ORIGINAL RESEARCH PAPER

CHANGES IN PHYSICAL FITNESS OF 9–10 YEAR-OLD SPORTS DANCERS DURING A TEN-MONTH TRAINING CYCLE

Aistė Barbora Ušpurienė, Algirdas Čepulėnas

Lithuanian Sports University
Address: Sporto 6, LT-44221 Kaunas, Lithuania
Phone: +37061269645
E-mail: aiste.uspuriene@lsu.lt

Abstract

Research shows that the mastery level of dancers in dance sport is closely related to their physical fitness though there has not been enough research in the changes of indices in physical fitness of juvenile (9–10-year-old) sports dancers while training dance sport. Research aim was to test the effect of training in dance sport on the indices in physical fitness of 9–10-year-old sports dancers. The subjects in the research were 9–10-year-old sports dancers (n=20): 10 girls and 10 boys. The dancers were tested twice: in January 2012 and in November 2012. We established the following indices in physical fitness: hand grip strength, the frequency of fine hand movements, the frequency of leg movements running on the spot for 10 s, speed of hand movements performing 25 cycles of movements, static balance, trunk flexibility, dynamic strength endurance of abdominal muscles, explosive strength and speed strength of legs, explosive strength endurance, simple and complex psychomotor reaction to light stimulus. Dancing practice sessions add a positive effect on psychomotor abilities – simple psychomotor reaction for girls and boys ($p < 0.05$) and complex psychomotor reaction for boys ($p < 0.05$). The indices in physical fitness of juvenile sports dancers did not change much in the research period. Specialized dancing practice sessions did not have significant effect on the improvement in physical fitness, however, a tendency of improvement in physical fitness was observed.

Key words: *dance sport, motor skills, dancing practice sessions, juvenile dancers.*

Introduction

Dance sport is a sport, but it is also an art (Karpenko & Sivitsky, 2009). Dance is one way of human communication, cognition and expression (Bannon & Sanderson, 2000; Lavender & Predock-Linnell, 2001; Smith-Autard, 2003).

Dance sport is becoming more and more popular among children and adolescents. Even children start participating in dance sport contests.

The process of athlete training is oriented to sports results and is associated with the realization of physical fitness in the mastership development, emotional satisfaction in dancing, the development of artistic abilities to express the idea of dance in body movements (Bannon & Sanderson, 2000; Kostić et al., 2003; Smith-Autard, 2003; Karpenko & Sivitsky, 2009; Torrents et al., 2011). Synchronicity of movements, interaction between dancers, repeated sequences of movements, dancers' contact in a pair are of great importance (Torrents et al., 2011). Sports dancers perform non-standard dynamic movements at shifting intensities (Dornowski and Zabrocka, 2008). Movements are performed both in a locomotor way – while moving dancers from one space to another – and in a non-locomotor way – staying in one place. Dance sport contests' intensity demand good physical fitness and functional capacity from dancers (Kostić et al., 2003; Klonova & Klonovs, 2010; Radionov, 2011; Vissers et al., 2011; Ushpurene & Chepulenas, 2012). During a dance much time is spent performing the workload at the intensities exceeding the anaerobic threshold (Klonova & Klonovs, 2010; Vissers et al., 2011; Ushpurene & Chepulenas, 2012). The mastership of dancers much depends on their physical fitness (Kostić et al., 2003; Radionov, 2011).

Technical fitness of sports dancers is closely related to their motor skills: coordination, speed, flexibility, speed strength and endurance (Radionov, 2011). Professional literature highlights teaching and improving dancing technique (The Revised Technique of Latin-American Dancing ISTD, 1983; The Ballroom Technique, 1994), but little attention is paid to the problems of physical training. Research sources (Kostić et al., 2003; Torrents et al., 2011) maintain that training children, their program should include physical exercises for the development of their motor skills. The problem in physical training of juvenile (9–10-year-old) sports dancers has not received adequate attention yet. We suppose that changes in training and physical fitness indices of juvenile sports dancers are relevant research problems worth studying.

Research aim was to study the impact of training dance sport on the indices in physical fitness of 9–10-year-old sports dancers.

Material and Methods

Participafs. The study was carried out in Lithuanian dance sport club "Bonus". The subjects were 20 dancers of juvenile (9–10-year-old) age group – 10 boys and 10 girls. The age of the girls (mean ± SD) was 9.88 ± 0.83 years, and that of the boys was 9.86 ± 1.07 years. According to the age classifier in dance sport (Age Restrictions, 2011) the subjects were attributed to juvenile group. According to the mastery level in sports the subjects matched level E4 and E6 classificatory classes (Regulations of Classificatory Classes, 2011). The height of girls dancers was 141.50 ± 6.28 cm, body mass – 31.13 ± 5.14 kg, body mass index (BMI) – 15.51 ± 2.08 kg/m². The boys' height was 143.29 ± 7.70 cm, body mass – 37.43 ± 7.32 kg, BMI – 18.12 ± 2.62 kg/m². Before the start of the study, the parents of participants signed a written informed consent form.

