

ASSESSMENT OF EFFECTIVENESS OF SPORTS MASSAGE IN SUPPORTING OF WARM-UP

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Annotation. *Purpose:* Warm-up is necessary part of sports training, because prepare the body for exercises and minimize the risk of injury. The aim of this study was assess the effectiveness of two types of warm-up: aerobic exercises and exercises with sports massage (before). *Material and Methods:* The research covered 59 women. All of them did fitness tests two times. Each test was preceded by a different form of warm-up (aerobic exercises, exercises with massage). For examined the differences t-Student test was used. *Results:* Warm-up with massage had positive effect for fitness level. More effective was exercises preceded by massage – differences in results (after the standard warm-up and warm-up with massage) in every tests were significant ($p < 0.001$). *Conclusion:* Alternative form of warm-up can be effective way to preparing the body for exercises and make the training more attractive.

Key words: warm-up, sports massage, fitness, women.

Introduction

Properly conducted training consists of three main elements: warm-up, actual exercises and cool-down [1]. Warm-up is considered to be an indispensable element of preparation to each physical activity, however, according to some authors, such as Bishop or Fradkin, there is little scientific evidence proving its effectiveness [2, 3, 4].

Warm-up techniques may be divided into two categories: passive and active warm-up. Passive warm-up is based on the application of external factors, such as hot shower, sauna, bath, diathermy, or warm compress. Passive warm-up does not cause the body to lose its energy substrates. On the other hand, there is active warm-up, which assumes properly selected physical exercises, which may include jogging, gymnastics, cycling, or swimming. Stretching is also an important element of a successful warm-up, since it prevents muscles from being damaged. However, this type of warm-up is usually applied when preparing for sports trainings and their effects [5, 6].

The main purpose of a warm-up is to increase the inflow of blood to the muscles, providing working muscles with an additional supply of oxygen and nutrients and raising their temperature to the optimal value of approximately 37°C [1, 2, 7]. Of course we should remember, that core temperature is generally close to about 37°C, while the temperature of the surface of the body can be much more diversified and lowered as a result of exercises. It's an effect of the perspiration and returning heat by working muscles [8]. Moreover, warm-up reduces muscle stiffness and increases the number of stimuli in motoneurons. Moreover, warming up exercises applied prior to physical activity also aim at increasing the effectiveness of thermoregulation through the activation of sweat glands. Thanks to such mechanisms, a warm-up alone does not result in raising internal body temperature [1, 5, 7].

Properly conducted warm-up should take from 5 to 20 minutes, depending on the type of exercises to be performed. Short warm-up is usually applied when preparing for endurance training. Long warm-up, on the other hand, is applied when preparing for intensive power and speed exercises. It should be emphasized, however, that, in order not to waste the effects of preliminary exercises, the interval between the end of warm-up and the beginning of training should not exceed 15 minutes [1, 7].

The primary purpose of the research was to evaluate the effectiveness of two forms of warm-up exercises (standard warm-up – based on general developmental exercises and sports massage of the lower limbs preceding proper warm-up) in preparing for physical exercises.

Material and Methods

The research covered 59 women attending fitness classes on a regular basis (at least three times a week). The age of women participating in the research was 29.3 (± 11), in average. Their average height was 166.9 cm (± 4.8) and their average body weight was 61.7 kg (± 6.3). For comparative purposes, the research group was divided into sub-groups, in which the criterion for division was:

- age – women after the age of 30 ($n=25$) and before the age of 30 ($n=34$),
- training experience – women with less than a year's experience in exercising ($n=35$) and women with more than a year's experience in exercising ($n=24$),
- exercising in the past – women who exercised in the past ($n=29$) and women who did not exercise in the past ($n=30$).

All women participating in the research received two various forms of preparation to physical exercise: standard warm-up and warm-up preceded by sports massage of lower limbs. After having received all types of warm-up, the women underwent fitness tests and filled in survey questionnaires.

Standard warm-up was the first type of preparation to physical exercise. Here, the warm-up was based on copying steps from aerobics to the rhythm of music. The recommended tempo of music was 130-135 BPM. The exercise consisted of the following steps: march in place, toe step, step touch, twice, hill back, knee up, grapevine, which additionally engaged the upper limbs. The steps were arranged in a simple choreographic block, suitable for any exercising person. Then, additional stretching exercises for neck, shoulder, trunk and lower limb muscles were introduced. To close the session, several breathing exercises were performed. This warm-up took approximately 10 minutes [9].

