accelerometer (TrignoTM Wireless EMG System Overview, Delsys, USA; ±2*g*), positioned roughly at L5 level, and the variability (standard deviation) calculated in the AP direction. Surface electromyograms (EMG) were collected from the medial gastrocnemius (MG) and tibialis anterior (TA) muscles bilaterally from the Trigno system (1.926Hz). The EMG's RMS amplitude was obtained to evaluate the degree of muscle excitation. Due to the small sample size, the statistical analysis involves data description by means of median (minimum – maximum).
Results: In relation to EO (8.41, 7.56 – 8.98 gx10-3), the standard deviation of ACAP reduced with BFac (median, min-max: 7.82, 4.32 – 11.45 gx10-3) and increased with BFlaser (9.83, 6.50 – 11.01 gx10-3). For the right body side, the RMS of TA increased with the biofeedback (BFac: 6.33, 2.99 – 9.67rms; BFlaser: 6.11, 2.31 – 8.32rms) when compared to EO (5.07, 2.11 – 7.16 rms). For the MG, while RMS was smaller with BFac (5.53, 2.95 – 17.84 rms), the RMS was higher with BFlaser (7.35, 2.93 – 16.95 rms) in relation to EO (6.63, 2.51 – 23.92 rms). For the left side, both ankle muscles showed a smaller RMS with BFac (TA: 4.29, 3,70 – 7.07rms; MG: 6.22, 2.53 – 10.93rms) and with BFlaser (TA: 3.59, 2,32 – 3.59rms; MG: 6.90, 2.38 – 15.44rms) do que EO (TA: 5.18, 4.50 – 6.70rms; MG: 8.31, 2.01 – 23.29rms).
Conclusion: These qualitative considerations indicate BFac seems to reduce the size of postural sway, while BFlaser increases it during standing balance, when compared to EO. Furthermore, an asymmetric postural activation was revealed regardless of biofeedback. TA and MG seem to reduce the level of muscle excitation at left, while they are more active at right.
Implications: Findings suggest that EMGs may provide different estimates of muscle arousal if collected unilaterally during upright posture with biofeedback. Ongoing study with more individuals to advance knowledge about the potential of biofeedback in improving postural control and reducing the risk of falling.
Keywords: Postural Control, Biofeedback, Electromyography

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201

RELATIONSHIP BETWEEN MAXIMUM MUSCLE STRENGTH AND FREQUENCY SPEED OF KICK TEST FOR BLACK BELT TAEKWONDO ATHLETES

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Background: Taekwondo is a predominantly aerobic combat sport modality (58-66%) in which high-intensity actions are performed with the contribution of the anaerobic alactic system (26-30%) followed by the contribution of the anaerobic lactic metabolism (4-5%). High-intensity actions are performed repeatedly with muscular power and short duration. Thus, seeking to understand the relationship between the variables that represent maximum muscle strength, and the aerobic capacity of taekwondo athletes is relevant for a better understanding of the modality.
Objectives: The aim of this study was to determine whether the 10-second Frequency Speed of Kick Test ($FSKT_{10s}$) correlates with maximal muscle strength in black belt taekwondo athletes.
Methods: Nine male athletes (age: 20.3 ± 5.2 years; height: 177 ± 7.2 cm; body mass: 71.8 ± 15.3 kg and practice time: 9.6 ± 7.2 years) who competed at the state level or more prominently (international: 73%; national: 9%; state: 18%) participated in the study. All were free of any lower limb injury and had no neuromuscular disorder. Maximum muscle strength was achieved in the half-squat exercise, as previously described in the literature. $FSKT_{10s}$ is 10s long, alternating semi-circle kicks between right and left segments on a dummy using a simple torso protector, as often seen in taekwondo matches. Each participant was instructed to read and sign the Informed Consent Form with information about the procedures and risks associated with the study. The Kolmogorov-Smirnov test was used to assess data normality. Pearson's correlation was used to determine the relationship between selected variables. Correlations were classified as follows: 0.0 – 0.1 (trivial), >0.1 – 0.3 (minor), >0.3 – 0.5 (moderate), >0.5 – 0.7 (large), >0.7 – 0.9 (very large), and >0.9 – 1.0 (perfect). For all analyzes an $\alpha = 5\%$ was adopted.
Results: The athletes reached 133±33 kg (95% CI: 108 – 158) during the maximal strength test performed in the half-squat exercise. Values are expressed in relation to the body mass value (1RM/Body mass: 1.9±0.3, 95% CI: 1.6 – 2.1) and allometric scale (1RM/(body mass)0.67 : 7.6±1.4, 95% CI: 6.5 – 8.7). Pearson's correlation showed a statistically significant correlation between the maximum muscle strength test and the $FSKT_{10s}$. The correlation between 1RM/body mass was r = 0.72 (p=0.014). The correlation between 1RM/ $(\text{body mass})^{0.67}$ was r = 0.84 (p=0.004). Both correlations were classified as 'very large'.
Conclusion: There is a strong correlation between maximal muscle strength and $FSKT_{10s}$.
Implications: The strong correlation between the variables studied indicates that athletes with muscular strength developed at optimum levels also improve the frequency of blows applied in a short period of time. Thus, coaches and strength and conditioning coaches will be able to help taekwondo athletes to improve their performance by applying means and training methods aimed at developing maximum muscle strength at optimal levels.
Keywords: Combat sport, Martial art, Sports performance

