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POROVNANIE HODNOTENIA INTENZITY ZAŤAŽENIA DVOMI RÔZNYMI METÓDAMI NA HODINÁCH AEROBIKU A AQUAROBIKU U ŠTUDENTIEK VYSOKÝCH ŠKÔL

THE COMPARISON OF INTENSION OF LOADING WITH TWO DIFFERENT METHODS ON LECTURES OF AEROBICS AND AQUAEROBICS AMONG STUDENTS OF UNIVERSITIES

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ABSTRACT

Authors in this contribution are dealing with the comparison evaluation of intension of motion loading among female university students who are studying in a different field, among the lectures of aerobics and aquaerobics. With the comparison of methods of intensity loading during three watched sections and two measurements we found out that small differences of results which we got with objective and subjective method came up in the second measurement. We could see that the results were from comparable more or less identical. This could be seen in the modeled content with the rising range of heart rate, so in the second and third watched section in both measurements among lectures of aerobics and aquaerobics.

Keywords: intensity of loading; aerobics; aquaerobics; objective methods of intensity loading; subjective methods of intensity loading

SÚHRN

Autorky sa v uvedenom príspevku zaoberajú porovnaním hodnotenia intenzity pohybového zaťaženia vysokoškoláčok, rôzneho študijného zamerania, počas hodín aerobiku a aquarobiku. Komparáciou rôznych metód hodnotenia intenzity zaťaženia počas troch sledovaných úsekoch a dvoch meraní sme zistili, že menšie rozdiely hodnôt, získaných objektívnou a subjektívnou metódou sa prejavili v druhom meraní. Porovnateľné až zhodné výsledky oboch aplikovaných metód sme pozorovali pri modelovanom obsahu so stúpajúcim rozmedzím srdcovej frekvencie, teda v druhom a treťom sledovanom časovom úseku v oboch meraniach počas hodín aerobiku a aquarobiku.

Klíčová slova: aeróbne pohybové aktivity; intenzita zaťaženia; aerobik; aquarobik; objektívne metódy hodnotenia intenzity zaťaženia; subjektívne metódy hodnotenia intenzity zaťaženia

Introduction

The optimal physical activity is as important and necessary for a person as the optimum quality and quantity of food or sleep. Experts agreed in the opinions that well-chosen physical activity has a positive impact on lowering the risk of the formation of cardiovascular disease, disease of the musculoskeletal system, the optimization of blood pressure, lowering the obesity, it is a positive prevention from the formation of arteriosclerosis, diabetes or bone loss, lowering and reduction of stress, the rise of physical ability and performance, improvement of sleep etc. (Ondrušová, 2010; Lőrinczová & Tibenská, 2011).

Aerobic movement activities are for a few decades in the center of interest and attention of many researches and they are one of the most extended activities for their health effect and their positive effect not only in the prevention from the cardiovascular disease. Aerobic movement activities or aerobic exercising are according to Cooper (1990) that kind of physical activities, during which the higher supply of oxygen is needed and they also force the organism to rise the use of oxygen by its requirements. The results of aerobic activity are

positive changes in lungs, heart and in the vascular system. If we say it in other words, the regular physical activity of this kind improves the ventilation of lungs and increases the whole amount of blood and this blood could better transport the oxygen in the organism. Aerobic movement activities mostly covered the endurance activities with moderate intensity. (Cooper, 1990). This group of activities includes not only the rhythmically and cyclically repeating activities with moderate or mild intensity (walking, running, swimming, cycling, skating, jumping with the rope) but also activities with highly variable intensity (aerobics, dancing, sports games) and a lot of exercising on trainers which imitates more or less every aerobic activity : stationary bike, trainer for walking, different types of running trainers, trainer for rowing, Nordic skiing, skating or downhill skiing(Šimonek & Kyselovičová, 1999).

Aerobics is the type of physical activity with aerobic character, it puts into activity large muscle groups (Olson et al., 1991; Williford et al., 1989) and by this it stimulates and positively influence the work of cardiovascular system, respiratory and musculoskeletal system and it invokes positive changes of VO_2max (Vaccaro & Clinton, 1981) and it positively influence the physical ability and locomotion performance of organism. The physiological efficiency of aerobics to organism is according to many researches identic with fast walking, endurance running, swimming or cycling (Nieman, 1990; Thomsen & Ballor, 1991; Heyward, 1991; Berry et al., 1992). The intensity and dynamic of exercising is conditioned with music, which raise the motivation and strengthens the emotional side of exercising.

If we respect the intensity of loading and frequency the efficiency of movement activities in water is comparable with the one out of water. The water environment on one hand allow us the movement, but on the other hand it hampers, when we are creating an exercising program for aqua fitness, it is very important to take into consideration the physical laws of water With regular and long-lasting training in water vegetative organs, cardiovascular system, central nervous system, respiratory system, muscles, joints and ligaments will adapt to this environment and it leads to increase of physical ability (Labudová & Ďurechová, 2005).

