



Meeting Report

# Italian Society of Sports and Exercise Medicine Annual Conference Held in Brescia, Italy, 18–19th November 2016

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## 1. Aim and Scope of the Meeting

The annual conference and scientific meeting of the Italian Society of Sports and Exercise Medicine took place in Brescia, Italy from 18th to 19th November, 2016. This is the fourth meeting of this new Society, born ten years ago. This year for the first time, at this meeting, was present the Italian Society of the Internal Medicine and different Italian patients associations. The theme of the Italian Society of Sports and Exercise Medicine in 2016 was “Exercise is Medicine”. The plenary session “adapted and preventive physical activity” was provided to address ongoing debate in Italy about the role of the movement and physical activity and the role of sports and exercise medicine in chronic diseases. In particular, there were different addressed topics as cardiovascular and cancer diseases, diabetes, osteoarthritis, aging, transplantation and biomechanics in relation to the adapted physical activity. Abstracts of scientific presentations during the meeting are collected in this report.

## 2. Summary of Scientific Presentations

*P-01. Cardiovascular Performance after 5 Months of Exercise as Prescription Program: A 6-Minute Walk Test and Echocardiographic for Functional Assessment*

Mascherini, G.; Scacciati, I.; Francini, L.; Petri, C.; Stefani, L.; Galanti, G.

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**Introduction:** Exercise as prescription represents a therapy in many chronic diseases. More recently the employment of the 6-Minute Walk Test (6MWT) for a regular evaluation has been spread. The study is aimed to verify the role of the 6MWT in predicting the progressive improvement of the heart performance.

**Materials and Methods:** Eleven hypertensive patients were enrolled for this study. At the beginning ( $T_0$ ) and after 5 months ( $T_5$ ) of exercise program, at least three times a week at moderate intensity, a 6MWT was carried out to evaluate: meters (6MWD), Peak Heart Rate (PHR), Peak Respiratory Rate (PRR), Systolic and Diastolic Blood Pressure (SBP, DBP). In the same session an echocardiographic exam was performed.

**Results:** After 5 months there was a positive trend: 6MWD  $T_0$ :  $567.27 \pm 66.65$  m in  $T_5$ :  $599.09 \pm 81.42$  m ( $p = 0.33$ ); PHR  $T_0$ :  $134.36 \pm 12.13$  beats /min in  $T_5$ :  $136.00 \pm 10.30$  b/min ( $p = 0.74$ ); PRR  $T_0$ :  $30.00 \pm 4.38$  r/min in  $T_5$ :  $31.45 \pm 4.95$  r/min ( $p = 0.47$ ); SBP  $T_0$ :  $137.73 \pm 14.89$  mmHg in  $T_5$ :  $143.64 \pm 12.67$  mmHg ( $p = 0.33$ ); DBP  $T_0$ :  $75.27 \pm 7.80$  mmHg in  $T_5$ :  $70.91 \pm 5.84$  mmHg ( $p = 0.15$ ). Cardiac Mass Index (CMI) resulted to significantly increased after 5 months of regular exercise.

**Conclusions:** Exercise as prescription improves the effort tolerance showed by the HR response at the peak of the exercise, with an increase of CMI parameter. The 6MWT seems to be a sensible test much more than echo parameters whose modifications need a longer period of observation. Otherwise the pulmonary response to the exercise does not seem to be apparently easily estimated in presence of exercise program at moderate intensity.

*P-02. Exercise Prescription Program to Reduce Cardiovascular Risk Factors: Comparison between Cancer and Hypertensive Patients*

Stefani, L.; Mascherini, G.; Scacciati, I.; Francini, L.; Petri, C.; Galanti, G.

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**Introduction:** A short period unsupervised exercise program's impact in metabolic chronic diseases is not yet well investigated. The study aims to verify the effects of "fast walking" associated to a resistance exercise in hypertensive and cancer patients.

**Materials and Methods:** Ten cancer survivors aged 48.8 years and 19 hypertensive patients aged 54.3 years were evaluated by BMI and waist circumference, cardiovascular performance and of exercise tolerance, by 6-Minute Walk Test (6MWT), heart rate (HR), respiratory rate (RR) and SBP, DBP at rest and at the end of the exercise. Total Body water (TBW), extracellular and intracellular water (ICW, ECW), and the flexibility (sit & reach test), strength test for the upper limbs (hand-grip) and lower ones, (30" Chair Test) were also performed. The exams were performed at the initial phase of the study and after 3 months of regular physical exercise.

**Results:** A significant reduction of anthropometric parameter has been observed (BMI  $T_0 = 29.2 \pm 6.8$  vs.  $T_3 = 27.4 \pm 4.4$ ,  $p < 0.001$ ; waist circumference:  $T_0 = 92.5 \pm 14.1$  cm vs.  $T_3 = 92.1 \pm 12.8$  cm,  $p < 0.05$ ) in the hypertensive population as well as in tissue water distribution (ECW  $T_0 = 17.5 \pm 3.7$  vs.  $T_3 = 17.2 \pm 3.9$ ,  $p < 0.005$ ), while predominant improvement of the cardiovascular parameters was observed in cancer group (DBP  $T_0 = 76.4 \pm 6.5$  vs.  $T_3 = 72.2 \pm 7.1$ ,  $p < 0.05$ ; 6MWT meters  $T_0 = 487.8 \pm 116.0$  vs.  $T_3 = 525.6 \pm 117.3$ ,  $p < 0.05$ ). In the same group the flexibility tests resulted to be also improved (sit and reach test:  $T_0 = 0.4 \pm 7.4$  cm vs.  $T_3 = 4.1 \pm 6.1$  cm,  $p < 0.05$ ).

**Conclusions:** Mixed exercise program modifies mainly the cardiovascular risk factors in a hypertensive population, while in cancer the exercise tolerance and the flexibility parameters. Further studies will be anyway necessary to investigate the main cause of this diverse sensibility.

*P-03. Effects of Med Diet on Oxidative Stress Resulting from Exhaustive Exercise in Skeletal Muscle*

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**Introduction:** Physical exercise induces oxidative stress through production of reactive oxygen species and can cause damage to muscle tissue. Oxidative stress, resulting from exhaustive exercise, is high and improvement of antioxidant defenses of the body may ameliorate damage caused by free radicals. Extra-virgin olive oil is widely considered to possess anti-oxidative properties. The aim of this study was to determine if extra-virgin olive oil improved the adaptive responses in conditions of oxidative stress.

