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Abstracts

International Conference on Technology in Physical Activity and Sport. TAPAS 2020. 24th-27th November 2020

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Physical performance after resistance training in squat with and without local EMS.

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Objective: To analyze the muscular fatigue produced after an acute session of resistance training in a squat exercise with guided weight, comparing the acute effects with and without concurrent electrostimulation (EMS) in the quadriceps.

Method: 16 trained men (29 ± 4.03 years) performed randomly and counterbalanced two sessions of resistance training in Smith machine (with and without EMS) on different days. The EMS training used the Compex program with 8 seconds of contraction (60 Hz) at the maximum intensity supported by the subject throughout the movement and 6 seconds of relaxation (7 Hz). Training protocol consisted of 3 blocks of 5 sets of 3 repetitions at 70% 1RM with a 6-second rest between sets and 1 minute between blocks. At the beginning and end of the training, the Power, Height, Speed and Flight time were quantified in the vertical jumps squat jump and countermovement jump in a contact platform, Leg Isometric Maximum Strength, muscle pain as well as Rate Perception Exertion (REP).

Results: In both training protocols, significant differences were observed in all variables between the initial and final values, except for the variable muscle pain. However, no significant difference was observed between protocols.

Conclusions: The results show an increase in muscle fatigue after effort, however, the addition of EMS to resistance training did not produce a significant increase in fatigue, probably because the training protocol performed was not intense enough.

Keywords: Muscle fatigue; EMS; Squats; Hypertrophy.

The impact of smartphone use on physical and mental health. A pilot study with office workers

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Objective: To analyse the relationship between smartphone use and body composition, physical fitness, quality of life and selective attention in office workers.

Method: A cross-sectional pilot study was carried out with 30 office workers (16 men and 14 women) who were between 27 and 59 years old. We collected their body composition (height, weight, body mass index, waist-hip ratio and percentage of fat mass), physical fitness (countermovement jump, handgrip strength and cardiovascular endurance performing the 6-minute walk test), quality of life (SF-36), selective attention (Stroop Test) and smartphone use.

Results: The use of the smartphone was significantly correlated with quality of life dimensions, pain (r^2 = 0.219, p = 0.04) and physical component (r^2 = 0.153, p = 0.03). Selective attention was also correlated with smartphone use. Specifically, the congruent score (r^2 = 0.143, p = 0.01) and "Stroop effect" (r^2 = 0.195, p < 0.01).

Conclusions: The results of this pilot study suggest that smartphone use could correlate with quality of life dimensions and selective attention. It will be necessary to continue and expand the study to get more knowledge about these devices.

Keywords: Smartphone; Physical fitness; Quality of life; Cognitive function

Evaluating 24-hours activity behaviors during pregnancy: the importance of the objective assessment of daily activity behaviors.

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Objective: To objectively evaluate 24-hours activity behaviours during pregnancy.

Method: A cross-sectional assessment of 24-hours activity behaviours (sleep, sedentary activity (ST), light (LPA), moderate (MPA) and vigorous (VPA) physical activity) was developed on 342 pregnant women by using a multisensor monitor for at least 7 consecutive days.

Results: Pregnant women spent 7.9 hours sleeping, 9.2 hours on ST, 5.1 hours on LPA, 1.4 hour on MPA and 0.4 minutes on VPA at midpregnancy. The most prevalent behaviour at midpregnancy is ST, which supposes the 38.8% of pregnant women's day and the 58.4% of waking hours, increasing at later pregnancy. Sleep, LPA, MPA and VPA decrease from mid-pregnancy to later pregnancy.

Conclusion: When analysing the influence of daily activity on pregnant women's health, it is necessary to have a whole vision of all lifestyle activity behaviour. Multisensor monitors and novel statistical approach as compositional data analysis allows to properly analyse the associations between daily activity behaviours and health.

Keyword: Lifestyle; Daily Living Activities; Physical Activity; Sleep; Sedentary Lifestyle.

¿Is it possible, with the help of new technologies, to succesfully adapt a corporate wellness programs to the situation caused by COVID-19? A real case study.

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Objective: To show how a well-known Spanish fitness brand, O2 Centro Wellness, applies all its digital knowledge to help its client, Mahou San Miguel, to successfully adapt its corporate wellness programme, a national benchmark, to the new reality brought about by the COVID-19, using a fitness application and with the help of new technologies.

