Application of physiotherapeutic methods to support training and post-exercise recovery of combat sports and martial arts contestants

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Summary

Introduction. High-performance training does not only constitute physical effort, but also a number of supporting psychological, medical and physiotherapeutic activities. The purpose of this study was to characterize physiotherapeutic methods applied in supporting training and biological regeneration of athletes of martial sports and arts.

Materials and methods. 149 athletes of judo, aikido, kickboxing and taekwondo participated in the survey. The author’s survey constituted the study tool. Differences were calculated using the chi-squared and t-Student test for independent groups, assuming p≤0.05 as the minimum significance level.

Results. Regular use of physiotherapy treatments supporting trainings and post-exercise regeneration was declared by 103 (69%) of the studied athletes (75% judo athletes, 26% aikido athletes, 65% kickboxing athletes and 70% taekwondo athletes). Selection of treatments was diverse (p<0.05), but the most frequently applied treatment indicated by representatives of all disciplines was sauna. Regular use of complementary exercises was declared by 123 (83%) studied athletes (84% judo athletes, 62% aikido athletes, 88% kickboxing athletes and 93% taekwondo athletes). No significant differences were observed regarding the selection of complementary physiotherapeutic exercises among representatives of various disciplines. Among complementary exercises the studied athletes did stretching most frequently (44%).

Conclusions. 1. The most commonly used physiotherapy treatments include the ones which are easily accessible (sauna, taping, massage). Nonetheless, their effectiveness is scientifically proven. 2. Among treatments and exercises used by athletes there are modern forms, such as kinesiotaping or stabilizing exercises, which show professionalism of coaches and sports physiotherapists.

Introduction

Physical effort causes numerous changes in muscular tissue. They include among others fatigue, damages to muscle fibers, inflammatory changes, pain during physical effort, as well as after it [1]. Physical fatigue of muscles is a physiological defensive reaction of the body, preventing muscular cell damage and formation of harmful products of metabolism. Reasons for fatigue depend on intensity and duration of physical effort. They can be divided into two groups: muscular (peripheral fatigue) and depending on the central nervous system (central fatigue) [2].

An essential element of the training process is rest and regeneration of the body. Rest means pauses between efforts (trainings), while regeneration involves restoration of exercise capacity of the body. For this purpose numerous physiotherapeutic treatments, such as massage, sauna or cryotherapy, are applied [3,4]. Application of the above mentioned treatments aims at accelerating and improving the process of post-exercise restitution, as well as injury prevention, treatment of already existing injuries, compensation of muscular dystonia or improving movement quality [5-7].

Selection of treatments supporting training and biological regeneration of athletes cannot be accidental. Planning and programming biological regeneration should be individualized and thought through, it should correspond to the training cycle, cooperate with the implemented training, complete it and prepare athletes for participation in contests. In biological regeneration numerous physiotherapeutic, psychoregulatory and kinesiotherapeutic treatments are applied. It is recom-
mended to use various measures, as their skillful combination increases effectiveness of the restitution process [1,8].

The main cognitive purpose was to characterize physiotherapeutic and kinesiotherapeutic methods applied in supporting training and biological regeneration of athletes of martial sports and arts.

**Material and methods**

149 men practising judo, aikido, kickboxing and taekwondo ITF participated in the survey. All of them have been athletes for at least three years. For comparative purposes, they were divided into subgroups and the division criteria included age (seniors, n=61 – youth and juniors, n=88), years of trainings (more than 10, n=49 – less than 9, n=100) and experienced serious injuries preventing training for at least 10 weeks (athletes with an injury, n=47 – athletes without an injury, n=102). Detailed biometric characteristics are contained in Table 1.

The author’s survey constituted the study tool. The first part included biometric data and the implemented training. The second part – the type and frequency of applied treatment and complementary exercises, post-exercise regeneration and consequences of potential injuries.

Standard statistical tools were used to develop the study – an arithmetic mean and standard deviations. Dependencies between features were determined using the Pearson correlation. Differences between particular data were calculated using the chi-squared and t-Student tests for independent groups. The minimum significance level was assumed at the level of p≤0.05.