**Materials and Methods:** Twenty-four 12-week-old male Sprague-Dawley rats were divided in three groups: (1) rats fed with standard chow and not subjected to physical exercise; (2) rats fed with standard chow and subjected to exhaustive exercise; (3) rats fed with a diet rich in oleic acid, the major component of extra-virgin olive oil, and subjected to exhaustive exercise. Exhaustive exercise consisted of forced running in a five-lane 10° inclined treadmill at a speed of 30 m/min for 70–75 min.

**Results:** We studied some biomarkers of oxidative stress and of antioxidant defenses, histology and ultrastructure of the Quadriceps femoris muscle (Rectus femoris). We observed that, in rats of group 3, parameters indicating oxidative stress such as hydroperoxides and thiobarbituric acid-reactive substances decreased, parameters indicating antioxidant defenses of the body such as non-enzymatic antioxidant capacity and Hsp70 expression increased, and R. femoris muscle did not show histological and ultrastructural alterations.

**Conclusions:** Results of this study support the view that extra-virgin olive oil can improve the adaptive response of the body in conditions of oxidative stress.

#### *P-04. Cardioprotection in Breast Cancer Survivors: Role 2D Speckle Tracking*

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**Introduction:** Regular physical activity (PA) and sport are normally allowed to preserve myocardial function in cancer patients, however they can represent a risk for patients with potential cardiotoxicity. Global Longitudinal Strain (GLS) is recently promoted in the follow-up of the myocardial function. No data are available about the role of 2D GLS Speckle Tracking analysis, to detect the eventual differences among the surviving breast cancer.

**Materials and Methods:** A group of 23 surviving cancer subjects trained in competitive sports activity Dragon Boat Athletes (DBA) for at least 5 years, were selected and submitted to a complete echo exam including LV GLS assessment (XStrain, Esaote, Florence, Italy), matched with a group of 23 previous cancer patients, following the exercise as prescription therapy and compared with two groups of 20 healthy athletes (HA) from different kinds of non-competitive sports, and 20 volunteers (healthy subjects) submitted to the exercise as prescription program.

**Results:** All the values were within the normal range. Ejection Fraction (EF) ( $64.8 \pm 5.1$ ) and Global Longitudinal Strain (GLS) ( $-25.4 \pm 2.1$ ) resulted significantly higher ( $p < 0.05$ ) only in HA if compared to all. No differences between Ex Prescr. patients (EF:  $59.95 \pm 7.3$ ; GLS:  $-19.93 \pm 4$ ) compared to the DBA competitive trained group (EF:  $57.2 \pm 5.5$ ; GLS:  $-21.87 \pm 5.3$ ) both similarly treated with cardiotoxic drugs.

**Conclusions:** 2D STE analysis and particularly GLS completes the assessment of the myocardial function during exercise as prescription therapy as well in sport. GLS improves the supervision of the intensity of exercise and optimizes the cancer therapy.

#### *P-05. Bioelectrical Values During a Regular Season in Professional Soccer Players*

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**Introduction:** Football is a sport team with a discontinuous nature of physical effort and the duration of the regular season is 10 months length. Hydration status, water consumption are aspects of human performance debate in recent years. The aim was collect bio impedance data of all team in order to check and analyzed, at the end of the season, whether there was a trend of the bio electrical values of the team members.

**Materials and Methods:** Bioelectrical parameters of an Italian professional football team were recorded eight times during a regular season. The detection was carried out following the standard tetrapolar method by Bio Impedance Analysis (BIA). Twenty-five male soccer players were submitted at BIA measurement, but only eleven athletes (age  $22.36 \pm 1.80$  years, height  $181.27 \pm 7.67$  m) took part in all eight sessions detection.

**Results:** The data recorded by conventional BIA processing did not show any statistical differences both in weight, hydration and cellular masses. Bio Impedance Vector Analysis (BIVA) shows a high significance in Anova test for the values of Reactance (Xc) and Phase Angle (PA), while the Resistance (Rz) presents no significant differences among the eight measurements.

**Conclusions:** Body composition and hydration status in footballers are generally well and the variations in conventional BIA are minimal. Therefore the BIVA in this population may give specific information for physiological changes for training dues. A regular BIA assessment athletes is desirable to follow the physiological adaptations to training loads, which are particularly high in the period preceding the start of the official competition.

*P-06. Clinical Experience of a Moderate and Unsupervised Mixed Exercise Program in Cancer Patients*

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**Introduction:** Aerobic and resistance exercise have been recently promoted to improve global fitness, cardiovascular performance and quality of life of cancer patents. It is normally proposed in a “supervised way”. The study aims to investigate the long term effects of “unsupervised exercise program”.

**Materials and Methods:** A group of 37 colon and breast cancer survivors (7 male and 30 female, 45 ± 3 years) were enrolled for the long term exercise as prescription program. An individualized level of aerobic and resistance exercise, at moderate intensity (60% of the maximal effort), was established by the 6 Minutes Walking Test (6MWT). A resistance exercise was determined on the basis of chair stand test and hand-grip tests. The weight, body mass index (BMI), waist and hip circumferences, hydration by BIA Analysis and cardiovascular parameters at the 6MWT were assessed.

**Results:** A significant reduction of the weight (T<sub>0</sub>: 72.5 ± 16 vs. T<sub>12</sub>: 71.2 ± 15; *p* < 0.005); of the BMI (T<sub>0</sub>: 26.5 ± 5.5 vs. T<sub>12</sub>: 26.12 ± 5.5; *p* < 0.01); Waist circumference (T<sub>0</sub>: 97.5 ± 15 vs. T<sub>12</sub>: 85.8 ± 13; *p* < 0.01) diastolic blood pressure (DBP) after 6MWT (T<sub>0</sub>: DBP 71 ± 8 vs. T<sub>12</sub>: 70.8 ± 8 mmHg; *p* < 0.01). The distance at 6MWT (T<sub>0</sub>: 525.8 ± 7 vs. T<sub>12</sub>: 547.64 ± 6 mt; *p* < 0.001) was increased. A very significant improvement (*p* < 0.001) has been observed also among the strength parameter for the upper and lower limbs. No significant variations of the myocardial parameters.

**Conclusions:** Mixed exercise maintains normal heart function in previous cancer patents, enhances strength and modifies substantially the body composition reducing of cardiovascular risk factors.