The second form of preparation to physical exercise was sports massage of the lower limbs followed by standard warm-up (described above). The massage was performed manually. The duration of the procedure was approximately eight minutes (four minutes for each leg), and the position, in which the massage was performed was sitting with legs bent. The massage was a power massage applying the following techniques: sliding, compression, kneading, percussion [10, 11, 12, 13].

After having performed all forms of warm-up, the women were asked to undergo specific fitness tests, the results of which were entered to special data sheets. The intervals between particular evaluations were seven days [14].

Four fitness tests were carried out as part of the research: a power test – long jump from standing (the length of the jump was measured), a test of suppleness – a bend to the front performed on a bench (the distance of the tip of the longest finger to the ground was measured), a speed test – a 10-second run in one spot, clapping hands below the knees (the number of claps decided on the result) and an physical efficiency test – the Ruffier Test (the Ruffier coefficient was used to evaluate the results of the test). The Ruffier Test was based on performing 30 squats in 30 seconds and monitoring pulse during the rest immediately following the exercise and after one minute of the rest. The Ruffier coefficient is calculated basing on the following formula [14]:

$$IR = [(P + P1 + P2) - 200]/10$$

IR – Ruffier Index

P – resting pulse

P1 – pulse measured immediately after the test

P2 – pulse measured after 1 minute of the rest

Standard statistical analysis methods were applied in evaluating empirical data. The results of particular fitness tests were presented with the use of arithmetic means (\bar{x}), taking into account the standard deviation (SD) factor. The significance of disparities between couples of variables were evaluated using the t-Student test for dependent groups, assuming $p < 0.05$ as the minimal significance level.

Results

Standard warm-up basing on aerobic exercises (without massage) proved to be the least effective method of preparing to physical exercises, compared to applying massage. Women applying sports massage acquired considerably better results ($p=0.000$) in all tests (tab. 1). The biggest disparities were recorded in the results of the speed test, and the smallest ones – in the physical efficiency test. The most beneficial results in all fitness tests were achieved with warm-up preceded by sports massage.

Analyzing the results of particular sub-groups, it may be claimed that non-standard form of preparation to physical exercise (warm-up preceded by massage) had greater impact on women under the age of 30. The biggest differences in all sub-groups were recorded with respect to power, flexibility and speed tests. Massage had the slightest impact there – particularly among younger women with smaller experience in training (tab. 2).

Table 1.

Average results (with SD) of fitness tests preceded by two kind of warm-up

	Aerobic exercises		Exercises with massage		Difference [p]
	mean value	SD	mean value	SD	
POWER long jump [cm]	132.47	19.9	146.45	19.1	0.000
FLEXIBILITY deep bend [cm]	1.67	10.1	7.93	9.5	0.000
SPEED run with tapping [n of tapping]	28.12	4.7	34.55	4.7	0.000
PHYSICAL EFFICIENCY Ruffier Test [IR]	9.27	3.7	6.74	3.5	0.000

Table 2

Results of fitness tests preceded by two kind of warm-up in subgroups

subgroups	kind of warm-up	POWER long jump [cm]	FLEXI-BILITY deep bend [cm]	SPEED run with tapping [n of tapping]	PHYSICAL EFFICIENCY Ruffier Test [IR]
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persons over 30 years old	only exercises	117.5	0.3	24.6	7.72
	massage	133.78 **	5.89 ***	31.89 ***	5.74 *
persons under 30 years old	only exercises	137.13	1.37	29.38	9.42
	massage	150.09 ***	8.41 ***	35.32 ***	6.78 ***
subgroups	kind of warm-up	POWER long jump [cm]	FLEXI-BILITY deep bend [cm]	SPEED run with taping [n of tapping]	PHYSICAL EFFICIENCY Ruffier Test [IR]
persons practicing under 1 years old	only exercises	135.25	-0.1	28.7	9.86
	massage	149.56 ***	5.78***	35.72 ***	6.8 ***
persons practicing over 1 years old	only exercises	128.5	4.21	27.28	8.43
	massage	142.15 ***	10.92 ***	32.92 ***	6.67 **
subgroups	kind of warm-up	POWER long jump [cm]	FLEXI-BILITY deep bend [cm]	SPEED run with taping [n of tapping]	PHYSICAL EFFICIENCY Ruffier Test [IR]
persons practicing sport in the past	only exercises	141.55	5.25	29.1	9.36
	massage	154.06 ***	11.72 ***	34.83 ***	7.22 ***
persons not practicing sport in the past	only exercises	116.79	-4.92	26.35	8.29
	massage	133.31 ***	2.08 ***	33.61 ***	5.45 ***