Method: Case method. The research method was based on the analysis of the available documentation and direct observation, completing it with two semi-structured interviews (qualitative approach)

Results: The service was successfully and fastly adapted to this new situation with the "Cuidarme en casa" programme, offering online training, coach communication, updated personalised routines (501 routines), technical videos and 12 weekly online classes, through the Cuidarme APP and the Cuidarme website, as well as Youtube. In terms of results, 60.3% of employees trained similar or even more than usual This fact contrasts with a study that concludes that the Spanish adult population decreased daily physical activity and increased sedentary time during the COVID-19 (Castañeda et al., 2020)"

Conclusions: With the help of different new technologies, it is possible to successfully adapt a corporate wellness program to the new situation. This can be a good example for companies to adapt to this teleworking scenario and take care of their employees ´health, even when they are out of the office.

Keywords: Healthy workers · Fitness, App · Telework · Corporate Wellness · COVID-19

Associations of cardiorespiratory fitness with cognitive function in older people: The EFICCOM Project

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Objective: To examine the associations of CRF and cognitive function dimensions in older people.

Methods: Ninety-two participants (68.9±2.9 years, 41 women) participated in our study. CRF was assessed by cardiopulmonary exercise test using indirect calorimetry. Cognitive function was evaluated by a battery of neurophysiological standardized tests (memory, attention, language, processing speed, fluency and cognitive flexibility). Linear regression analyses were performed on CRF variables (relative and absolute VO_{2peak}) and cognitive function dimensions.

Results: There were significant positive associations of absolute VO_{2peak} with language and fluency (both $p<0.05$). After adjusting for confounders (sex, age, education level and body mass index), there were significant positive associations between relative and absolute VO_{2peak} and language, fluency and cognitive flexibility (all $p<0.05$).

Conclusion: Higher levels of CRF are associated with better performance on language, fluency and cognitive flexibility. Further studies are needed to better understand this relationship with larger samples and using a randomized control trials design.

Keywords: Exercise; Physical Fitness, Alzheimer Disease and Aging.

Effects of a full squat strength training program with three different set configurations (Traditional vs. Cluster 1 vs. Cluster 2) on lower limb muscle strength performance.

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Objective: Analyze the effects produced by a strength trainind during five weeks, with the same volumen in the full squat exercise on the strength of the lower limbs when training with medium weights (60-70% 1RM), compared to three different configurations of the set.

Method: It is a linear and experimental investigation. A total of 15 physically active subjects participated in the study. The participants were divided into three groups: 1) Traditional Group, which carried out the repetitions of each set continuously; 2) Cluster 1, incorporating a recovery interval of 30 seconds in the middle of the set; and 3) Cluster 2, incorporating a recovery interval of 30 seconds every two repetitions. They conducted a strength in complete squat training program with same volumen, two sessions per week during five weeks.

Results: The results show significant improvements in performance of the lower limbs muscular strength, evualuated through the estimation of 1RM, in the Traditional groups (P=0.01) and Cluster 2 (P=0.03). Regarding the speed loss throughout the set,the results show significant differences between the intensities of 60% RM and 65% in the Traditional group (P=0.05) and in the Cluster 1 group (P = 0.02), with greater losses of speed in the first sessions (1-4).

Conclussions: The developed training program produced significant improvements in the performance of the lower limbs muscular strength in the Traditional group and Cluster 2 group.

Keywords: Training Load; Traditional Methodology; Cluster Training; Loss of Speed; Recovery Time.

Digital Consumer Profile in Fitness Centers

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Objetive: The objective of the present investigation is to analyze the profile of the digital consumer in fitness centres through the applications they made available to its associates.

Method: The sample was composed by 1600 members of gyms in Portugal (945 women and 655 men). The descriptive analysis indicates that 84% use the gym application. Of these, 62% were women, 67% had higher education qualifications, 34% attended the gym more than 5 times in the last 15 days and 64% have been attending the gym for at least 2 years.

Results: The results also indicate that 56% of the sample considers the app quite useful and both, who consider it useful and those who do not, reveal an average training frequency in the 15 days preceding the test of more than 5 times.

Conclusions: We conclude that it is the women, members with higher academic qualifications, those who attend the gym the most often and those who have been registered the longest, who use the app the most. We also concluded that the fact that the member considers the app more or less useful does not influence the training frequency.

Keywords: Technologies; App; Gym; Consumer Characteristics.

Sagittal disposition of the spine in overweight and obese adolescents: assessment with Spinal Mouse® after a Pilates programme

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Objective: To assess the effect of the Pilates method on sagittal arrangement of the spine measured with Spinal Mouse® device in adolescents with overweight and obesity.