*P-7. Is there an Association between Different Morphological BAV Patterns and LV Dimensions in Athletes from Different Kinds of Sports?*

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**Introduction:** Bicuspid aortic valve (BAV) is a common congenital cardiac disease normally represented in two different morphologies: “typical (raphe) or atypical (no-raphe)”. It has been demonstrated as BAV can be associated to a mild enlargement of the left ventricle (LV) chamber. The prevalence of the two BAV patterns and the eventual association with the increase of the LV dimensions is not yet investigated. The study aims to investigate in a large group of BAV athletes from different kinds of sports, and mild valve dysfunction, these two aspects.

**Materials and Methods:** From 2000 to 2011, a group of 292 BAV subjects were submitted to a 2D echo exam (MayLab 50-ESAOTE) to classify the BAV morphology and to measure the standard LV systo-diastolic parameters (LV diameters, wall thickness and Cardiac Mass Index (CMI)).

**Results:** The typical BAV was more represented in all the groups (68%, 67% and 63%). Within the typical BAV pattern the form due to the fusion of the right cusp with the left one, was more common

(70%, 73% and 62%) in all the groups. In athletes only, typical BAV was found in 51% of soccer players, in 10% of basketball players, in 8% of cyclists, 6% swimmers, and 15% rugby players. All the echo parameters didn't show any statistical differences with respect of the different morphological BAV patterns and to the different kind of sports.

**Conclusions:** The results confirm the prevalence of BAV in athletes is similar to the general population. No significant impact of sport in the LV dimensions of different BAV patterns associated.

*P-8. Chondrogenic Differentiation of Human Adipose Tissue-Derived Mesenchymal Stem Cells in a 3D in Vitro Model*

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**Introduction:** The aim of this study was to identify the most appropriate time point for the successful chondrogenic differentiation of adipose tissue-derived mesenchymal stem cells (AMSCs).

**Materials and Methods:** For this purpose, the expression of some chondrogenesis markers, such as collagen type I, collagen type II, lubricin and RUNX2 have been investigated by immunohistochemical and Western blot analysis at different time points (7, 14, 21 and 28 days). The AMSCs chondrogenic differentiation in the natural self-assembling constructs, called "cell pellets" has been also assessed by the histological (hematoxylin and eosin) and histochemical (alcian blue staining) methods.

**Results:** The results showed that the differentiated chondrocytes, after 21 days of differentiation process, were able to produce increased quantities of collagen type I, collagen type II, and lubricin, suggesting the hyaline cartilage formation, and reduced expression of RUNX2, a protein expressed by the hypertrophic chondrocytes in the late stages of differentiation and normally expressed by osteoblasts.

**Conclusion:** Our study demonstrates that 21 days represents the optimum period for the potential implantation of AMSCs derived chondrocytes for the cartilage defects. This information could be useful for the future development of cell-based therapies for the articular cartilage degenerative diseases.

*P-9. The Effects of Physical Activity and Mechanobiology on Articular Cartilage*

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**Introduction:** Osteoarthritis (OA) is a degenerative disease of the articular cartilage, and it represents one of the most common causes of disability in the world. It leads to social, psychological and economic costs with financial consequences. Different OA treatments are usually considered in relation to the stage of the disease, such as surgical management, pharmacologic and non-pharmacologic treatments. In relation to mild OA, non-pharmacologic and behavioural treatments are recommended because they are less invasive and better tolerated by patients. All of these treatments used to manage OA are problematic, but solutions to these problems are on the horizon. Until today, there has been very little information regarding the physical treatment of this important disease to help medical doctors and patients in the choice of the best-adapted training to manage pain and disability limitations in patients with OA. The aim of this report is to find some answer in the management of OA through physical therapy treatment.

**Materials and Methods:** All data suggest that training exercise is considered an effective instrument for the treatment of mild OA. For this reason, we have chosen to study the effects of physical activity

in an in vivo animal model of OA and the effects of mechanical loading on articular cartilage in an in vitro 3D model through the use of a bioreactor.

**Results:** These results demonstrated the cell signaling correlated to the mechanical loading, some aspects of the mechanobiology and the positive and negative effects of the mechanical loading on articular cartilage in both in vitro and in vivo model.

**Conclusions:** The benefits of the mechanical loading on articular cartilage have both short- and long-term effectiveness.

*P-10. Physical Activity in Elderly: Effects on Cardiac Autonomic Modulation*

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**Introduction:** Heart rate variability (HRV) is an independent predictor of the risk of sudden cardiac death. This study aimed to verify the improvements in cardiac autonomic modulation in elderly people after a 6 months physical activity program.

**Materials and methods:** Experimental procedure includes a phase 1 in which the cohort of subjects underwent to cardiopulmonary test and analysis of HRV after 5 min of ECG recording during tilt-test. In phase 2, subjects performed 3 times a week an aerobic and resistance workout for six months. During phase 3 we repeated the same tests used the initial assessment to evaluate improvements. The study was conducted in a cohort of 19 subjects ( $70.6 \pm 5.4$  years), 10 females and 9 males. Inclusion criteria were: age between 65 and 90 years old, subjects physically active, presence of informed consent. Exclusion criteria were: diagnosis of diabetes mellitus 1 or 2, diagnosis of cardiac arrhythmia, previous syncopal episodes, presence of acute diseases, patients with pacemaker or implantable defibrillator; beta-blockers treatment. Electrocardiograms single-channel were obtained by BodyGateWay device. The spectral analysis was possible by HeartScopeII software. Data obtained were analyzed using Student *t* test ( $p < 0.05$ ).

**Results:** Cardiopulmonary tests showed an improvement of  $VO_2$  at 1aSV of 10.1% ( $p = 0.02$ ) and an increase of % $VO_2$  at 1aSV of 6.61% ( $p = 0.016$ ). HRV analysis demonstrated an increase of total-power in the upright position ( $p = 0.015$ ). Low Frequency (LF) and High Frequency (HF) hadn't showed significant changes, as proved by student *t* test results.

**Conclusions:** We did not obtain any significant change in autonomic cardiac control although the administered training was effective. It would be interesting to assess increase in total-power. Study results confirm that a training period in a cohort of elderly subjects is not associated with change in the LF and HF components, as already shown by medical literature.

*P-11. Physical Activity in Elderly People: Evaluation of the Recovery Phase Post Maximal Exercise*

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**Introduction:**  $T_{1/2}$  (index of oxygen kinetics) and HRR (heart rate recovery) are related with prognosis in patients with heart failure.  $VO_2$  max, HR max, AT (anaerobic threshold), RC (respiratory capacity) are indicators of physical fitness. As known by literature one year of supervised physical activity improve these indices. The aim of our study is to investigate in elderly people the impact of a 6 month long physical exercise program using these parameters.