* p<0.05; ** p<0.01; *** p<0.001: differences between measurement after standard warm-up and warm-up with massage

Discussion

Increased physical activeness has beneficial effect on the health of every human being. This is because particular systems and organs are activated and exercised as a result of changes occurring in the course of and after physical training. However, in order to prepare for physical exercise in the correct way, one needs to warm up properly.

Research proves that properly chosen warm-up has beneficial effect on the results of fitness tests. Proper preparation to physical exercise is also commonly applied in rehabilitation. Brzęk and Nowotny-Czupryna [15] examined how warm-up influences the results of fitness tests in patients who suffered from heart attack. Their research proved that warm-up performed prior to physical exercise has effect on the results of the submaximal strain test both in men and women. Additionally, patients suffering from cardiologic conditions who applied proper warm-up displayed increased endurance of larger strains. The next precious piece of information was the fact that warm-up preceding a strain test had considerable effect on lowering the value of maximum and final pulse [15].

The next, very important aspect of warming up before proceeding to training is injury prevention [16, 17]. Research conducted by Malliou in Greece on 404 aerobics instructors proves that proper warm-up combined with stretching and cool-down after training lowers the risk of the occurrence of personal injuries [18]. Similar conclusions were raised by Obałkowska [5], who claimed that proper warm-up has great impact on the properties of muscles, and, in result, contributes to minimizing the possibility of injuries. Research conducted by Subasi et al. [19] confirms the positive impact of warm-ups in injury prevention as well.

The results of research on the impact of massage as a preparatory element to physical exercise do not always lead to identical conclusions [20, 21, 22, 23, 24]. What is actually proven is the positive effect on the mental sphere, which is the key factor in some sport disciplines (e.g. combat sports) [22, 25, 26]. In the case of fitness tests, positive impact of massage was recorded in short-term exercises [21, 27]. In the case of the research referred to herein, the impact of massage was the smallest in the Ruffier Test measuring physical efficiency. It should be emphasized, however, that massage has undeniable impact on injury prevention.

Sports massage produce mechanic stimuli which, as such, cause numerous local and general changes in human body. Applying proper techniques, one may stimulate particular tissues: muscular and skin tissue as well as particular systems: nervous, circulatory, excretory, breathing and alimentary system. In response to massage, the body raises its temperature in the area being massaged for approx. 1.5-1.8°C. A specific direction of massage, for instance in the direction of the heart causes the blood to circulate faster from the veins and capillary vessels, thanks to which the tissues of the body part being massaged expel the products of metabolism and absorb nutrients more actively [10, 12].

The application of alternative forms of preparation to physical exercise may not only increase the effectiveness of training itself but also make the training more attractive. The primary purpose of sports or recreational training is increasing the strength and physical efficiency of the entire organism. In order to make this process more efficient, exercise must be performed on a regular basis, which could lead to monotony and boredom. Therefore, it is essential that we prepare our bodies for training on a proper way.

It seems justified that further research in this matter focused on a larger, more diversified group of people with respect to age, sex, health condition, height-weight parameters, experience in physical training, or even lifestyle. In addition, warm-up may be followed by other physiotherapeutic procedures or various forms of stretching, the results of which may also be evaluated [28, 29].

Conclusions

1. Warm-up preceded by sports massage was the most effective method of preparing to physical exercise. Active engagement of physiotherapists in preparing sportsmen to physical exercise and the introduction of massage as an element of warming up before contests could improve the psychomotor abilities of contestants.
2. Sports massage may serve as interesting supplements to traditional warm-up procedures, both for professional sportsmen, and amateurs.
3. The present results may be the basis for a prospective randomized study involving a more diverse group of people.

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