Method: 37 adolescents (experimental group = EG; n = 20; control group = CG; n = 17) participated in this randomized clinical trial. Participants were volunteers from a Secondary Education center who were overweight or obese and could actively participate in Physical Education sessions. GE carried out a Pilates program of 2 sessions / week (15 minutes / session) for 9 months. CG received regular Physical Education classes. All subjects were evaluated in pre-test and post-test. Sagittal disposition of the spine was evaluated using Spinal Mouse® device in relaxed standing position.

Results: Mean body mass index was 27.28 ± 2.67 kg / m2. EG showed no changes in thoracic curve (+2.650; p = 0.273) and reduced lumbar curve (-4.95; p = 0.016). CG significantly worsened thoracic curve (+8.059; p = 0.009) and showed no changes in lumbar curve (-2.882; p = 0.181). No differences were shown in the changes between EG and CG (thoracic curve: F = 1.093; p = 0.306; lumbar curve: F = 1.208; p = 0.283).

Conclusions: The Pilates method prevents augmentation and generates positive changes in sagittal disposition of the spine measured with Spinal Mouse® device in adolescents with overweight and obesity. These findings provide relevant knowledge, serving for further research on sagittal misalignments and the positive effect of the Pilates.

Keywords: Spinal; Children; School; Back; Kyphosis; Lordosis.

Comparison of displacement and time kinematic variables amongst some leg press variants on a female population

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Introduction: Leg press is widely performed for the strengthening of the lower limbs. However, since it may play its role into performance, it remains unknown whether feet width stance, feet rotation and exercise velocity may affect kinematic outputs such as displacement (centimeters) or time (milliseconds) during each derivative.

Objective: to analyze differences on displacement and exercise time kinematic measures amongst 5 leg press derivatives performed at different velocities.

Method: Ten females with a minimum of one-year resistance training experience participated. A linear transducer sampling at 1000 Hz was used to extract kinematic parameters (T-Force System, Ergotech, Murcia, Spain). Displacement and time were assessed during concentric and eccentric contraction phase.

Results: ANOVA showed no main interaction on time for exercise*contraction phase ($F_{(4, 36)}$ = 0.70, p = 0.489, ηp^2 = 0.07). Displacement during concentric phase was significantly (p < 0.01) greater during maximum intended velocity sets. Also, ANOVA showed significant differences (p < 0.01) on time between maximum intended velocity sets and controlled velocity sets for both phases.

Conclusion: Feet width stance and feet rotation did not affect kinematic outputs. However, those maximum intended velocity exercises, which more closely mimic sports related activities and daily life movements such as squatting, jumping or running tasks, would be advisable to enhance performance.

Keywords: Linear Transducer; Movement Velocity; Machine devices; Women; Lower Limbs Kinematics.

Estimating energy expenditure during active virtual reality gaming

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Objective: The purpose of this study was to compare two methods of tracking energy expenditure (movement displacement and heart rate) versus the laboratory "gold standard" (indirect calorimetry) during active virtual reality gaming (AVRG).

Methods: Eleven participants (6 females, 5 males, 22.5±2.5 y) played 15-minutes of AVRG while undergoing three different methods of EE tracking simultaneously: indirect calorimetry measuring oxygen consumption (VO2), movement displacement data from the VR system (MOV), and a heart rate monitor (HR).

Results: Total estimated energy expenditure (EE) during the 15-minute gameplay was 69.21±10.85, 77.42±24.63, and 134.00±32.98 kcals for VO2, MOV, and HR, respectively. An ANOVA was utilized to determine if there was a significant difference between EE methodologies and Bland-Altman analyses were run to assess agreement between VO_2 and MOV as well as VO_2 and HR. The HR measure overestimated kcals (p<0.0001) compared to VO_2,

but there was no significant difference between VO_2 and MOV EE estimates.

Conclusion: These results suggest 1) movement displacement may be an accurate method to track EE while playing VR games compared to indirect calorimetry, and 2) new equations must be developed specifically for AVRG to improve HR estimates of EE during gameplay.

Keywords: Caloric Expenditure; Movement Displacement; Accelerometry; Heart Rate; VO2

The role of 'exergames' as an adjunct treatment in patients diagnosed with severe mental disorder: a vision of the current scientific evidence

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Objective*:* To analyze studies that show scientific evidence on the effects on quality of life and depressive symptoms caused by the implementation of an intervention based on physical exercise through new technologies (exergaming) as an adjunct to pharmacological treatment in patients with severe mental disorders.