**Materials and Methods:** We recruited 20 elderly patients without contraindication and, at first ( $T_0$ ), we assessed  $T_{1/2}$ , HRR,  $VO_2$  max HR max, AT and RC by Cardiopulmonary exercise testing (CPET). After the 6 months training ( $T_6$ ) we repeated the evaluation. Then we compared and analysed (through student *t* test) the results of the two CPETs.

**Results:** As regard  $T_{1/2}$ , HRR and  $VO_2$  max we didn't obtain statistically significant results but HR max showed a significant improvement of AT ( $T_0$ :  $61 \pm 6$ ;  $T_6$ :  $67 \pm 5$ ;  $p = 0.001$ ) and RC ( $T_0$ :  $87 \pm 7$ ;  $T_6$ :  $91 \pm 2$ ;  $p = 0.03$ ).

**Conclusion:** Six months of physical activity are not enough to cause an increase of cardiac and pulmonary parameters ( $T_{1/2}$ , HRR,  $VO_2$  max, HR max), but the enhancement of AT and RC indicates an improvement in the capacity to perform higher intensity exercise. The fundamental limits of the study were the poor compliance of the subject and the short duration of the program. Therefore, probably, prolonging the duration of the supervised physical exercise and improve the compliance we could obtain better results also in elderly people.

#### *P-12. Pre-Event Massage for Increased Power Performance*

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**Introduction:** Sport massage has been used for many years around the world as an aid to enhance performance, recover from muscle soreness and prepare for exercise. While massage is often used as an adjunct therapy, it is most commonly used in post-exercise contexts rather than pre-exercise contexts. Pre-exercise activities, such as warm-up, stretching and massage, can enhance performance and decrease the likelihood of eccentric exercise induced muscle damage. However, massage has not proven beneficial in a pre-exercise context, as little research has been conducted in this area. Therefore the purpose of this study was to examine the use of massage as an ergogenic aid.

**Materials and Methods:** Vertical jump baselines were used to compare and contrast the performance results after a 15 min lower body massage which included: Prone Position: (i) Treatment to lower leg-calf (1.5 min per leg, 3 min total), (ii) Treatment to the hips (2 min per leg, 4 min total), (iii) Treatment to the hamstrings (2 min per leg, 4 min total); Supine Position: (i) Treatment to the quadriceps (2 min per leg, 4 min total).

**Results:** Mean vertical jump height were 30.4 cm ( $\pm 7.3$  cm) at baseline, and 30.28 cm ( $\pm 9.1$  cm), 31.1 cm ( $\pm 8.3$  cm), 31.3 cm ( $\pm 8.6$  cm), 31.5 ( $\pm 8.8$  cm) at 1, 6, 11 and 16 min post massage. Results indicated that the use of massage prior to performance decreased vertical jump height after 1 minute but steadily increased it at 6, 11, and 16 min respectively. It can be concluded that pre-event massage may decrease performance immediately following massage, but may improve performance for a period between 6 and 16 min following.

**Conclusion:** Pre-event massage may inhibit neural drive and spinal reflexes used in jumping for a short period following a massage, but significantly increase performance for a period following. However, more research needs to be conducted on massage localization and duration in order to further see the effects of pre-event massage on performance.

#### *P-13. Pre-Event Dynamic Warm up for Increased Power Performance*

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**Introduction:** Warm-up has been found to enhance performance and decrease the plausibility of eccentric exercise generated muscle damage. It is hypothesized that dynamic motion, followed by neuromuscular activation through balance and explosive movement may prove to be more beneficial than low level dynamic motion alone. The purpose of the present study was to examine the effects of a dynamic warm-up for the promotion of muscular force production (as measure via a vertical jump).

**Materials and Methods:** Each trial lasted approximately 45 min, and included two baseline vertical jump trials followed by a 15 min warm-up. Vertical jump data was collected at 5 min intervals following the warm up.

**Results:** The mean vertical jump height (VJH) at baseline was 28.17 cm with a standard deviation of  $\pm 8.46$  cm; the mean height achieved at 1 min was 32.08 cm ( $\pm 9.71$  cm), at 6 min 30.38 cm ( $\pm 10.19$  cm), at 11 min 30.41 cm ( $\pm 10.59$  cm), and at 16 min 30.04 cm ( $\pm 10.33$  cm). Each jump at the 1, 6, 11 and 16 min intervals were compared to the initial baseline jump using a one tailed paired *t*-test ( $p < 0.05$ ), and were found to be significantly greater than baseline.

**Conclusions:** Warm ups play an important role in maximizing performance in athletes. The present findings provide evidence that a dynamic warm up can increase power performance in a vertical jump procedure.

#### *P-14. Cardiovascular Fitness Assessment in Renal Organ Transplants*

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**Introduction:** Regular Physical exercise is a new method to reduce the metabolic syndrome in presence of solid transplantations. An Italian pilot study is going to assess the benefits of a supervised exercise training program, in renal solid organ recipients.

**Materials and Methods:** By the informed consent, 6 renal transplant recipients patients, were submitted to supervised aerobic exercise program, whose intensity, duration and frequency were established after a cardiopulmonary exercise test. An echocardiographic exam, skin fold, bio impedance analysis, and test of strength for the lower limbs (leg press for the quadriceps and calf) and higher limb (arm curl, french press and lateral lift) were also performed. The exercises consisted of 30 min of aerobic training at the intensity of aerobic threshold and 2 sets of 20 repetitions at 35% of the maximum load for each resistance exercise.

**Results:** All the echocardiographic parameters are normal Left Ventricle Diastolic diameter (LVDD (mm)  $48.0 \pm 3.6$ ; Left Ventricle Systolic diameter (LVSD) (mm)  $30.0 \pm 5.4$ ; Cardiac Mass Index (CMI) ( $\text{m}^2/\text{m}^2$ )  $116.8 \pm 21.7$ ; Ejection Fraction (EF) (%)  $62.0 \pm 3.2$ ; E peak (cm/sec)  $85.2 \pm 15.2$ ; Deceleration Time (DT) (cm/sec)  $212.7 \pm 58.0$ ). These values will then be updated every six months to adapt the program that will end after one year of training.

**Conclusion:** Cardiovascular fitness assessment after renal transplantation is an essential requirement to start with an aerobic and resistance exercise program. The Physical Exercise is a promising tool in this special category despite the eventual long term positive impact is not yet demonstrated.

#### *P-15. Myocardial Performance in Breast Cancer Survivors Athletes*

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**Introduction:** The upper limbs edema in breast cancer survivors is a frequent side effect, often controlled with sport activity as Dragon Boat. No data are available on the cardiovascular performance when this sport is regularly practiced. The study aims to evaluate in a group of survivors breast cancer women (BC), the myocardial effects of Dragon Boat.