Testing procedures. The dancers were tested two times. The first period of testing was January 2012, and the second – November 2012. Organized group training sessions with a coach were held three times a week. The dancers developed their special technical, tactical fitness according to the coach's plan (Table 1).

Table 1.

Annual training plan for juvenile group dancers

Periods	Preparatory		Competition		Transition	Preparatory		Competition			Transition	
Months	VIII	IX	X	XI	XII	I	II	III	IV	V	VI	VII
Technical training, %	80	70	50	50	45	70	60	35	35	35	60	**Vacation**
Tactical training, %	20	30	50	50	55	30	40	65	65	65	40	
Competitions	-	+	+	+	-	-	+	+	+	+	-	
Number of hours for training a week	9	9	7	7	6	9	9	7	7	7	6	

The following methods of the research were approved with junior (12–13-year-old) sports dancers (Ušpurienė & Čepulėnas, 2011).

The hand grip strength was measured with a dynamometer which had to be clenched with maximal effort. Motor abilities (speed, flexibility, balance, strength endurance) were measured using recommended approved tests: running on the spot raising the knees high (when the thigh reaches the horizontal position) for 10 s; Tapping Test 3 x 10 s; hand movement speed test – the person had to perform 25 movements as fast as possible and to

touch circles on a plane which were 60 cm apart from each other (Eurofit, 1988); Sit and Reach Test for 30 s (Johnson & Nelson, 1986); standing on the front foot of one leg until the person can keep balance, and the time is recorded; standing vertical jumps measured with the contact board SBM-1, taking off with both feet without hand movement with a squat of 90^o, with a squat of 135^o and with hand movement. Leg muscles' fatigue and endurance were estimated when the dancers performed a serious of 20 jumps from a squat position at the angle of 90^o (Bosco et al., 1982). Psychomotor reactions were measured applying diagnostic device KTD-8. We measured simple psychomotor reaction time, when the dancers knew exactly what stimulus they had to react to, and complex psychomotor reaction, when there were several stimuli, and the dancers had to react only to one of them. The subjects had to react to light stimuli.

Statistical analysis. The research data were processed applying the methods of statistical analysis (Microsoft Office Excel Programme). We calculated the arithmetic mean ($\bar{x}$), standard deviation (SD), Student (*t*) test criterion, and index *p* for statistical significance. The level of significance was set at 95%, when $p<0.05$.

Results

Research findings given in Table 2 allow estimating the achieved levels of motor abilities (speed, flexibility, balance, strength endurance) for dancers – girls and boys. The frequency of steps for girls was 40.06 ± 5.20 steps during 10 s in the first stage of the research, and that for boys was 45.64 ± 7.85 steps, and in the second stage they were at the same level ($p > 0.05$). The speed of hand movements can be evaluated and estimated according to the time needed for 25 movement cycles for the right and the left hands. In the first stage of the research girls performed 25-movement cycles with the right hand in 16.34 ± 2.33 s, with the left hand – in 16.46 ± 2.04 s, for boys those indices were relatively 17.64 ± 1.67 and 18.00 ± 2.02 s. In the second stage the indices of hand movement's speed for girls and boys were slightly higher, but the changes were not statistically significant ($p > 0.05$). The number of fine movements of boys (Tapping Test) during 30 s was 141.43 ± 5.44 to 142.57 ± 8.73 times ($p > 0.05$), but for girls it increased ($p < 0.05$). Both girls and boys achieved the greatest number of fine movements during the first 10 s, and later the frequency of movements gradually decreased.

Table 2.

Changes in the indices of physical fitness for juvenile girls and boys in dance sport