Method*:* A systematic search was carried out in electronic databases in September 2020. The terms used for the search were those that responded to the acronym of the PICOs model for this study. For study eligibility, programmed inclusion criteria were applied to select the studies that provided the highest quality evidence.

Results*:* After applying the selection criteria, four studies were obtained. Only one of them directly analyzed the variable related to quality of life, and the rest analyzed other variables that had a strong relationship with it, and all of them obtained beneficial results when the intervention was compared with pure control groups. Similarly, the included studies reported beneficial effects on depressive symptoms when comparing intervention with pure control groups. All the interventions based on 'exergames' equalized the effects caused when compared with active controls or other types of more traditional interventions.

Conclusions*:* The 'exergames' could be an effective tool in the treatment of severe mental disorders, although the different characteristics of pathologies and patients that exist within severe mental disorders must be taken into consideration, and that these interventions must be accompanied by the corresponding pharmacological treatment.

Keywords*:* Mental disorders; Mental health; Exercise therapy; Quality of life.

Measurement of salivary cortisol as a method to estimate the degree of acute stress in the elite of professional football. An experimental study

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Introduction: The professional footballer during the season has a significant stress caused by the team's position in the table and his own personal performance in the matches.

Objective: Observe whether variables such as the result of a match and the team's position on the table can influence the salivary cortisol values.

Method: Cortisol salivary measurements were taken under fasting conditions on arrival at the stadium the day after the match, during the last 10 rounds of the Italian football league Serie A, season 2019-2020 after the lockdown. Footballers who played more than 80 minutes in the matches were assessed (n=18).

Results: It can be seen that when the team wins, the average cortisol values are much lower.

Conclusions: Winning or losing the match is the factor that influences salivary cortisol levels, being a useful biomarker to determine acute stress. Having achieved permanence did not influence, nor did we show any special difference when the team played away or at home.

Keywords: Performance; Biomarkers; Serie A; Match.

The KINBIA® anthropometric tool in the control and monitoring of athletes and non-athletes.

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Objective: The lack of software that correctly applies anthropometric tactics led us to develop a webApp project for body composition analysis with anthropometric measurement techniques and bioelectric impedance.

The objective is to provide to health and sport professionals a useful tool for the study of body composition, using formulas and correct strategies for each population, based on age, sex, race and level of physical activity.

Method: KINBIA® has been developed in PHP version 5.6.4 computer language and validated in five countries by professionals in the field of nutrition, health and sports.

Results: The software carry out anthropometric calculations with specific formulas for each population group. In the case of anthropometry, the tetracompartmental fractionation is calculated with an error of ± 1% about the weight. In bioimpedance, the program provides data on the nutritional condition index, potassium, proteins, minerals, body volume and a vector graph of cell damage.

Conclusions: Currently KINBIA® has a registry of 700 professionals who use the platform. The software is registered in the Industrial Property and World Intellectual Property like "KINBIA - BODY COMPOSITION ASSESSMENT".

Keywords: kineanthropometry, bioimpedance, body composition, health indices, phase angle.

Reliability and validity of kinematic variables of jumping and running assessed by two-dimensional video analysis with high-speed cameras. A systematic review.

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Objective: The rapid development of sport cameras has made accessible to everyone the high-speed video recording. However, the expense of three-dimensional (3D) motion capture systems remains high. Two-dimensional (2D) video analysis may have lower measurement accuracy but it is an inexpensive and portable option for kinematic analysis in running and jumping.

The aim of this systematic review is to investigate the reliability and validity of 2D kinematic measurements with high-speed cameras during running or jumping.

Method: SPORTDiscus, PubMed y Scopus were searched from inception and 12 studies were included.

Results: Most kinematic variables of running and jumping demonstrated moderate to excellent inter-rater and intra-rater reliability. However, differences between 2D measures and other analysis methods were high for certain variables.

Conclusions: Despite the disagreement with other systems, 2D video analysis is a pragmatic method for evaluating most kinematic variables usually measured during running or jumping.

Keywords: Motion Analysis; Accuracy; Kinematics; Inter-rater; Intra-rater.

Machine Learning and estimation of the prevalence of osteoporosis in postmenopausal women based on compliance with the WHO physical activity recommendations.

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Introduction: Contemporary statistical approaches coming from Data Mining and Machine Learning can help us identify associations between data and build predictions models.