**Materials and Methods:** A group of 55 survived cancer breast women, practicing Dragon Boat were yearly submitted to an ergometric test, and to a 2D echocardiographic exam (MayLab 50-ESAOTE) to evaluate the hemodynamic, morphological and functional cardiac parameters. All data have been matched with a group of 36 healthy women (HW).

**Results:** Both groups have maintained a normal systolic function during all the period, despite the CMi and BMI and EF values were higher in HW. After 4 years of sport Dragon Boat activity, the diastolic parameters resulted to be improved in both, but especially in BC group (A peak: from  $68.5 \pm 15.1$  to  $50 \pm 14.1$  cm/sec with  $p < 0.05$ ; E': from  $9.3 \pm 2$  to  $11.89 \pm 1.7$  cm/sec with  $p < 0.001$ ). The data of the ergometric test showed in both normal values despite in HW group were significantly higher than in BC (Double Product  $23870 \pm 3190$  in HW vs. BC  $22785.8 \pm 276$  with  $p < 0.005$ ).

**Conclusions:** The results obtained demonstrate significant improvement of the diastolic function in BC survivors after four years of Dragon Boat sport training with an excellent effort's tolerance. Competitive sport activity does not have any negative impact on the myocardial performance in patients previously treated with chemotherapy.

*P-16. Physical Activity in Transplant Recipients: State of the Art*

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**Introduction:** It is well known that transplantation is considered the gold standard of treatment for most patients with end-stage renal disease (ESRD), also that kidney transplant recipients (KTR) are characterized by long-term clinical complications due to the immunosuppressive therapy. In particular, these patients have a high risk of development cardio-vascular disease (CVD).

**Materials and Methods:** In addition to the traditional CVD risk factors (e.g., hypertension, dyslipidaemia, diabetes mellitus, renal impairment, left ventricular hypertrophy and lifestyle factors), others non-traditional factors influence the high incidence of cardiovascular events after transplantation. These include, among others, the duration of prior dialysis, graft function after transplantation, elevated inflammatory markers, proteinuria, toxic effects of immunosuppressant drugs, bone and mineral metabolism abnormalities and vascular and valvular calcifications. However, among all these risk factors, the lack of physical exercise and a sedentary lifestyle seems to play a crucial role.

**Results:** There is a mounting evidence based on epidemiologic and experimental studies, that physical exercise reduces the risk of all-cause of mortality, and it is effective in the primary and secondary prevention of CVD in general population.

**Conclusion:** Physical activity is actually considered one of the key elements for the prevention and management of chronic diseases, including transplant recipients.

*P-17. Study Protocol "Transplant and Now Sport": Results and Perspectives*

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**Introduction:** The study protocol "Transplant and Now Sport" is based on a model of cooperation between transplantation specialists, sports physicians and exercise specialists, organized as a team combining their specific skills to effectively actuate the physical exercise programmes.

**Materials and Methods:** This report is based on 65 patients (41 males, 24 females;  $46 \pm 13$  years; 48 kidney, 10 liver, 6 heart, 1 lung transplanted; time from transplant  $6.4 \pm 6.1$  years) who performed prescribed and supervised exercises consisting in three sessions/week of aerobic and strengthening exercises, for one year.

**Results:** Results show a significant decrease of Body Mass Index ( $-0.83$ ,  $p < 0.05$ ), a significant increase of peak aerobic power and maximum workload ( $+2.7$  mL/kg/min,  $+15.1$  W,  $p < 0.05$ ) in the incremental cycling test. In addition, maximum strength of plantar flexors ( $+14.1$  kg,  $p < 0.05$ ) and countermovement jump performance ( $+2.3$  cm,  $p < 0.05$ ) significantly increase. Creatinine and proteinuria tend to decrease, but the differences are not significant. In the Health Related Quality of Life assessed by SF-36 questionnaire, physical function, role-physical and social functioning scales

showed a significant improvement ( $p < 0.05$ ). The results of this study protocol show the positive effects of the model based on the cooperation between Transplantation Centres, Sport Medicine Centres and Gyms in the administration of a supervised exercise prescription.

**Conclusion:** These data should be considered a contribution to develop and promote further detailed exercise protocols and to foster improved post-transplantation health and survival, helping to ensure that physical activity become a safe routine medical treatment plan of patient management.

*P-18. The Role of the Exercise Specialist in the Administration of Exercise in Transplant Recipients: The Emilia-Romagna Program*

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**Introduction:** The cooperation between transplantation specialists, sports physicians and exercise specialists, organized as a team combining their specific skills to effectively start up the physical exercise programmes is a new goal.

**Materials and Methods:** The exercise specialist is the professional with greater expertise in administration of tailored physical activity in accredited gyms called “gyms for health” which transplant recipients can find trainers who know the problems related to the transplant world. The exercise specialists can support the sport physicians during the functional assessments for the strength and power test (CMJ, handgrip test, submaximal test of upper and lower limbs).

**Results:** Exercise specialists have to know well the transplant features, the possibility of the rejection, the drug therapy and the cardiovascular risks. In addition, the professionalism of the exercise specialist is to accurately follow the transplant recipients by teaching the proper exercise performance and constantly communicating with the sports physicians for possible side effects or problems that can arise during the practice of the prescribed exercise. Another task is motivating the transplant recipients to continue to practice physical activity to change their lifestyle.

**Conclusions:** Now the Emilia Romagna region has created a care pathway to ensure that all transplant recipients, in stable clinical conditions, can be encouraged to carry out physical activity, with the possibility of having a personalized exercise program and do it in the gyms for health or at home, recording the physical activity in the app or on a health diary. Making disclosure becomes increasingly important, both among patients and physicians.

*P-19. Hydration in Cancer*

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**Introduction:** Cancer patients are frequently associated with an unbalanced compartmentalization of body fluids in consequence of sedentarism and pharmacological cellular toxicity. Total Body Water (TBW) is approximately 50%–60% of body weight in human adult while in pathological conditions, the percentage values can swing out of the reference ranges. Moreover, it is very important how the TBW is subdivided, usually Intra Cellular Water (ICW) represent the 60% and Extra Cellular Water (ECW) the 40% of TBW. The study aims to investigate the eventual efficacy of an unsupervised and individualized medium-long term exercise program in the improvement of the patients' hydration status.