Research stages	Indices	Hand grip strength, kg		Number of steps while running in place during 10 s, times	Hand movement speed-time needed for 25-movement cycles, s		Number of fine movements during 30 s in tapping test, times	Sit and lie down test during 30 s, times	Sit and reach test, cm	Vertical jump in place taking off with both feet, cm		
		Left hand	Right hand		Left hand	Right hand				With a squat at the of 90°	squat at the angle of 135°	With hand movement
Girls												
I	$\bar{X}$	9.75	10.13	40.06	16.46	16.34	140.38	22.25	29.00	20.63	16.61	26.64
	SD	2.38	2.85	5.20	2.04	2.33	10.20	4.95	4.75	3.02	1.97	3.35
II	$\bar{X}$	10.50	10.88	40.00	16.01	15.88	142.25	23.13	29.50	21.63	17.47	26.93
	SD	2.45	2.59	4.94	2.02	2.08	5.55	4.58	4.47	2.69	1.79	3.38
	p	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05	p<0.05	p>0.05	p>0.05	p<0.05	p<0.05	p>0.05
Boys												
I	$\bar{X}$	13.00	14.00	45.64	18.00	17.64	141.43	21.71	23.57	21.50	13.19	29.54
	SD	4.55	4.56	7.85	2.02	1.67	5.44	1.98	3.74	1.36	2.33	3.76
II	$\bar{X}$	14.00	14.43	45.86	17.51	17.39	142.57	22.14	24.29	22.01	13.54	30.45
	SD	4.47	4.54	7.20	1.78	1.58	8.73	1.46	3.25	1.08	2.18	3.93
	p	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05	p>0.05

Flexibility of girls was better than that of boys ($p < 0.05$) (Tab. 2), and in the second stage the index of flexibility for girls was 29.50 ± 4.47 cm, and for boys – 24.29 ± 3.25 cm. The hand-grip strength of the left hand of girls and boys decreased during the second stage, but the changes were insignificant ($p > 0.05$) (Tab. 2).

Both girls and boys achieved the highest indices of static balance standing on one foot in the third trial in the first and the second stages (Figure 1).

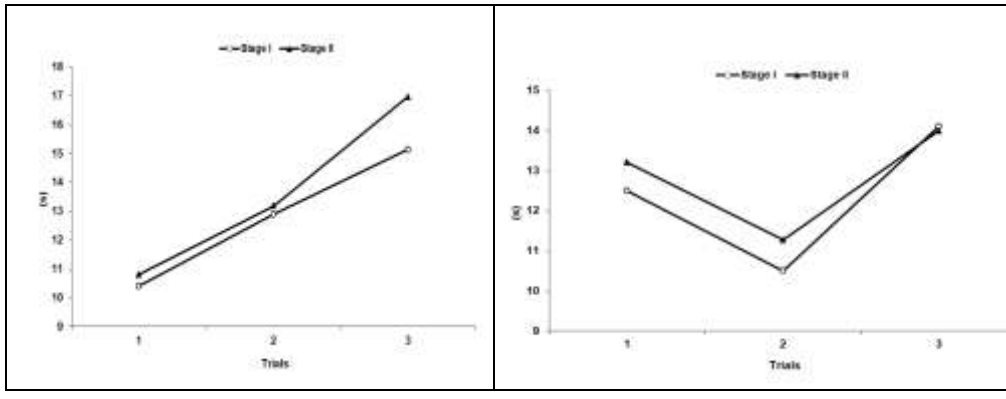

Figure 1. Indices of standing on the front foot of one leg for girls (A) and boys (B)

The indices of the Sit up Lie down Test during 30 s (Table 2) did not change during the whole research ($p > 0.05$). The indices of the vertical jumps show the explosive strength of legs (jump from a squat position at the angle of 90^o) and speed strength (jump from a squat position at the angle of 135^o). The explosive strength of leg muscles of both boys and girls tended to improve in the course of the study, but the changes were low ($p > 0.05$). The indices of 20-jump series show that strength endurance of leg muscles for girls and boys slightly improved (Fig. 2).

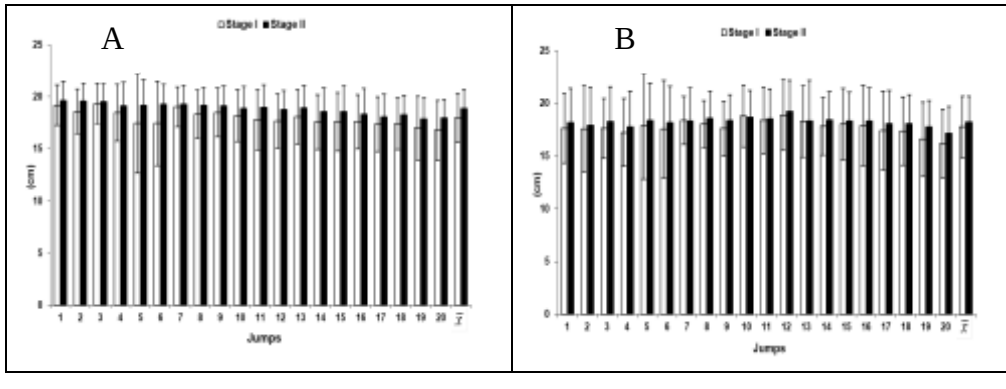

Figure 2. Changes in the height of jumps for girls (A) and boys (B) performing a series of 20 jumps

The average height of jump in a series during the second stage was 18.85 ± 0.53 cm for girls and 18.25 ± 0.41 cm for boys. Simple psychomotor reaction for boys and girls (Table 3) performing the task with the right and the left hands improved ($p < 0.05$). The indices of complex psychomotor reaction for boys in the second stage were higher compared to the first stage ($p < 0.05$). The girls' indices of complex psychomotor reaction did not differ when the task was performed with the right or the left hands ($p > 0.05$).

