heart rate values were recorded from each smartwatch. Normality of the data was assessed using the Shapiro-Wilk test, and according to the results, was used Pearson's correlation.

Results: Validity showed that there is a positive association between the PB and XMB6 in maximum HR (0.767, p=0.000) and average HR (0.730, p=0.000) in cycle ergometer and average HR (0.659, p=0.000) in exergames. There is no association between the two wearables at the maximum HR (0.018, p=0.930) for exergames.

Conclusions: The study indicates that the XMB6 is valid in the maximum and average HR in the cycle ergometer. However, in exergames, the XMB6 shows very different maximum HR values than the reference wearable.

Keywords: Augmented Reality, Older Adults, Wearable Devices, Validation, Exercise.