**Results**

Regular use of physiotherapy treatments supporting training and post-exercise regeneration was declared by 103 (69% of the studied athletes (75% judo athletes, 26% aikido athletes, 65% kickboxing athletes and 70% taekwondo athletes). Selection of treatments was diverse (p<0.05), but the most frequently used treatment indicated by representatives of all disciplines was sauna (38% of the studied athletes declared a regular use of the Finnish or Roman sauna). The second most frequently applied method (20% of the studied athletes) was taping (flexible – kinesiotaping and hard – sports taping). They also listed hydro massage and hand massage (26 and 10% of the studied athletes). The magnetic field and cryotheraphy / cryostimulation were used less frequently (Tab. 2). Several athletes also listed other treatments, such as phototherapy – IR, UV, Incoherent Polarized Low-Energy Radiation Therapy (4 athletes), laser treatment (2 athletes), electrostimulation (2 athletes).

Taking the division into subgroups into account it was observed that older and more experienced athletes used physical therapy most frequently in order to support training and post-exercise regeneration (p≤0.05). Only the magnetic field and cryotherapy were more frequently listed by athletes from young groups with less years of training. Athletes who experienced at least one serious injury also used the physiotherapeutic support more frequently (Tab. 3).

Regular application of complementary exercises was declared by 123 (83%) of the studied athletes (84% judo athletes, 62% – aikido athletes, 88% – kickboxing athletes and 93% taekwondo athletes). There were no significant differences in the selection of physiotherapeutic exercises among representatives of various disciplines. Among complementary exercises the studied athletes did stretching most frequently (44%), Elements of Pilates (19%), swimming and aquatic exercises (17%) or stabilization exercises (15%) were applied less frequently. Stretching was most frequently selected by athletes of all disciplines. While the second choice among judo athletes was swimming and aquatic exercises; Pilates among aikido and kickboxing athletes, and stabilization exercises – among taekwondo athletes (Tab. 4). Yoga (6 athletes), relaxation exercises (3 athletes) and tai-chi (2 athletes) were less frequently selected.

Age, years of training or experienced serious injury did not determined the selection of exercises supporting training and biological regeneration among the studied athletes (Tab. 5).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of people</th>
<th>Age [years]</th>
<th>Body mass [kg]</th>
<th>Body height [cm]</th>
<th>BMI [kg/m2]</th>
<th>Training experience [years]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Judo</td>
<td>51</td>
<td>21.35 ± 0.09</td>
<td>75.65 ± 11.69</td>
<td>174.51 ± 3.32</td>
<td>24.73 ± 2.74</td>
<td>11.27 ± 4.44</td>
</tr>
<tr>
<td>Aikido</td>
<td>34</td>
<td>24.79 ± 5.71</td>
<td>81.49 ± 14.17</td>
<td>176.12 ± 6.11</td>
<td>25.58 ± 3.75</td>
<td>6.24 ± 4.87</td>
</tr>
<tr>
<td>Taekwondo</td>
<td>30</td>
<td>22.70 ± 5.79</td>
<td>70.72 ± 10.66</td>
<td>176.67 ± 7.32</td>
<td>22.66 ± 3.14</td>
<td>5.67 ± 2.37</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groups</th>
<th>Sauna</th>
<th>Taping</th>
<th>Hydromassage</th>
<th>Massage</th>
<th>Magnetic field</th>
<th>Cryotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Judo</td>
<td>24 (47%)</td>
<td>12 (24%)</td>
<td>7 (14%)</td>
<td>3 (6%)</td>
<td>8 (16%)</td>
<td>3 (6%)</td>
</tr>
<tr>
<td>Aikido</td>
<td>11 (32%)</td>
<td>2 (6%)</td>
<td>5 (15%)</td>
<td>7 (21%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Kickboxing</td>
<td>10 (29%)</td>
<td>7 (21%)</td>
<td>6 (20%)</td>
<td>2 (6%)</td>
<td>0</td>
<td>2 (6%)</td>
</tr>
<tr>
<td>Taekwondo</td>
<td>11 (37%)</td>
<td>8 (27%)</td>
<td>6 (18%)</td>
<td>2 (7%)</td>
<td>5 (17%)</td>
<td>1 (3%)</td>
</tr>
</tbody>
</table>
No significant differences in the frequency of treatment and additional exercises were observed. Most frequently application of exercises supporting training was declared by taekwondo athletes – on average 2.5 times a week, slightly less frequently – judo and aikido athletes. The level of using physiotherapeutic treatments was similar in case of athletes of various disciplines (Fig. 1). Older and more experienced athletes declared the use of physiotherapeutic methods (physiotherapeutic treatments and exercises) more frequently, however the differences were not statistically significant (Tab. 6).