Objective: To predict osteoporosis risk based on compliance to WHO guidelines for physical activity in postmenopausal women.

Method: Data from 917 postmenopausal women from the 2017-18 National Health and Nutritional Examination Surveys (NHANES) was analyzed using machine learning algorithms with the aim of estimating osteoporosis risk based on a supervised learning perspective. Input data for the prediction algorithm included physical activity data collected via questionnaire.

Results: From the information obtained by applying a decision tree algorithm, osteoporosis risk was estimated at 27'8% for postmenopausal women complying to WHO guidelines for physical activity, versus a 31'5% risk for non-compliers. Therefore, adherence to WHO recommendations could be associated to an osteoporosis risk reduction of 3'7%.

Conclusion: Machine Learning and Data Mining algorithms can help us identify key factors in preventing osteoporosis. Our analysis shows that complying to WHO guidelines for physical activity could have a significant impact on bone health.

Keywords: Osteoporosis; Physical Activity; WHO; Machine learning; Data mining.

Skin temperature of Spanish older adults: the EFICCOM project.

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Introduction: Infrared Thermography (IRT) is a new technique that quantifies body radiation and provides an accurate estimation of skin temperatures (T_{sk}). IRT has been increasingly used in both sports/exercise medicine and medical and health status. However, given the novelty of the technique and how age affects thermal status and response, it is of interest to describe the thermal pattern in older adults.

Objective: To describe the thermal pattern of Spanish older adults comparing the T_{sk} differences by sex.

Methods: A total of 93 participants (68.48±3.01 years, 41 females) were examined with a thermographic camera (FLIR E60) in a conditioned room (23.02±3.01°C, 46.87±5.58% relative humidity). The T_{sk} from 21 regions of interest (ROIs) were extracted, analysed and compared by sex using independent samples Student's t-test.

Results: Overall, the T_{sk} tended to be higher in 15 out of 21 ROIs in male compared to female, yet, only 6 ROIs achieved the significant threshold (i.e. posterior thigh was the ROI with the highest difference, 0.9°).

Conclusion: The thermal pattern of Spanish older adults shows sex-related T_{sk} differences in several body areas. Therefore, to apply specific thermal patterns considering sex differences is recommended to describe older population.

Keywords: Aged; Thermography; Sports Medicine.

Consequences of the Continued Practice of the Tail Tag Game on the Motor Behavior

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Objective: To assess the consequences due to the continued practice of the tail tag game in the behavioral and physical dimensions of youth players.

Method: Sixteen youth soccer players (n = 16; age = 13.0 ± 0.4 years) played tail tag, with the ball, 5 times (one-minute playing; one-minute of rest) within each of the four training sessions. The average Total Area (TA) occupied by the players and its approximate entropy (ApEn), the Total Distance Covered (TDC) and the accumulated PlayerLoad (PL) of each player were measured by a time-motion tracking system based on ultra-wideband (UWB) technology during the first and the last sessions.

Results: TA increased (182.54 ± 15.09 vs. 206.55 ± 16.35 m^2; $p < 0.05$; Cohen´s d = 1.53) and its ApEn values decreased (0.54 ± 0.08 vs. 0.27 ± 0.10 AU; $p < 0.05$; Cohen´s d = 2.98) from the first to the last session. The TDC (491.58 ± 85.30 vs. 402.27 ± 78.04 m; $p < 0.05$; Cohen´s d = 1.09) and the accumulated PL (11.39 ± 2.16 vs. 8.30 ± 1.95 AU; $p < 0.05$; Cohen´s d = 1.50) decreased from the first to the last session.

Conclusions: The continued practice of the same game tends to organize the behavior of the participants and demand a lower physical effort.

Keywords: game-based education; learning strategies; motor game; behavior; external load

Associations of center of pressure characteristics during a balance test with depressive symptoms in older adults: The EFICCOM Project.

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Objective: To examine the associations of postural balance and depressive symptoms in older adults.

Method: A total of 84 participants (68.9 ±2.9 years, 40 women) were involved. Postural balance was recording by displacement of the center of pressure (COP) from stabilometric tests with open and closed eyes (Romberg tests) using a force platform (Musclelab System). Depressive symptoms were assessed using the Geriatric Depression Scale. Linear regression analyses were performed on COP and depressive variables.

Results: Analyses showed those with higher COP displacement had significantly higher depressive symptoms (R^2 (0.37-0.39), all $p< 0.001$) in females but not in males after adjusting for confounders (body mass index and antidepressant medication).

