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European sports network  
for rehabilitation of  
persons with disabilities

# PRO SKI TRAINING SYSTEM

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## INTRODUCTION

In general PRO SKI training system represents an educational, recreation, fitness and rehabilitation training on PRO SKI SIMULATOR. The main objectives are recreation – fitness training, conditional-sport training and rehabilitation of users. While the basic tasks are proper selection of the training operators and their weight which affect the achievement of the basic objectives.

## BIOMECHANICS OF SIMULATOR

On proper technical performance affects the high complexity of biomechanical parameters, respectively control of kinematic and dynamic parameters. Fundamentals of kinematic parameters make spatial (path, trajectory and angular relationships), time (duration) and spatial-time parameters (speed and acceleration). Dynamic parameters are related with muscle power, resistance force and reactive power. While working on the simulator mentioned forces are under the direct influence of the elastic force of rubber resistance, pressure force on the surface, gravity, inertia, friction force and the force of rubber reaction.

Exerciser is mastering the technique with synchronized muscle contractions of agonists and antagonists and trying to master the forces that act on the body during exercise on a simulator. To start the movement of simulator, high importance has the force of leg muscle. Specifically, concentric contraction of agonist leg to achieve greater muscular force than the force of rubber resistance. Required concentric contraction of agonist is also dependent on the number of rubbers or resistance of rubbers, which is less about the middle of the simulator than on the ends. Specifically, the elastic properties of rubber around the middle of the simulator has less power than on the end when the force increases due to reaching maximum elasticity, which dependent on the set number of rubbers. Larger number of rubbers - higher resistance. At the time of reaching the maximum elastic force if the rubber resistance is greater than the force that we provide on the simulator, rubbers will be shortened and returned to the original/start position. In that moment the rubber reaction force is largest and requires high synchronization of leg agonist and antagonist but also the kinematic parameters like angle between the upper part (trunk) and lower part (legs). If all of these parameters are fulfilled exerciser can safely and without disrupting the balance perform exercise/s.

In addition to the dynamic properties of the simulator, great importance has inertia force which is dependent on the working speed and acting contrary to the elasticity force of rubbers. With higher working speed, the body will move faster out of inertia. And distort the balance of trainees.

## MUSCLE ANATOMY ON SIMULATOR

As in any sporting activities, PRO SKI or exercise on the PRO SKI SIMULATOR applies specific dominance of certain topological region, muscle groups and muscles. On PRO SKI SIMULATOR dominate identical muscle groups as skiing, in this case it's topological region of trunk (CORE), hip and legs for their flexion, extension and rotation by working on simulator. Of muscle groups and muscles primarily dominated upper leg muscles (quadriceps femoris, m. gluteus maximus and medius, M. sartorius, m. iliopsoas), lower leg (tibialis anterior, extensor digitorum longus, musculus soleus and peroneus longus), foot (extensors), CORE- trunk & back (latissimus dorsi, thoracolumbar fascia and m. obliquus externus abd.). While with the use of additional exercises with additional equipment, secondary activate upper leg muscles (adductor longus), lower leg (gastrocnemius), arms and shoulders (triceps, flexors and the extensors, biceps, deltoid muscles, trapezius), trunk, chest and back (trapezius, Teres minor and major, pectoralis and rectus abdominus). All these muscle groups and muscles must be well coordinated with each other, because they have separate functions during exercise. Also, is a great importance of proprioceptors and their coordination with the vestibular apparatus for maintaining the balanced position.

## PRO SKI TRAINING

Is a specific set of interrelated methodological, fitness and rehabilitation training operators on PRO SKI SIMULATOR, divided into three interconnected units. The PRO SKI UP (fitness and sport), PRO SKI REHA (joint system & neuromuscular dysfunction) and PRO SKI EDUCATION.

**PRO SKI UP** training (fitness & conditional-sport) positively affects energy (calories) consumption, learning and development of skiing movements, development of a large number of motor and functional abilities, stability and mobility of extremities. Of motor abilities the most influence is on development of leg strength (repetitive, explosive and plyometric), static and repetition strength of trunk, arms and shoulders, coordination, development of dynamic balance, agility and proprioception. While in the development of functional abilities positively affects on the aerobic and anaerobic capacity.

**PRO SKI REHA** is divided in two different causes. Rehabilitation of joint system and neuromuscular dysfunctions.

Targeted program for rehabilitation of joints enabled all movements of the joints in a controlled environment. With adjusted weights and proper selection of exercises customized for specific injury, progressively affect on their healing. Great affects are progressive development of balance (static and dynamic) and proprioceptors, one of the most important things for a high quality and fast recovery.

On the other hand, rehabilitation of neuro-motor dysfunction and improvement of cognitive abilities is possible with constant activation of the left and right hemispheres of the brain. Which affect on their better synchronisation. This kind of rehabilitation refers to a population that has survived a stroke or brain trauma, for people with intellectual disabilities and people diagnosed with dyslexia, dyslalia etc. Using a variety of coordination exercises and similar tasks during work out on PRO SKI SIMULATOR, it continuously potentiates lateral-cross type of movement with a simultaneous effect on dynamic balance. The research results (PROGRESSIVE REHABILITATION OF NEUROMOTOR DYSFUNCTION; Hagg 2015; J. Vešligaj-Damiš, B.A. Psych., D. Puhak, M.Ed. Kin.) showed a progressive effect on improving cognitive synchronization of the left and right hemispheres of the brain and improve the neuro-motor dysfunction. Proven results can fix dynamic balance for more than 200%, static balance for 100%, coordination and cognitive ability by 50%. Our PRO SKI REHA training is successfully implemented in the rehabilitation program of the Center for Rehabilitation Zagreb and Center Naprej from Maribor.

# NEW FORM IN PHYSICAL THERAPY

## SAFENESS

- Provides a 100% safe form of training/therapy, with proper selection of exercises and compliance with the basic PRO SKI EDUCATION principles.
- Customized to every population which are able to move with the assistance.
- It´s all about balance and stabilisation!
- Improving dynamic balance over 200% and static over 100% in just 10 treatments.
- Different levels of intensity created for everyone.

## COORDINATION

- A large number of continuous lateral movements affects the progressive development of the left and right hemispheres coordination.
- Enables the higher stimulus, using different requisites and exercises to the development of coordination integrated with development of balance.
- Proven results of this kind of training/therapy show us improvement for 50% in motorical tests for rhythm and coordination which can be connected to their faster motorical signals...

## ENDURANCE

- Provides great physical health of users
- Generally develops aerobic and anaerobic capacity and positively affects the cardio vascular system

## STRENGHT

- It strengthens all muscle groups and muscles.
- Using external stimulus with weights it influence on the speed of neuromuscular reactions. Especially with integrated balance and coordination in every movement.