The development of aerobic system has the same effect as in activities out of water but with lower heart rate (Michaud, et. al.1995). When we are counting the heart rate in water we need to take into consideration the laws of water environment. (Dočekalová, 2003) says that the values of heart rate in water are 13% lower, another author (Gaines, 1985) has confirmed 10 beats/ min. lower in vertical position and (Čechovská, et al. 2003) 7-13 beats/min. lower than outside the water.

The aim of work

The aim of work is to present, expand and put more exactly the knowledge about objective and subjective evaluation of intensity of loading by applying intermittent method of loading on lessons of aerobics and aerobics in the water among female students of universities.

Methods

The sample consisted of 30 female students from 1st to 3rd year of bachelor studying in the different field on Faculty of Chemical and Food technology, Slovak University of Technology, with the calendar age 18-20 years. The internal reaction of organism on motion loading in water in terms of functional parameters we have been getting by the measurements of heart rate (SF) by sport tester POLAR 810 and its notation with interval 5 seconds. With the subjective valuation of intensity of motion loading during motion programs, which we were chosen by us, we were getting the information by explorative method of regulated interview with the usage of Borg scale (table 1) of subjective perception of needed effort (RPE – rating of perceived exertion) in the scale with 20 points. Borg scale is a common method, which can be applied on the measurement of intensity of a big amount of impulsions, experiences and feelings. It is a scale on which we mark the level of subjective feelings. This scale represents the connection of muscle activity, changes of cardio-vascular system, psychological stress, and pain.

Table 1. The Borg scale expressed by words (Borg, 2004).
Tabuľka 1. Slovné vyjadrenia Borgovej škály (Borg, 2004).

RPE	Description	Intensity Level
7	Easy	
8		
9	Very Light	
10		50% MHR
11	Fairly Light	
12		60% MHR
13	Somewhat Hard	
14		70% MHR
15		
16	Hard	80% MHR
17		
18	Very Hard	90% MHR
19	Very, Very Hard	
20		

Before beginning of the lesson students were taught about the meaning and usage of the Borg scale during exercised unit. Table with point evaluation of subjective feelings according to Borg

was on the blackboard all the time in front of students. After the finishing of exercise of given part every student report her points personally, which she granted to given part of exercised unit according to her actual feelings.

Table 2 The basic mathematical-statistical characteristics of values of heart rate (measurement1).
Tabuľka 2. Základné matematicko-štatistické charakteristiky hodnôt SF (1. meranie).

Measurement 1 1. meranie	Aerobics/Hearth rate Aerobik/SF			Aqua/Hearth rate Voda/SF		
HR/1min SF/1min	**10 min**	**20 min**	**30 min**	**10 min**	**20 min**	**30 min**
x	121,9	140,8	154,7	112,6	132,9	148,7
stand.dev. smerod.odchýlka	13,04	13,78	13,74	10,24	8,65	8,33
median	125,5	142,5	156	112,5	132	146,5
min.	87	102	114	90	116	135
max.	135	159	173	137	152	177
range variačné rozpätie	48	57	59	47	36	42

Table 3 The basic mathematical-statistical characteristics of values of RPE (measurement1).
Tabuľka 3. Základné matematicko-štatistické charakteristiky hodnôt RPE (1. meranie).

Measurement 1 1.meranie	Aerobics/RPE Aerobik/RPE			Aqua/RPE Voda/RPE		
RPEx10	**10 min**	**20 min**	**30 min**	**10 min**	**20 min**	**30 min**
x	98,3	119,7	143,0	92,33	121,0	141,0
stand.dev. smerod.odchýlka	17,44	18,66	14,89	14,06	14,47	17,29
median	100	120	140	90	120	140
min.	60	80	120	70	100	100
max.	120	150	170	130	150	170
range variačné rozpätie	60	70	50	60	50	70

The motion program of aerobics was divided into 10 minutes long sections, during which we have used the interval method of loading in the rising range of heart rate (110-130 beats per minute, 130-150 beats per minute, 150-170 per minute). The motion program of aquaerobics in shallow water was divided into 10 minutes long sections, during which we have used the interval method of loading in the rising range of heart rate (100-120 beats per minute, 120-140 beats per minute, 140-160 beats per minute). When we have been counting the heart rate we have taken into consideration the laws of water environment and we have decreased the range of heart rate over 10 beats per minute (Čechovská, et al. 2003). When we are talking about the interval method we have chosen the ratio 3:1. Sections of intensive loading in duration 90 seconds and sections of low loading in duration 30 seconds. Content of sections consisted of exercises of aerobics in shallow water without gears. We have repeated measurements twice. By the end of every 10 minute section volunteers rated the loading by means of subjective method and the Borg Scale.

