INTRODUCTION

Karate is a martial art. Currently, there are several types of karate, sports karate being one of them. Having spread throughout the world most widely, this modern combat sport instills in its practitioners the desire to strive for superiority and championship in the competition. This goal can be achieved by forming sports fighting motor skills in karatekas.

In the process of long-term training sports, karate facilitates physical and intellectual development of the individual personality and moral education, helps improve sports tactics and widen moves arsenal [9, 12] and, therefore, increases karate skills.
Sports karate is characterized by both general and special physical fitness (GPF and SPF) of athletes during training sessions, which results in karatekas’ physical fitness (general and special), based on certain achievements in the formation of motor skills and physical qualities. In turn, physical fitness, together with motor coordination, is the basis of athletes’ motor performance.

The basis of karatekas’ general physical training is formed by motor acts, general developmental exercises and techniques that strengthen athletes’ bodies, as well as help develop basic motor qualities [9, 11].

Special physical training of karatekas aims at the development of agility and coordination, flexibility, speed, and explosive power, i.e. those specific physical qualities that are necessary when doing sports karate for solving professional tasks.

The relevance of the research subject is in the need to develop and implement new technologies optimizing athletes’ physical fitness [8, 12].

In the scientific literature, there is no data on the results of using the means of Hatha Yoga in professional sports, particularly in sports karate, and its impact on karatekas’ physical fitness.

Hatha Yoga is one of the oldest systems of holistic human development [4, 7]. We used Hatha Yoga system in the study as one of the options for optimization of karatekas’ physical fitness. We believe that we can influence the improvement of karatekas’ physical fitness through reconstructive procedure of Hatha Yoga that has been elaborated for several millennia [15].

The means of Hatha Yoga training include competitive, special and general preparatory exercises directed to optimizing fitness of athletes practicing karate [7, 13, 15].

The purpose of the study is to examine the dynamics of highly qualified karatekas’ physical fitness using the means of Hatha Yoga during training exercises.

MATERIALS AND METHODS

The study involved 60 karatekas of high sports qualification including candidate masters and masters of sports. The age of athletes ranged from 18 to 25, their experience of practicing sports karate was 5 years or more. We studied karatekas of sports clubs from Russia and Kazakhstan.

At the beginning of the study, all athletes had approximately the same level of physical, technical and tactical training, health and functional condition [15].

During the study were divided athletes into 2 groups: a control group (CG) and experimental group (EG). Each group consisted of 30 people. Karatekas’ control and experimental groups were practicing using the traditional methods of training. The EG students additionally attended Hatha Yoga classes for ten months.

Methods for determining the general and special physical fitness were based on tests. The tests to assess the general physical fitness included [15]:

1. Arms curl in the hanging position on the bar (pulling) – characterizes the power endurance and absolute strength [5, 6, 10].
2. Pushups – develops power endurance, speed-power qualities, and agility [2, 6].
3. Trunk flexion and extension in the supine position (folding) – help assess the speed-power qualities of the abdominal muscles [1, 2].
4. Standing long jump – characterizes the speed-power fitness of leg extensors [3].
5. Six-minute run – is to assess overall endurance [1, 5].
6. 100 m-distance run – determines the speed qualities [3].
7. 4×9 m shuttle run – characterizes the agility and quickness [1, 3].
8. “Crab” – helps assess flexibility [3].
9. “Lateral split” – helps assess flexibility [1, 5].
The tests to assess the special physical fitness included [15]:
1. Monitoring speed capabilities was implemented by counting the number of strokes mawashi-geri (roundhouse) in boxing bags during 10 seconds with both feet alternately [14].
2. When assessing power qualities we used the strength of the hits, assessed by the experts in the competitive battle on a 5-point scale [11]. The combaters’ strength of the hits is estimated using the strength coefficient (SC, %).
3. Special endurance was evaluated by a special coefficient (EC, %), which determines the ratio of the fighting effectiveness during the third (last) minute of the fight to the effectiveness of fighting during the whole fight.
4. Special flexibility (FC, %) was determined by the ratio of the number of kicks to the upper body (in the upper torso and head) to all kicks.
5. Special coordination abilities (CAC, %) were estimated as the average sum of the precision coefficient and the coefficient of complex coordination technical moves and actions.

Special physical fitness (SPFC, %) is defined as the arithmetic average of the coefficients – strength, endurance, flexibility, and coordination abilities [11, 15].

At the end of the study a statistical analysis of the data was done. We calculated the average value ( \( \bar{X} \) ) and its standard deviation (±σ). When determining the significance of differences between the average values of indicators we used Student’s t-test for independent sampling. The differences of the averages were considered statistically significant at a significance level of p≤0.05.

RESULTS AND DISCUSSION

Having studied the dynamics of both general and special physical fitness level of karatekas in control and experimental groups it would be possible to judge whether the selection sampling at the baseline of the research had been done correctly. This is evidenced by the lack of reliable significant difference between physical fitness of athletes in CG and EG at the beginning of the study, indicating the homogeneity of the sampling.

Analyzing the data obtained in the control and experimental groups of karatekas at the end of the study it should be noted that there was no significant difference observed in the following indicators of GPF and SPF: standing long jump; 6-minute run; 4×9m shuttle run; strength coefficient. The results of these tests characterize speed-power and power qualities of karatekas. At the same time the significant improvement in these indicators was observed in the EG at the end of the study [15].

Let us consider those indicators of general physical fitness where significant changes were observed in the EG compared with the CG subjects at the end of the experiment (see the Table 1).