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![Fig. 1. Frequency of using exercises and physical treatment supporting training and recovery](image-url)
Average duration of complementary exercises done after trainings was 14 minutes and 35 seconds (approx. 16 minutes in case of judo athletes, 15 minutes in case of taekwondo and kickboxing athletes, and 11 minutes in case of aikido athletes). No significant differences between the studied athletes were observed in this aspect, taking the division into subgroups into account.

**Discussion**

In modern high-performance sport the objective of biological regeneration is restoring psychophysical efficiency of athletes through cooperation with the training program, optimization of resting processes, prevention and decreasing consequences of diseases and injuries, as well as assisting in post-traumatic rehabilitation [1]. Cooperation with the training program is manifested by formulation of a special set of measures constituting biological regeneration (educational, psychological, medical and biological) and physiotherapeutic treatments which complement the training process. This combined activities result in increased physiological capabilities of the athlete’s body [8].

The physiotherapeutic treatment most frequently used by athletes was sauna. It was listed as one of the most common treatment of biological regeneration. According to some authors using the Finnish sauna increases capacity for physical work and improves human psychosomatic possibilities [9-11]. Effects of sauna were studied among athletes. It was proven than using a sauna after training decreases and delays fatigue [5, 12]. Tyka et al. argued that regular treatments in a sauna can increase abilities to carry out long-term efforts [13].

Taping, both flexible and hard is a more and more frequently used method supporting sports training. The athletes studied within this study listed it as the second most frequently used method. Especially kinesiotaping (KT) gains more and more popularity among athletes. The method developed by Dr. Kenzo Kase is simple and non-invasive [14]. KT is used in treating swelling, pain, motor abnormalities or reduced stability. Depending on the used application method, effects of taping is different, therefore a therapist can easily adjust it to the recommendations for a given athlete. In scientific literature results of various studies can be found which present evidence of positive effects of Kinesiotaping in sports training, injury prevention and treatment of injuries. It is used in various sports disciplines – among others in swimming, basketball, football, duathlon, and athletics [15-19]. Wiebeć et al. argued that application of KT improves power and muscular endurance of high performance swimmers. Athletes improved their jumping ability and length of the distance thanks to the force of inertia [15]. Improvement of jumping abilities was also noticed during the studies conducted on basketball players with recoucurring ankle inversion sprains. According to the authors application of KT influences improvement of proprioception in these athletes [17]. The efficiency assessment of kinesiotaping on the activity of muscles was also conducted by Lumbenso et al. They observed increased strenght of the gastrosoleus both 15 minutes after taping, as well as after 48 hours of wearing the tape. Moreover in the group where KT was applied on the gastrocnemius muscle also the level of strenght of flexors of the knee joint was improved [20]. Chang et al., thanks to the studies they conducted on athletes, proved an increase of a subjective sense of strength in a group of athletes in which KT was applied on the forearm muscles (despite the lack of reference of these results in the study of the maximum grip strength) [16].

The assessment of effects of various forms of massage in supporting training and post-exercise regeneration is an issue frequently discussed in scientific literature. Usefulness of massage in preparation to physical effort was studied obtaining positive results [21-23]. The application of massage in post-exercise regeneration was discussed most frequently [24,25]. Its effectiveness was confirmed regarding the reduction of post-exercise muscle pain – quicker regeneration and smaller pain of tired muscles of the massaged limbs were observed [26-28]. Some studies do not confirm positive effects of massage applied after physical effort [29,30]. Undoubtedly this phenomenon requires further scientific exploration.

Application of complementary exercises, stretching and compensation exercises by athletes mostly aims at alleviating negative consequences of the implemented training (e.g. asymmetry) and injury prevention. Prophylactic programs should be aimed at exercises improving postural control, endurance and torso muscle strength, as well as neuromuscular control of the kinematic chains of the lower limbs. Applying preventive programs, patterns of movement should be formed and attention should be paid to the quality and technique of movements [31, 32]. Effectiveness of preventive exercises was studied among football players and basketball players [33-35]. In each case the...
References


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