Conclusions: Our findings suggested a better balance is associated with less depressive symptoms in older adult females but not in male population.

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Keywords: Postural balance, Depressive symptoms, Geriatric Assessment, Elderly, Older adults.

Proprioceptive profile of amateur female basketball players of Mallorca Island

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Objective: To describe the proprioceptive profiles for knee joint position sense (JPS) of female basketball players of Mallorca island.

Method: An observational study were designed. 91 healthy female basketball players (18 to 30 years old) were evaluated during the basketball preseason. All participants performed a JPS test of knee-joint in closed kinetic chain in both right and left knee joint, just after a warm-up and familiarization process Also, anthropometric data and sport-related information were collected.

Results: Data showed 4.0 ± 3.4 y 4.1 ± 3.0 degrees as absolute proprioceptive error for right and left knee, respectively, without significant differences according to dominance or player position ($p > 0.05$). No significant correlations were obtained between JPS and age or anthropometric variables ($p > 0.05$).

Conclusions: The proprioceptive profile of amateur female basketball players from Mallorca island is about 4.0 degrees of proprioceptive error, without being influenced by dominance, player position, age or anthropometric variables.

Keywords: Basketball; Females; Proprioception; Knee joint

Assessment Instruments in school Physical Education. Use of mobile applications

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Objective: To analyze the degree of employment of mobile applications as an assessment instrument in Physical Education and the differences in their use according to educational level, age, sex, highest academic degree, teaching experience and hours of assessment training.

Method: Four hundred and fifty-five Physical Education teachers participated. The item "How often do you use Mobile Apps for Physical Education assessment" was used from an *ad hoc* designed questionnaire. The data for the different categories of analysis was reported by teachers.

Results*:* The results show that the average use of mobile Apps to assess is low (2.58 out of 6). There are statistically significant differences in accordance with educational level (Secondary Education 2.73 vs. 2.44 Primary Education), the highest academic degree obtained (Postgraduate 2.87 vs. 2.27 Degree), between the youngest and the oldest group (2.82 vs. 2.29), between the groups with less and average teaching experience the group with the highest experience (reporting the lowest values), and between the groups with more and less hours of assessment training (2.93 vs. 2.48).

Conclusion*:* The employment of mobile apps to assessment processes in Physical Education is still scarce, being used more among Secondary school teachers, the younger, those Who have

more teaching experience, a higher academic degree, and more assessment training.

Keywords: Mobile Applications; Assessment; Assessment Instrument; Physical Education.

Protocol for a randomised controlled trial (rtc) of intervention using wearables to promote adoption and maintenance of physical activity in adults with severe mental illness

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Objective: To evaluate the feasibility and effectiveness of an intervention based on wearables to reduce sedentary lifestyle and increase physical activity in people with severe mental disorders.

Methodology: A randomized controlled trial of two parallel groups will be developed for 12 weeks. A minimum of 80 adults with severe mental disorder will be recruited and randomly assigned to the intervention group (activity bracelet; behavioral feedback; adaptive step target, group coaching and walking) or to the control group (usual treatment). Different anthropometric and metabolic parameters will be recorded, variables related to quality of life, physical condition and lifestyle. Daily steps, moderate-vigorous intensity physical activity (> 3 METs), and sedentary time will be assessed using the SenseWear Pro3 Armband accelerometer (BodyMedia, Inc., Pittsburgh, PA, USA) at the beginning and end of the intervention.

Results: The intervention is expected to increase the number of daily steps, the levels of physical activity of moderate-vigorous intensity and reduce the sedentary lifestyle regardless of their initial activity level. In a complementary way, it is expected that the intervention will be feasible to implement in this clinical population, improving adherence to physical exercise programs.

Conclusions: If activity bracelets in combination with behavior change strategies are effective, they should be considered as an economical and sustainable adjunctive therapy option to promote a healthy lifestyle in mental health centres.

Keywords: Wearables; Physical Activity; Sedentary Behavior; Severe Mental Disorder; Intervention.

Modification of sports habits according to downloading and use of a mobile application in sports centers

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Objective: The aim was to analyse the changes in sports habits that occur in sports center users when they register and currently, comparing possible differences as they download the center's mobile application and those that do not.

Methods: The study had an analytical-descriptive design with non-probability sampling for convenience. The sample was composed of 1,285 participants, 55% female and 44.8% male. The variables analysed were download of the application, use or not of application, and sports habits (frequency, duration, level of fitness experience and type of activity practiced). The data collection procedure was carried out through an online survey using Google Drive Forms.