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202

AN ANALYSIS OF THE VARIABLES OF TACTICAL AND PHYSICAL PERFORMANCE IN THE U-17 MEN'S WORLD CUP

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Background: The tactical and physical demands of a soccer game are of interest to coaches and trainers for better prescription of the physical training process and understanding of the game's demands. When discussing the demands for games played by base categories, information is scarce. In this study, we will investigate correlations

between physical and tactical variables of under-17 soccer players who competed in the 2019 FIFA Soccer World Cup.
Objectives: The objective of the present study was to analyze and associate the variables of physical performance (total distance covered) and technical performance (ball possession, number of passes, shots on goal, compaction with the ball and compaction without the ball) of male soccer players during the FIFA U-17 World Cup.
Methods: Were analyzed 24 national teams participating in the under-17 football world cup, held in 2019. We selected from the technical report, accessed from the official website of the competition (www.fifa.com). Pearson's correlation test (r) was used to describe the association between variables. The correlation coefficient was classified as follows: 0.0 – 0.1 (trivial), >0.1 – 0.3 (minor), >0.3 – 0.5 (moderate), >0.5 – 0.7 (large), >0.7 – 0.9 (very large), and >0.9 – 1.0 (almost perfect). All procedures were performed in IBM SPSS (IBM SPSS Statistics – Version 20.0).
Results: The total average distance covered during the competition was between 106 and 121 km per match. The average ball possession for each team was 36 – 61% per game. There were between 315 and 588 passes and 6 – 24 shots on goal per match. The average compaction per match with ball possession was between 708 and 1081 meters^2, and without ball possession was 500 – 744 meters^2. Correlations classified as 'very large' were observed between possession of the ball and passes (r= 0.814), 'great' between total distance and compaction without the ball (r= -0.599) and passes and compaction without the ball (r= -0.555), 'small' between total distance and possession of the ball (r= 0.219), total distance and compaction with the ball (r= -0.103) and passes and compaction with the ball (r= -0.254) and 'trivial' between total distance and shots a goal (r = -0.075) and possession and compaction without the ball (r = -0.001).
Conclusion: It was observed that the exchange of passes is an important foundation for maintaining possession of the ball, exploring spaces on the field of play and reducing physical demand.
Implications: Coaches and trainers can develop the physical capabilities of players to serve as a basis for executing technical and tactical demands. Thus, based on our results, we suggest that technicians and trainers search for means and methods of physical and tactical training that are more efficient for the age group in question. In this way, players will be able to fulfill their duties during the game, pass with greater possibilities of reaching the goal and finish on goal when they are better positioned. The choice of this strategy will make it possible to improve the performance of the team/players during matches during the competition.
Keywords: Sports performance, Demands of the game, Youth sports

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203

PELVIC FLOOR MUSCLES CONTRACTION MAY STIMULATE THE CARDIAC AUTONOMIC CONTROL OF HEART RATE IN POSTMENOPAUSAL WOMEN: A CROSS-SECTIONAL STUDY

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Background: Pelvic floor muscles (PFM) contraction is often assessed during the quantification of PFM function, and it is the principal mechanism of the pelvic floor muscles training, as well as the first line of treatment of several PFM dysfunctions. However, comparisons about the effects of these muscle contractions on the cardiac autonomic modulation (CAM) in pre- and postmenopausal women are still not known.
Objective: To compare the effects of a PFM contractions protocol on heart rate variability (HRV) in rest and recovery, in apparently healthy pre- and postmenopausal women.
Methods: This is a cross-sectional study it was conducted at the Women's Health Research Laboratory, Federal University of São Carlos, Brazil. We recruited 37 apparently healthy women, aged between 20-70 years old, with a body mass index lower than 30 kg/m^2 and without history of pelvic surgery. Participants were divided into pre-menopausal group (PG=23, 24±3 years) and postmenopausal group (PMG=14, 57±7 years). The PFM protocol consisted of 8 min at rest in supine position, 10 sustained PFM contractions of 5 seconds each and 8 min recovery. The heart period (HP) was recorded during the protocol through a cardiac monitor (Polar® RS800CX Kempele, Finland). Resting and recovery HP variabilities (256 consecutive points of the tacogram) were assessed by representative time-domain indices (RMSSD and SDNN) and frequency domain indexes (LF and HF abs and normalized units).
Results: PMG showed reduced time domain indices compared with PG ($P<0.05$). Frequency-domain indexes showed that PFM contractions can affect the cardiac autonomic control, in recovery condition, by increasing sympathetic cardiac modulation (LFabs) and reducing cardiac vagal modulation (HFabs), $p<0.05$, in PG only.
Conclusions: Postmenopause is associated with a marked reduction in heart rate variability indices. The PFM contraction can affect cardiac autonomic control physiologically, to meet the metabolic demands during exercise; however, reflecting on the increasing sympathetic cardiac autonomic and reducing vagal modulation in the recovery, mainly in PG.
Implications: Long-term safety, as well as interventions based on PFM to improve CAM in postmenopausal women, should be investigated in the future.
Keywords: Heart rate variability, Pelvic floor muscles exercise, Women

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