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Fatigue does not decrease acute sprinting performance after a wheelchair tennis match: comparison between hard and clay courts

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Aim: In conventional tennis, sliding is very frequent on clay courts as a result of lower friction forces (Starbuck et al., 2016), but this is not possible in wheelchair tennis, where players have to use the same movement patterns on both surfaces (Ponzano et al., 2017). Therefore, the purpose of this study was to investigate potential modifications in coordinative and conditional abilities after a wheelchair tennis match by means of the analysis of non-linear speed on both hard courts and clay courts.

Methods: Twelve wheelchair tennis players played 12 matches, of which 6 on clay courts and 6 on hard courts. Before and after the matches, the participants performed the Twist and Sprint Wheelchair Test (Gollin et al., 2015) and data collected before and after each event were compared.

Results: The *t* test showed significant variations ($p < 0.05$, $ES = 0.20$, -2%) concerning the test performed on the hard court (H) between data collected before ($H_0 = 9.61$ s) and after ($H_1 = 9.43$ s) the match. Significant differences regarding the test on the clay court (C) before ($C_0 = 10.03$ s) and after ($C_1 = 10.04$ s) the match did not come to the light.

Conclusions: The effects of fatigue after a wheelchair tennis match that lasts less than 90 min do not bring about decrements of performance, regardless of the playing surface. Sprinting performance improves significantly after having played on hard courts, because of the continuous stimulation of specific coordination and the unimportant friction force caused by this surface.

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Multiple sclerosis: post-exercise recovery of heart rate and autonomic function

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Aim: Parasympathetic reactivation and sympathetic withdrawal affect the post-exercise heart rate recovery pattern (PHRR). Patients with

multiple sclerosis (MS) might develop autonomic dysfunctions lengthening the recovery following exercise and favoring the onset of fatigue. This study aimed at evaluating PHRR in MS patients and its relationship with EDSS and subjective fatigue.

Methods: Eleven MS patients [50.8 ± 6.1 years ($m \pm DS$); EDSS: 5.7 ± 1.1] and 8 age-matched controls (56.1 ± 6.0 years, CTRL) participated to the study. Patients were asked to sustain two different exercise intensities (5 and 10 watts, 4 min each) with the upper-limb, followed by 2 min of recovery. PHRR were evaluated from heart rate by: (1) HR reduction 30 (HRR_{30}) and 60 (HRR_{60}) s after the end of exercise; (2) the time constant (τ) of the mono-exponential HR decay; (3) the slope of the semi-logarithmic decay (T_{30}) of HR in the first 30 s recovery and (4) the Root Mean Square of Successive Differences (RMSSD) between consecutive heart beats (index of parasympathetic tone) calculated every 30 s after exercise. Subjective fatigue during recovery was calculated by the Rate of Perceived Exertion (RPE).

Results: Compared to CTRL, HRR_{30} was lower in MS patients, whereas T_{30} tended to be higher ($p < 0.05$ and $p = 0.08$, respectively). HRR_{60} , τ , and RMSSD every 30 s did not differ between groups while RPE was significantly higher in MS patients. No correlation was found between RMSSD, HR recovery parameters and EDSS or RPE.

Conclusions: The post-exercise reactivation driven by the cardio-vagal control is altered in MS subjects but this seems not to be associated to fatigue development as no differences were found in the parameters of the 30 s of recovery. The time-course of RMSSD seems to be not suitable in discriminating differences in parasympathetic reactivation suggesting the use of other heart rate variability indexes to focus on this dynamic.

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Time motion and notational analysis of competitive paddle

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Aim: Paddle is mainly played outdoors on an artificial turf court surrounded by a glass enclosure (Muñoz Marin et al., 2001), and its regulation and points are similar to those of tennis, so it can be classified as an intermittent sport (Gianfelici et al., 2016). The aim of this study was the description of the performance model of paddle match play. Additionally, intra and inter-observer agreements were assessed.

Methods: Six Italian Serie B national league matches were examined. Data were collected by means of a video camera (GoPro, Hero 4 Silver, GoPro Inc., San Mateo, CA, USA) and analyzed by using the software Longomatch Open Source version 1.3.2. 59 performance indicators, of which 11 pertaining to time-motion analysis (TMA) and 48 to notational analysis (NA), were taken into consideration. ICC has been utilized to evaluate intra and inter-observer agreement.