Results: Overall results show significant differences in users' sports habits from the time they registered to the current time of the study, and positive differences were also observed between those who downloaded the mobile application and those who did not.

Conclusions: The main findings of this study are that the use of a sports application improved users' sports habits by increasing the time spent in the center and your attendance frequency, as well as the level of fitness experience. Users who downloaded and used the center's mobile application performed more directed activities and less swimming than users who did not download or use the application.

Keywords: Mobile applications; Surveys and Questionnaires; Habits

Assessment of upper cross syndrome in young percussionists

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Objetive: We aimed use technology to determine the prevalence of Upper Cross Syndrome in the study population and detect a relation between it and other variables studied.

Method: 45 percussionist students have participed. Measured variables have been: muscle decompensation (Newton, by using a strain gauge), upper limb range of motion (degrees, by using a Protractor® Android application), level of physical activity and level of anxiety (by using IPAQ and STAI, supplied through a virtual platform).

Results: 28.88% of the subjects analyzed presented symptoms of Upper Cross Syndrome. This population shows a lower mean age (16.23±3.16), a lower level of physical activity (3537.07±2329.10 mets / min per week) and more minutes of sedentary lifestyle (344.61±244.59 minutes a day) and lower level of anxiety. A significant correlation had been found between range of motion and anxiety – state (r2=-0.666 p<0.05).

Conclusions: Prevalence of Upper Cross Syndrome among our sample was lower than other studies (56,1% in Bravo, Humala,& Otorongo, 2013; 58.15% in Ramón, Rodríguez & Serrano, 2011; and 37.1% in Mubeen et al., 2016). The results reflect a lower level of physical activity, more sedentary lifestyle, less active shoulder range of motion, and lower levels of strength in music students with Upper Cross Syndrome. Especially remarkable is the relation between range of motion and anxiety which might suggests that an improvement range of motion program could reduce anxiety and be positive in order to prevent musicians from suffering Upper Cross Syndrome.

Keywords: Posture, Muscle strength; Range of motion; Symptom assessment.

Comparison of the internal/external load induced by the FIFA 11+ warm-up program in different training sessions in young soccer players: A preliminary study.

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Introduction: Several studies have found the effectiveness of the FIFA 11+ warm-up to reduce injury rates in soccer. However, few studies have quantified the physical-physiological responses

of young soccer players during this type of warm-up. *Objective:* The aim was to compare the internal/external load induced by the same warm-up program (FIFA 11+) carried out in different trainings sessions.

Method: Sixteen young soccer players (13.0 ± 0.4 years) performed the FIFA 11+ warm-up at the beginning of the two different training sessions. The *player load* (*PL*) and the *mean heart rate* (*mean-HR*) of each player were measured in both sessions using an electronic performance and tracking system certified by FIFA (WIMU PROTM, RealTrack Systems, Almeria, Spain).

Results: The *PL* induced by the FIFA 11 + warm-up was significantly and substantially higher in the second training session in comparison to the first (8.5±1.3 vs 12.7±2.2 AU; $p<0.05$; Cohen´s *d* Effect Size (ES) = 2.36, *very large*). The *mean-FC* did not vary significantly from the first to the second training session (139.7±14.0 vs 136.5±13.5; $p<0.05$; ES=0.23, *small*).

Conclusion: The results suggest that the external load induced by the FIFA+ warm up can vary considerably between training sessions.

Key words: Team sport; Soccer; Training strategy; Internal load; External load.

Analysis of explosive force, sprint distance and high-intensity running in a match situation between Hungarian second-division soccer players

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Objective: Match play competitive in team sports requires players to perform actions resulting in frequent intense acceleration and deceleration. Accordingly, these accelerations and decelerations make up a substantial part of the high-intensity external workload, imposing distinctive and disparate internal physiological and mechanical loading demands on players. The aim of the present study is to compare the difference between the load characteristics of five league matches. Twenty-eight (n=28); (age = 22.0 years ± 5.9) young professional players participated at least four games during the examination period. The averages (± sd) of the assessments for anthropometric measure are body mass, body height, and percent body fat were 78.7±8.9 kg, 181.7±10.1 cm, and 10.2±2.3% respectively.

Method: The observation of the players took place in the five weeks following the changes in their training stimuli. Data were collected through electronic performance tracking systems (Catapult Vector). The combined team-level measures of explosive efforts (EE), sprint distance (SD) and high-intensity running (HIR) total player load (TPL] of the four matches and their weekly differences were compared using a repeated measures ANOVA with Tukey HSD post hoc method. The level of significance was set at $p \leq 0.05$.