**Materials and methods:** From a large cohort of 145 cancer patients, a subgroup composed of 35 subjects (7 male and 28 female,  $58 \pm 10$  years,  $72.6 \pm 16.3$  kg,  $26.7 \pm 5.9$  BMI) previously affected by colon and breast cancer and clinically stable, were enrolled for the long term exercises prescription program. Following the ACSM guidelines, an individualized level of aerobic and resistance exercise, at moderate intensity (60% of the maximal effort), was established by the 6MWtest. A resistance

exercise was determined on the basis of chair stand test and hand-grip tests. During the follow-up, hydration status by Bioelectrical Impedance Analysis (BIA) using 101, Akern-RJL Systems, Florence, Italy were assessed.

**Results:** Significant changes were detected for what concerns the redistribution of body water with statistically significant results. In the analysis of data collected appears evident that there was a significant improvement of ICW% at T<sub>6</sub> (T<sub>0</sub>: 51.61 ± 4.43 vs. T<sub>6</sub>: 52.93 ± 4.11;  $p < 0.01$ ) and at T<sub>12</sub> (T<sub>0</sub>: 51.61 ± 4.43 vs. T<sub>12</sub>: 54.24 ± 3.41;  $p < 0.001$ ). While it appears evident a significant reduction of ECW% at T<sub>6</sub> (T<sub>0</sub>: 48.38 ± 4.43 vs. T<sub>6</sub>: 47.06 ± 4.11;  $p < 0.01$ ) and at T<sub>12</sub> (T<sub>0</sub>: 48.38 ± 4.43 vs. T<sub>12</sub>: 45.75 ± 3.41;  $p < 0.001$ ) despite the absence of a significant variations of TBW%.

**Conclusions:** In cancer patients an unsupervised mixed moderate intensity exercise contributes to improve the water distribution in the active intracellular compartments. Those results appear to be already relevant after 6 months and they become even more evident after 12 months.

*P-20. Therapy in Movement: An Exercise-Therapy Project for Chronic Diseases. The operating Model: Patients Enrollment, Assessment Protocol and Adapted Physical Exercise Prescription*

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**Introduction:** The “Therapy in Movement” project was a practical application of the huge evidences about benefits of exercise prescription and practice for patients with noncommunicable chronic diseases (NCDs). The project lasted since October 2014 to May 2016 at the gym of the Sport Medicine Service of the Local Health Authority of Biella and its multidisciplinary team was made up of a sport physician and a clinical exercise physiologist. It was a real experience about the powerfulness and effectiveness of the adapted physical exercise as a prevention and therapy medicine, particularly for type 2 diabetes mellitus and breast/colorectal cancer patients.

**Materials and Methods:** Patients' enrollment was made possible thanks to the network based on Sports Medicine, Diabetology and Oncology services. Patients who wanted to take part in the project were invited to go to the Sports Medicine service. There, each of the 40 subjects who participated in the project underwent an health and functional assessment (T<sub>0</sub>) that was made up of a medically supervised maximal exertion treadmill test with ECG monitoring to evaluate the cardio-respiratory system response to the effort; a 30” Arm-curl test for the upper body strength; a 30” Chair-stand test for the lower body strength; a Back-scratch test for the upper body (shoulders) flexibility; a Chair Sit-and-reach test for the body flexibility. Based on the ACSM guidelines and on the results of the functional assessment, the clinical exercise physiologist designed a multimodal tailored physical exercise program that was carried out throughout two supervised 90-min sessions at the Sports Medicine gym. Multimodal exercise programs were characterized by an aerobic component with a 40%–60% HRR intensity; a functional strength component with calisthenic exercises; a final cool down component with breathing and flexibility exercises. Moreover, each subject received a Mywellness<sup>®</sup> key device to self-monitor daily physical activity. After 12 weeks (T<sub>1</sub>), each subject underwent a new health and functional assessment to evaluate improvements gained and design a new home-based exercise program. For a six-months period, clinical exercise physiologist met each subject once a month to help him/her to maintain a high compliance to the home-based exercise program (follow-up).

**Results:** All subjects gained improvements in aerobic capacity, strength and flexibility and almost all of them reported a better quality of life thanks to a more suitable performance on activities of daily living (ADL) and a perceived stronger health status.

**Conclusion:** “Therapy in Movement” project was a real experience, which demonstrated that it is possible and effective to apply exercise guidelines to the practice to promote exercise prescription and practice also at public health authorities. It is very important to set networks to facilitate patients access to these opportunities and to organize multidisciplinary teams to build up operating models able to

take care of all aspects of chronic disease patients. Moreover, it is very important public stakeholders to invest capitals to guarantee continuity to projects like this and to set up new ones.

*P-21. Ventilatory Strategies During Different Types of Exercise in Subjects with Different Body Mass Index (BMI)*

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**Introduction:** As is known in literature, during exercise high BMI subjects have less efficient ventilation than normal weight subjects. We assumed that the position in which the exercise takes place can have effects on ventilatory patterns in relation to the BMI. Therefore we analyzed ventilation and breathing pattern in various BMI subjects at rest and through different types of exercise.

**Materials and Methods:** 30 trained subjects, divided into 3 groups: A (8 male, 2 female; age  $52 \pm 29$ , BMI  $23 \pm 1$ ), B (7 male, 3 female; age  $57 \pm 17$ , BMI  $27 \pm 1$ ), C (8 male, 2 female; age  $59 \pm 21$ , BMI  $37 \pm 2$ ). Evaluation: spirometry, 6 Minutes Walking Test (6MWT), Sit & Reach (S & R), waist circumference (CW). VE monitoring (Spiropalm, COSMED) at rest and during exercise: steady load six minutes tests (Borg 4/10) of: I) Treadmill; II) Bike Recline; III) Sitting position Arm Ergometer; IV) Vertical bike; V) Upright position Arm Ergometer.

