EFFECTS OF EMS TRAINING ON HIGH-PERFORMANCE SPORT

THE MAIN STATEMENTS OF TODAY'S LEVEL OF KNOWLEDGE. LITERATURE COLLECTION SELECTED AND SUMMARISED BY PROF. DR. DIRK FRITZSCHE. SOURCE REFERENCES OF THE LITERATURE COLLECTION IN THE FULL VERSION.

PROF. DR. DIRK FRITZSCHE

Prof. Dr. Fritzsche is a heart surgeon and senior consultant at the Sana Heart Centre in Cottbus. He and his team are heavily involved in the design and further development of the EasyMotionSkin

Fritzsche recognised the weaknesses of the EMS technology and developed the first wireless, internally connected EMS system as part of a project funded by the Federal Ministry of Science. He also went on to patent the first dry electrode, allowing EMS training to take place without additional moisture.

Throughout the development period, he initiated and supervised more than 2000 training sessions of patients with cardiac insufficiency at the Heart Centre in North Rhine Westphalia. His astounding results were published by him and his team in various publications.

The key results, among others, showed significantly increased oxygen intake and strength in the patients, increased ejection fraction of diseased hearts, reduced blood pressure and blood sugar levels as well as elimination of lumbar spine symptoms.

Prof. Dirk Fritzsche and his team, along with other experts, have studied the medical effects of EMS training on patients with various syndromes and become a founder and pioneer of wireless EasyMotionSkin EMS technology.

MAXIMUM STRENGTH AND MUSCLE HYPERTROPHY

- Trained athletes from various disciplines experienced increases in maximum isometric strength of between 15% and 40%, with an average of 32.6% (5, 6, 7, 9, 22, 24, 27).
- The average improvement in maximum isometric strength following EMS training with untrained subjects was 23.5% (1, 2, 3, 4, 8, 10, 11, 14, 15, 16, 18, 19, 20, 21, 25, 28).
- Athletes can achieve 30 - 40% improvements in maximum strength after only 5 weeks using EMS (12).
- Using MVC, competitive swimmers achieved improvements in the eccentric and concentric contractions of their latissimus dorsi and quadriceps femoris muscles and better freestyle swimming times (23).
- Case study of a high-performance weightlifter: 4 months of EMS training: 1 RM (repetition maximum) increased during squats by around 20kg, further improvements to 'snatch' and 'clean and jerk'.
- EMS can also be provided to untrained people and those looking to get fit: muscle size increased by around 10% after 8 weeks using isokinetic training (eccentric and concentric) combined with EMS (26, 29).
- Mixed training (hypertrophy using machines) combined with EMS was shown to have the greatest effects on maximum strength (13).

ELASTICITY AND PERFORMANCE

- Various authors have confirmed a positive effect on contraction speed (1, 3, 5).
- The EMS training group saw the greatest gain in movement speed (approx. 30% improvement in muscles involved in bending bones), thus significantly increasing performance (4, 6).
- A combination of classic strength training (hypertrophy) and EMS training increases both performance elements (movement speed and power), (4,6).

SPRINTING AND JUMPING

- The sprint studies showed improvements in competitive athletes of 3.1±1.7% over a 3-week period.
- Brocherie et al. (2) improvement of 4.8% in the sprint time of ice hockey players over 10m.
- Pichon et al. (9) improvement of 1.3% to cover 25m (sport type: swimming) and 1.45% for the 50m freestyle time.
- With combined strength training (plyometrics/EMS), Herrero et al. recorded (3) a 2.3% reduction in time needed to sprint 20m among untrained individuals.
- After EMS training, jumping abilities improved by between 2.3% and 19.2%; after isometric EMS training (an average of +10±6.5%); and 6.7% to 21.4% after dynamic EMS training (1, 4, 5, 7, 8, 13).
- After combined EMS training, the literature states that there was an average increase in jumping ability of 11.2±5.5% (3, 6, 11).

ENDURANCE

- Static endurance: the average increase is 30.3% at an average stimulation frequency of 75 +/- 44 Hz. (1, 2, 3)
- Dynamic endurance: the average increase is 41% at an average stimulation frequency of 76 Hz +/- 10 Hz (2, 4, 5, 7).
- Long-term stimulation with low frequency stimulation of skeletal muscle in experiments on animals (rabbits) resulted in the development of mainly slow twitch muscle fibres with a high proportion of mitochondria (6).

PREVENTION OF SARCOPENIA AND DEMINERALISATION OF BONES

- Increasing bone density
- Prevention of age-related fractures, particularly vertebrogenic compression fractures
- Alleviation of osteoporosis
- Optimisation of fat distribution and body fat/muscle ratio

PERFORMANCE, STAMINA; OXYGEN CONSUMPTION AT THE ANAEROBIC THRESHOLD; MAXIMAL OXYGEN UPTAKE

- EMS training leads to an increase in maximal oxygen consumption or oxygen uptake at the anaerobic threshold (at) of 22-37%.
- Vo2max; VO2 at 22-37%
- EMS training leads to an increase in maximum strength and/or performance at the anaerobic threshold (at) by up to 32%.
- Watt max; Watt at 32%
- EMS leads to an increase in the cardiac ejection fraction (EF) of 8%

CONCLUSION

The connection between EMS training and training sessions in high-performance sports, such as football, tennis, basketball, golf, wrestling, swimming and similar sports can complement the usual stress structures and enable an improved performance in professionally trained performance athletes.

A few additional EMS training sessions makes it possible for high-performance athletes to significantly improve efficiency in accomplishing their training goals. The amount of time saved and the improvements in efficiency which result from EMS training offer the starting point of a promising alternative to conventional strength training in high-performance sport.

The study results shown here demonstrate the numerous positive effects of whole-body EMS training for important areas such as endurance, maximum strength and speed, as well as the prevention of injuries.