Results: Sprint distance (SD) and high-intensity running (HIR) shows a significant ($p<0.001$) difference between football match 1 and the other four matches (1 vs 2, 1 vs 3, 1 vs 4 vs 5). In addition, team-level averages of total player load (TPL) were also significant ($p<0.05$).

Conclusions: The findings of this descriptive study provide meaningful information regarding explosive efforts (EE), sprint distance (SD), high-intensity running (HIR) as well as total player load (TPL) profiles of professional football matches. This data could also serve as a comparison source for future researchers or sports scientists and coaches from professional football teams.

Keywords: Team sports, Total player load, Team-level, Mechanical loading.

Physical performance after resistance training in squat with and without local EMS.

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Objective: To analyze the muscular fatigue produced after an acute session of resistance training in a squat exercise with guided weight, comparing the acute effects with and without concurrent electrostimulation (EMS) in the quadriceps.

Method: 16 trained men (29 ± 4.03 years) performed randomly and counterbalanced two sessions of resistance training in Smith machine (with and without EMS) on different days. The EMS training used the Compex program with 8 seconds of contraction (60 Hz) at the maximum intensity supported by the subject throughout the movement and 6 seconds of relaxation (7 Hz). Training protocol consisted of 3 blocks of 5 sets of 3 repetitions at 70% 1RM with a 6-second rest between sets and 1 minute between blocks. At the beginning and end of the training, the Power, Height, Speed and Flight time were quantified in the vertical jumps squat jump and countermovement jump in a contact platform, Leg Isometric Maximum Strength, muscle pain as well as Rate Perception Exertion (REP).

Results: In both training protocols, significant differences were observed in all variables between the initial and final values, except for the variable muscle pain. However, no significant difference was observed between protocols.

Conclusions: The results show an increase in muscle fatigue after effort, however, the addition of EMS to resistance training did not produce a significant increase in fatigue, probably because the training protocol performed was not intense enough.

Keywords: Muscle fatigue, EMS, squats, hypertrophy.

Anthropometric techniques for evaluating body composition in the elite of professional football. Comparative study.

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Introduction: Football has become professionalised to the point where all factors are analysed in order to optimise player performance.

Objective: Analyze and compare the muscle and fat component with three different anthropometric techniques, in elite athletes of the Italian football league "Serie A".

Method: The muscle and fat mass have been evaluated using three tools, the BIA method; the DEXA and the anthropometric method (30 variables) analysed with the KINBIA® software. Two evaluations are compared in the season 2019/2020: pre-season and mid-season (n=11), of players who played more than 70 minutes per match.

Results: The evolution of the values has been negative in the fat mass (-0,409 kg by BIA, -1,164 kg by DEXA and -0,566 kg by the anthropometric method) and positive in the muscle (+0,416 kg by BIA, +1,477 kg by DEXA and +1,294 kg by anthropometric method) and the body weight (+1,92%).

Conclusion: Scientifically the three techniques are contrasted, the evolution of the masses are comparable, but not their absolute values.

Keywords: Kinbia, Bioimpedance, DEXA, Fat mass, Muscle mass.

Applicability of movement velocity to quantify training volume in pull-up exercise

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Introduction: Training volume has been considered a critical factor for inducing neural and structural adaptations. Therefore, establishing strategies that allow precise volume control requires attention.

Objective: This study aimed to analyse the reliability of velocity loss as variable to quantify the training volume in the pull-up exercises.

Method: 70 subjects performed an incremental loading test to determine the one repetition maximum (1RM). After this, the subjects performed the maximum number of repetitions with their own body mass with the pull-up exercise. For the analyses, the subjects were grouped according to the relative intensity represented by their body mass.

Results: A strong relationship was observed between the percentage of repetitions performed (%Rep) and the percentage of velocity loss (%VL; R2 = 0.93-0.95) for relative intensities ranging from 60-85% of 1RM. Inter-individual variability in %Rep decreased as %PV increased (CV range 23.1-2.4%). Furthermore, the %Rep for a given %VL was similar for relative intensities comprised between 60-70%, while this increase for relative intensities comprised between 75-85% of 1RM.

Conclusion: The magnitude of velocity loss during the set seems to be an accurate indicator for individualizing training volume in the pull-up exercise.

Keywords: velocity loss, velocity-based training, resistance training, volume training.

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