**Results:** Spirometry: normal. 6MWT (meters): A ( $478 \pm 133$ ), B ( $460 \pm 137$ ), C ( $384 \pm 71$ ). Sit & Reach A ( $0.3 \pm 16$ ), B ( $0.3 \pm 8$ ), C ( $-17.5 \pm 9.8$ ;  $p < 0.005$ ). CA (cm): A ( $90.7 \pm 10.4$ ), B ( $102.6 \pm 5.4$ ), C ( $131.8 \pm 16.4$ ;  $p < 0.005$ ). Ventilatory pattern (Tidal Volume = TV; Respiratory rate = RR): during exercise expressed as a percentage variation ( $\Delta\%$ ) compared to basel. Sum of five exercises (I, II, IV and V): A ( $\Delta VE\% 206 \pm 62$ ,  $\Delta VC\% 178 \pm 49$ ,  $\Delta RR\% 115 \pm 24$ ), B ( $\Delta VE\% 205 \pm 73$ ,  $\Delta VC\% 169 \pm 49$ ,  $\Delta RR\% 121 \pm 21$ ), C ( $\Delta VE\% 207 \pm 70$ ,  $\Delta VC\% 159 \pm 45$ ,  $\Delta RR\% 131 \pm 32$ ). Sum of sitting position exercises (II and III): A ( $\Delta VE\% 209 \pm 63$ ,  $\Delta VC\% 166 \pm 42\%$ ,  $\Delta RR\% 125 \pm 29$ ), B ( $\Delta VE\% 209 \pm 81$ ,  $\Delta VC\% 172 \pm 52$ ,  $\Delta RR\% 120 \pm 20$ ), C ( $\Delta VE\% 208 \pm 82$ ,  $\Delta VC\% 159 \pm 49$ ,  $\Delta RR\% 130 \pm 28$ ). Sum of standing position exercises (IV and V): A ( $\Delta VE\% 198 \pm 62$ ,  $\Delta VC\% 163 \pm 44$ ,  $\Delta RR\% 121 \pm 19$ ), B ( $\Delta VE\% 201 \pm 75$ ,  $\Delta VC\% 168 \pm 52$ ,  $\Delta RR\% 119 \pm 20$ ), C ( $\Delta VE\% 211 \pm 60$ ,  $\Delta VC\% 166 \pm 39$ ,  $\Delta RR\% 127 \pm 23$ ).

**Conclusion:** As expected, patients with a BMI  $> 35$  have higher CA and perform less well, they have limitations in exercise capacity and flexibility. The main result is in the difference of the ventilatory pattern adopted: during the exercise high BMI subjects have a VE increase more on charge of the FR than the VC (=VE less efficient) mostly when the exercise is done in a sitting position. These considerations may help manage exercise programs in subjects at risk of drop out whether the programs are not customized having regard of their limitations, to introduce the exercise in the daily routine and achieve a more active lifestyle.

*P-22. A Tailored Physical Activity Intervention for Hospitalized Onco-Hematology Patients*

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**Introduction:** The therapy of hematological malignancies persists for a long time and involves in various complications. The main consequences of chemotherapy are fatigue and forced bed rest, due to immunodeficiency secondary to the treatment that, in turn, also contributes to in impairment of physical efficiency. Physical activity and structure exercise programs can prevent this weakening through the improvement of aerobic capacity and muscle strength, thus this investigation aimed to determine the beneficial role of exercise in the maintenance of the physical function in onco-hematology inpatients.

**Material and Methods:** The study included 15 patients, who were administered a tailored exercise protocol during their hospitalization. Intervention was mainly focused for the development of strength and flexibility; exercise sessions were directly performed in the patients' own hospital room. Exercise program was supervised by an Exercise Specialist and driven by audio-video support. Intervention group was compared with control group that consisted of 12 patients, which remained physically inactive for their hospitalization.

**Results:** The intervention group did not show significant decreases during hospitalization period. Significant changes were found in flexibility performance ( $p < 0.05$ ), as well as strength and balance control appeared as enhanced. In contrast, strength had a significant decrease in the control group.

**Conclusions:** Results from this investigation showed that a tailored exercise protocol administered to hospitalized onco-hematology patients is feasible and efficient to promote the maintenance of their physical function. Moreover, results indicated a beneficial effect of the exercise counteracting side effects of chemotherapy treatments with a concurrent reduction in bed rest syndrome.

*P-23. Functional Evaluation in Obese Patients before and after Sleeve Gastrectomy*

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**Introduction:** Sleeve gastrectomy (SG) has become a standard of care in severe obesity, however, cardio-respiratory and muscle function after SG have only insufficiently been investigated.

**Material and Methods:** This is an observational study in 26 severely obese patients (BMI  $45.23 \pm 5.82 \text{ kg/m}^2$ ) comparing physical function pre and post SG (about six months). All patients listed for SG were included, except for those with co-morbidities known to restrict physical exercise. Incremental cardiopulmonary exercise testing, standardised strength tests and balance analysis were performed.

**Results:** Although SG led to a huge weight loss ( $-33.41 \pm 10.99 \text{ kg}$ ), the absolute  $\text{VO}_2$  peak, oxygen pulse ( $\text{VO}_2/\text{HR}$ ) and the oxygen uptake efficiency slope (OUES) significantly deteriorated (all  $p < 0.001$ ). Furthermore,  $\text{HR}/\text{VO}_2$  slope increased whereas  $\text{VO}_2/\text{Exercise-time}$  slope decreased significantly (both  $p < 0.001$ ). The HR reserve increased due to a reduction of resting HR; the HR recovery improved after SG (all  $p \leq 0.01$ ). Parameters of ventilatory efficiency were not affected by SG. The time-constant (Tau  $\tau$ ) of the fundamental component of  $\text{VO}_2$ -kinetics, reflecting oxygen metabolism at the skeletal muscle level, was found significantly worsened after SG ( $p < 0.05$ ). However, handgrip and leg-extension strength were thereby not significantly changed. Balance parameters determined were similar pre and post SG.

**Conclusions:** The ventilatory and cardiac efficiency seem not to be negatively affected by SG, thus, we hypothesize that the decrease in aerobic capacity could be due to alterations in peripheral muscles. Indeed, pilot results from  $\text{VO}_2$ -kinetics analysis seem to support the idea of a deterioration of oxidative muscle metabolism after SG.

*P-24. Dynamic Balance and Explosive Strength Assessment by an Integrated Inertial Sensor in a Group of Elderly People*

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**Introduction:** During aging process, strength and balance are subjected to a decline that, in turn, determines an unavoidable reduction in the performance during activities of daily living (ADLs) with a concurrent increase of fall risk. Nowadays, among the methods adopted to evaluate functional capacity in the elderly, integrated inertial sensors are spreading considerably, therefore the aim of this study is to report the reliability of a recently developed and not still available in commerce integrated

sensor to evaluate dynamic balance and explosive strength in a group of healthy asymptomatic elderly people.

**Material and Methods:** Thirty older adults were equipped with two inertial sensors, one applied on the right ankle and one on the back, fixed around the waist. Participants were asked to perform the Jump Test on the Bosco Platform and the Time Up and Go Test, in order to compare the measures acquired by the inertial sensors with the measures derived from the already validated Tests.

**Results:** Comparisons between measures were represented by the Bland-Altman's plots. Mean differences of measurements did not deviate from zero. Ninety-five percent of values fell within the limits of agreement.