Results: The average match duration was 53.7 ± 14 min and the effective playing time 31.3% of the total, with a work/rest ratio corresponding to $1:3.4 \pm 0.8$. The average rally duration was 6.7 ± 1 s, with an average of 4.7 ± 0.7 shots performed per rally.

Many significant differences pertaining to shots characteristics (SC), errors (E), serve (S), points won (PW) and winning and losing players were observed. ICC for the intra and inter-observer agreement were 0.99 and 0.95 to 0.97 respectively.

Conclusions: This study provides important data regarding the match analysis of paddle. With reference to international literature, it is possible to notice many similarities with tennis, despite the shorter match duration and the greater effective playing time in paddle.

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POSTER SESSIONS

1 APA

Effects of thin plantar inserts on the horizontal heterophoria: modification of the functional relationships between the foot and posture

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Aim: The muscles of the feet seems to work with a functional synergy with the ocular muscle: the invertors muscles of the feet are synergic with the convergence muscles and the evertors of the feet work together with the divergence muscles (Roll et al. 1988). Vertical heterophoria could reflect a mild global sensorimotor conflict between sensory, such as somesthetic, and motor inputs affecting the performance of balance control and maybe lead to pain (Matheron et al. 2011). Medial arch support is more effective than lateral arch support and acts upon divergence, whereas lateral arch support produces its effects upon convergence only. (Foisy et al. 2015)

The aim of this study was to verify the modifications of horizontal heterophoria with maintaining an External Heel Wedge (EHW) applied according to the Bricot's method.

Methods: seventeen healthy subjects with the right dominating eye were recruited (age 31 ± 5 years). The EHW was made from a cork half moon thickness of 1.5 mm, length 6 cm and a height of 3 cm. The Maddox rod test to evaluate the horizontal heterophoria was performed. For both eyes we evaluated the distance of correction and calculated the difference between eyes.

The sequence of tests foresaw: trials baseline without EHW, trials with EHW, trials after an adaptation period of 15 min on treadmills with EHW.

Results: Data showed statistically significant variations (Parametrical statistic analysis ANOVA, post-hoc, baseline vs after 15 min, $p < 0.05$) in the discrepancy of exophoria between two eyes and Left eye correction.

Conclusions: This study has shown how a mechanical stimulation applied on the plantar arch can affect the optical axis. The results highlight that the application of this kind of stimulation decreases significantly the discrepancy of correction of the exophorias between two eyes. This variation occurred on the non-dominating eye while the dominating eye did not suffer significant changes.

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Effect of Tai Chi training on strength and balance in a group of elderly people

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Aim: Among the fundamentals of Tai Chi there are “the work on stability”, “the work of the legs” and the achievement of a psychological balance. The strength training of the lower limbs and the balance underscore the importance of these conditional and coordinative skills in Tai Chi. In elderly people, one of the main reasons for approaching physical activity is to improve strength, balance and inner wellbeing. The aim of this study was to assess the effects on strength, balance and the degree of acceptance after 6 months of a Tai Chi program compared with an Adapted Physical Activity (APA) program.

Methods: Fifteen older subjects were recruited for this study and divided into two groups: the Tai Chi group (6 subjects; 69.3 ± 3.3 years) and the APA group (9 subjects; 73.2 ± 5 years). The protocol was composed of two 1 h-sessions per week, for 6 months, under the supervision of certified Tai Chi and APA trainers. The probability level taken to indicate significance was $p < 0.05$. Values are mean \pm SD.

Results: After 6 months of activity, the Tai Chi group and APA group showed significant improvements in both strength and balance. Furthermore, the enhancements in balance and the degree of acceptance were significantly greater in the Tai Chi group compared to the APA group ($p < 0.05$), whereas not significant differences in strength were showed between the Tai Chi group and APA group.

Conclusions: The results of the present study show that Tai Chi is a more feasible intervention to improve balance, and for the degree of acceptance of physical activity compared to APA.

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