Table 3.

Changes in the indices of psychomotor reactions for boys and girls in juvenile group of dancers

Research stages	Indices	Girls				Boys			
		Simple reaction time, ms		Complex reaction time, ms		Simple reaction time, ms		Complex reaction time, ms	
		Left hand	Right hand	Left hand	Right hand	Left hand	Right hand	Left hand	Right hand
I	$\bar{x}$	297.42	319.67	327.00	319.00	284.52	278.95	300.62	324.57
	SD	55.39	42.35	56.35	51.27	42.59	52.59	53.22	26.54
II	$\bar{x}$	262.38	263.00	307.50	294.38	257.43	249.00	261.43	287.43
	SD	54.10	21.25	55.84	38.53	28.65	52.12	32.48	35.80
	p	p<0.05	p<0.05	p>0.05	p>0.05	p<0.05	p<0.05	p<0.05	p<0.05

Discussion

Training young sports dancers much attention should be paid to their physical training (Kostić et al., 2003; Karpenko & Sivitsky, 2009; Radionov, 2011). In practice, dancers develop their physical fitness independently, and not in the practice sessions with a coach. Research shows that physical fitness of young dancers improves more rapidly when dancing practice sessions include physical training or physical exercises for motor abilities development (Radionov, 2011).

The speed of leg movements of boys and girls performing the test "Frequency of steps running on the spot during 10 s" matched the level of persons engaged in sports. The speed of hand movements of boys and girls matched the low level of 10–11-year-old schoolchildren (Eurofit, 1988). Changes in the frequency of fine movements of the hand showed that the

nervous system of female and male juvenile dancers is not capable of maintaining constant maximal frequency of fine movements.

The results of the test "Sit up Lie down during 30 s" of juvenile dancers matched the girls and the boys lower than average level in physical fitness of children of the same age according to the scale in physical fitness in Eurofit (1988). Flexibility indicators for both boys and girls according to the scale of Johnson & Nelson (1986) were rather high. The girls' duration indicator standing on the front of one leg (static balance) in the first stage was 15.13 ± 8.78 s, and in the second one – 16.96 ± 8.86 s. The balance indices of junior girls (12–13-year-old) dancers according to this test were from 20.73 ± 6.96 s to 32.63 ± 14.69 s (Ušpurienė & Čepulėnas, 2011). The boys' duration indicator standing on the front of one leg during the second stage reached to 13.99 ± 6.28 s the relative indices of junior boys dancers were from 21.85 ± 14.37 s to 36.35 ± 20.52 s (Ušpurienė & Čepulėnas, 2011).

In dance sport, body balance during the whole dance is of great importance. The ability to maintain static balance helps to keep balance in the required positions, and keeping dynamic balance helps to perform various movements and actions under the influence of external powers (Dornowski & Zabrocka, 2008). The results of the jump with hand movements show the power of single leg muscle contraction (Bosco et al., 1982). The indices of girls jump with hand movements corresponded to the high level of juvenile dancers according to Mero et al. (1992) scale. For boys the level was very high. Dancing practice sessions had a remarkable positive effect on the psychomotor domain. The indices of simple psychomotor reactions improved for girls and boys ($p < 0.05$) and complex psychomotor reactions for boys ($p < 0.05$).

Summing up the research findings we suggest that specialized dancing practice sessions did not have greater effect on the improvement of dancers' physical fitness, but we could observe a tendency of improvement in some elements of physical fitness. The juvenile (9–10-year- old) dancers' indices of speed, flexibility, strength endurance and explosive strength were adequate to those of boys and girls of the same age group and complied with the average or high level standards.

In the perspective, dance sport training should also include training sessions of general physical fitness and it would be appropriate to verify their effect on the physical fitness of juvenile sports dancers.

Conclusions

The indices in physical fitness of juvenile sports dancers did not change much in the research period. Loads of technical and special training did not affect the changes in dancers' motor skills.

Physical fitness is a significant component of juvenile sports dancers' sports fitness, and the improvement of physical fitness indices requires inclusion of physical training into the programs of training sports dancers, or regular practice sessions in dance sport should be supplemented with physical exercises for the motor skills' development.

The perspective of further research is to establish the optimal ratio of exercises for general physical fitness for juvenile dancers' technical training in their training sessions.

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