**Conclusions:** Results show a clear reliability of the tool, which demonstrated a good correspondence with standard tests already used to assess explosive strength and dynamic balance. The integrated inertial sensor can represent a valid instrument in the function evaluation in the elderly.

*P-25. Functional Evaluation Techniques for the Design of a Method to Identify Fatmax*

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**Introduction:** Among the benefits of regular physical exercise, we took into account the production of lipid dependent energy. Several previous studies were designed to determine an exercise intensity that causes the maximum fat oxidation (Fatmax) through incremental tests or constant load, in which the heart rate were identified and the corresponding intensity RER closer to the maximum oxidation of lipids. Objectives of the study were testing and reliability of INCA and FATmaxwork testing software.

**Materials and Methods:** We enrolled 25 overweight subjects with a mean age of  $50.92 \pm 4.462$  and BMI of  $27.53 \pm 1.72$  kg/m<sup>2</sup>. All subjects were submitted to FATmaxwork test on a treadmill, with metabolimeter portable VO<sub>2000</sub>, with an initial speed of 3 km/h and an increase of 1 km/h every 5 min until it reaches 20 min. The calculation of Fatmax-zone has been identified through the INCA software program that seeks to roughly estimate the values corresponding to Fatmax using a quadratic function.

**Results:** From the data the Fatzone was identified with an RER of  $0.86\% \pm 0.89\%$ , W  $130\% \pm 63.6\%$  and  $54.2\% \pm 4.93\%$  of HR. From the comparison of the constant-load test and INCA was a difference of  $0.008\% \pm 1.92\%$  with regard to the RER and  $-0.216\% \pm 1.922\%$  of the HR. Men have got Fatmax to one watt of  $158.28\% \pm 71.62\%$  an RER of  $0.86\% \pm 0.12\%$  to  $54.58\% \pm 5.24\%$  of HR while women a Fatmax to a wattage of  $115.13\% \pm 34.49\%$  with an RER of  $0.87\% \pm 0.05\%$  to  $56.30\% \pm 8.11\%$  of Heart rate (HR).

**Discussion:** The resulting data do not differ from those in the literature and demonstrate a significant reliability of INCA and Fatmaxwork test. Interesting elements in the development of this new test were the possibility of applicability to different types of subjects and safety in its development. The development of INCA and Fatmaxzone software test have responded to the requests need to date from the studies in this area: to find a good and efficient method for calculating the Fatmax.

*P-26. Physical Activity and Transplant of Solid Organ. Feasibility Study: Project Vitattiva*

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**Introduction:** The transplantation of solid organs (heart, kidney and liver) and increasingly used for the treatment of diseases in the terminal phase. Nevertheless every type of transplanted presents secondary complications, in particular a high risk of cardiovascular disease (hypertension), myopathies and psychological problems in addition to the limitations on the exercise response. Accordingly, it

is now proven that the practice of physical exercise can improve the condition of the transplanted. The project aims to assess the feasibility of a program of individualized physical activity and carried out in security that meets the needs of a diverse group of transplant recipients, see the possible risk factors and contraindications, establish control parameters and evaluate the responses in terms of physical efficiency motivating the population transplanted to the operating practice.

**Materials and Methods:** Seven patients transplanted were subjected to a cardiovascular physical training and exercise program to free 4-month body with a frequency of two to three sessions per week, primarily as a group activity to get progressively (4 months) in independent sessions of supervised training. Recruitment is done through visits and specialist examinations and through the administration of cardiopulmonary exercise testing (CPET). The pre- and post-training was done by the same CPET and some functional tests such as Sit and Reach Test, Side Bending Test, balance tests monopodalic, stabilometry with eyes open and closed. The internal load monitoring (cardiovascular effort 50%/70% of HR max) was performed by heart rate and Borg scale (CR10) in order to overcome the problems related to the standardization of parameters of patients with cardiovascular disease or under pharmacological treatment that way disturbed the answers.

**Results:** The CPET, administered only in 5 patients showed an improvement in 3 of them and of little relevance in the remaining 2 for the difficulty in reaching the intensity of anaerobic threshold. Functional tests, carried out in the entire sample, showed mean increase in flexion mobility of 18.5 cm (Sit and Reach trunk), a swing reduction of center of gravity (stabilometric rating:  $-28\%$  with open eyes and  $-22\%$  with closed eyes) and an overall improvement in maintaining the balance monopodalic, especially with eyes closed.

**Conclusions:** The main feature at the close of the project is not the established improvement in physical abilities, but the demonstration of the feasibility of an exercise program directed to a diverse population of transplanted which can meet the common needs. Are fundamental results all methods of assessment and monitoring (both clinical nature or for the exercise) that allowed the safety of the project. In particular, there was a particularly strong moral response of the patients in terms of participation and motivation, thanks to the continuous supervision and support a team of specialists and graduate in Sports Science.

#### *P-27. Cardiorespiratory Evaluation in Kidney Transplant Recipients*

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**Introduction:** It is well known that kidney transplant recipients have reduced fitness, given their previous illness, the immunosuppressive therapy and sedentary habits. Cardiopulmonary exercise test is a very helpful tool to evaluate their cardiorespiratory fitness (CRF), stratify their cardiovascular risk and to prescribe a proper exercise program.

**Material and Methods:** One hundred thirty-five kidney transplant recipients (95 males, 40 females;  $50.3 \pm 12.5$  years old;  $24.6 \pm 3.7$  kg/m<sup>2</sup>) performed a cardiopulmonary exercise test on the treadmill. We classified them into two groups: subjects with a low CRF (VO<sub>2</sub> peak < 25th percentile) and the ones with a normal CRF (VO<sub>2</sub> peak > 25th percentile).

**Results:** Seventy-four out of 135 (55%) subjects showed a low VO<sub>2</sub> peak, which was significantly lower respect to the fitter group ( $23.2 \pm 5.2$  mL/kg/min vs.  $30.4 \pm 6.5$  mL/kg/min). The rate of females was lower in the low CRF group (19% vs. 43%). Moreover, they had higher rates of chronotropic incompetence (45% vs. 15%) and sedentary habits (66% vs. 51%). The rate of subjects that didn't underwent to dialytic treatment before the transplant was similar in the two groups (19% vs. 20%).

**Conclusions:** Most of kidney transplant recipients show a significant impairment of CRF, which implies an increased risk of mortality and disability. Cardiopulmonary assessment should be recommended for prescribing a supervised exercise program in order to improve their health status.



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