<table>
<thead>
<tr>
<th>Parameters of karatekas’ General physical fitness</th>
<th>Groups of Karatekas ( ( \bar{X} \pm \sigma ) )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control group (n=30)</td>
</tr>
<tr>
<td></td>
<td>BE</td>
</tr>
<tr>
<td>Pulling (number)</td>
<td>9.81±1.06</td>
</tr>
<tr>
<td>Pushups (number)</td>
<td>48.7±2.45</td>
</tr>
<tr>
<td>Folding (number)</td>
<td>22.8±1.47</td>
</tr>
<tr>
<td>Standing long jump (cm)</td>
<td>224.5±6.6</td>
</tr>
<tr>
<td>100 m-distance run (sec)</td>
<td>12.54±0.31</td>
</tr>
<tr>
<td>Six-minute run (m)</td>
<td>1730±54.8</td>
</tr>
<tr>
<td>4×9m shuttle run (sec)</td>
<td>9.95±0.21</td>
</tr>
<tr>
<td>“Crab” (cm)</td>
<td>46.7±3.42</td>
</tr>
<tr>
<td>“Lateral split” (cm)</td>
<td>24.6±1.47</td>
</tr>
<tr>
<td>The total score of GPF</td>
<td>3.47±0.67</td>
</tr>
</tbody>
</table>

Note: BE – the beginning of the experiment, EE – the end of the experiment; * – p≤0.05 – the significance of differences in-group compared with the initial measurement; + – p≤0.05 – the significance of differences between control and experimental groups at the end of the study.
The results in pulling evidently increased in the CG by 12% (p ≤ 0.05) at the end of the trial period, while in the EG the results in pulling evidently increased by 24.1% (p ≤ 0.05); the significance of differences observed when comparing with the CG demonstrates the effective influence of hatha yoga on this physical fitness indicator of karatekas in the EG.

The results in pushups evidently increased in the CG by 7.4% (p ≤ 0.05) at the end of the study, while in the EG this index evidently increased by 11.4% (p ≤ 0.05); and the significance of differences observed when comparing with the control group indicates the effective influence of hatha yoga on increasing both the karatekas’ power qualities and physical fitness in general.

The results in exercises for the abdominal muscle evidently increased in the CG by 7.5% (p ≤ 0.05) at the end of the trial, while in the EG this index increased by 15.2% (p ≤ 0.05). However, the significance of differences was also observed with the respect to the CG, indicating greater influence effect of hatha yoga comparing to the traditional methods of training karatekas.

Significant improvement occurred in the assessment of flexibility in the CG under the influence of traditional karate sports training program – the results in exercise “Crab” improved by 7.3%, and in exercise “Split” by 9.3% (p ≤ 0.05) at the end of the research. In the EG the results of measuring flexibility evidently increased by 15.2% and 21.5% (p ≤ 0.05), respectively. Again the significance of differences observed with respect to the CG demonstrates the effectiveness of hatha yoga influence on the increase in flexibility of karatekas in the EG.

Let us consider those indicators of special physical fitness where significant changes were observed in the EG compared with the CG subjects at the end of the experiment (see the Table 2).

### Table 2

The dynamics of karatekas’ Special physical fitness (SPF)

<table>
<thead>
<tr>
<th>Parameters of karatekas’ Special physical fitness</th>
<th>Groups of Karatekas (X ± σ)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control group (n=30)</td>
</tr>
<tr>
<td></td>
<td>BE</td>
</tr>
<tr>
<td>Mawashi-geri during 10 sec (number)</td>
<td>21.72±1.71</td>
</tr>
<tr>
<td>The strength of the hits (%)</td>
<td>43.5±2.36</td>
</tr>
<tr>
<td>Endurance (%)</td>
<td>42.7±2.56</td>
</tr>
<tr>
<td>Flexibility (%)</td>
<td>53.1±3.11</td>
</tr>
<tr>
<td>CCA (%)</td>
<td>57.7±3.24</td>
</tr>
<tr>
<td>CSPF (%)</td>
<td>55.6±2.47</td>
</tr>
<tr>
<td>The total score of SPF</td>
<td>3.42±0.36</td>
</tr>
</tbody>
</table>

Note: BE – the beginning of the experiment, EE – the end of the experiment; CCA – the coefficient of coordination abilities; CSPF – the coefficient of special physical fitness; * – p ≤ 0.05 – the significance of differences in group compared with the initial measurement; + – p ≤ 0.05 – the significance of differences between control and experimental groups at the end of the study.

The results of measuring the SPF coefficient evidently increased by 4.7% (p ≤ 0.05) in the CG at the end of the study. In the EG the SPF coefficient measurement results evidently increased by 8.1% (p ≤ 0.05). The significance of differences observed when compared to the CG demonstrates the effectiveness of influence of hatha yoga on SPF index of athletes in the EG [15].

### CONCLUSIONS

The conducted study demonstrated that using the means and methods of hatha yoga leads to the increased efficiency of the training process. The introduction of hatha yoga in the training process for karatekas significantly improves the indices of athletes’ physical fitness (both general and special) that is immediately reflected in their performance and increased competitive sportsmanship.

The study has resulted in the development of practical recommendations for karatekas aimed at optimizing their physical fitness. The recommendations are based on the means of hatha yoga. The necessity to apply the means of hatha yoga in sports karate training sessions is
also testified by the fact that this sport contributes to the development of almost every single muscle of the human body. Namely, yogic exercises are aimed at strengthening the muscles, increasing their plasticity and endurance, and improving joint mobility.

ЛИТЕРАТУРА


REFERENCES

1. Aulik, I.V. (1977), How to determine the fitness of an athlete?, Physical Culture and Sport, Moscow.

5. Ivanov, V.V. (1987), Complex control in training athletes, Physical Culture and Sport, Moscow.


Контактная информация: Elen555@tut.by

Статья поступила в редакцию 15.07.2014.