Results

Overall, we can say that results of our experiment have confirmed that the intensity of loading that we got from objective method, measurements of heart rate, was higher than measurements we got from subjective intensity of loading – the Borg scale in both types of motion loading. The basic mathematical-statistical characteristics of the results of first measurement could be seen in the second and third chart.

The basic mathematical-statistical characteristics of the results of second measurement could be seen in table 2 and 3.

Figure 1 shows the comparison of objective and subjective valuation of intensity of loading in aerobics and aquaerobics in the first measurement. The most significant differences between both methods that we have used, were expressed in the first measured section, where the average heart rate (HR) was 122 beats/min and the value of RPE 98 in aerobics, heart rate 113 beats/min and the value of RPE 92 in aquaerobics. We have measured differences also in the next two sections of the measurement 1, where the average heart rate during aerobics was 141 beats/min and the value RPE 120, in aquaerobics the results were: heart rate 133 beats/min and RPE 121, more precisely the average heart rate was 155 beats per minute and RPE 143 in aerobics, in aquaerobics the heart rate was 149 beats per minute and 141 in RPE.

We can point out that students were feeling the intensity of intermittent loading during aerobics in different environment identically.

The basic mathematical-statistical characteristics of the results of second measurement could be seen in table 4 and 5

In the file of students during the second measurement (figure 2) we have measured the average values of heart rate as the internal respond of organism on physical loading higher than subjective perception and its point values in aerobics mostly in the first and second measured section, where the average heart rate was 126 beats/min. and the values RPE 111, more precisely 144 beats/min. and the values RPE 129. In the third measured section of second measurement the values of objective and subjective valuation were comparable and they have shown a bigger identity in

values that we got in both methods as in the first measurement.

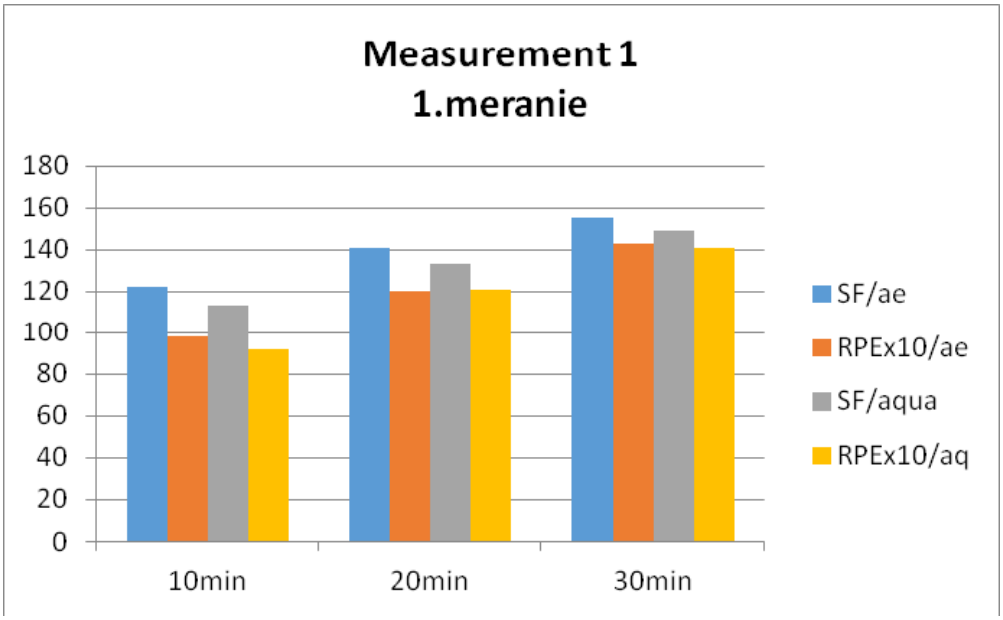

Figure 1. The comparison of objective and subjective valuation of intensity of loading in aerobics and aquaerobics in single timed sections (measurement 1).
Obrázok 1. Porovnanie objektívneho a subjektívneho hodnotenia zaťaženia v aerobiku a aerobiku vo vode v jednotlivých časových úsekoch (1.meranie).

Table 4 The basic mathematical-statistical characteristics of values of heart rate (measurement2).
Tabuľka 4. Základné matematicko-štatistické charakteristiky hodnôt SF (2. meranie).

Measurement 2 2.meranie	Aerobic/hearth rate Aerobik/SF			Aqua/hearth rate Voda/SF		
HR/1 min. SF/1min.	**10 min**	**20 min**	**30 min**	**10 min**	**20 min**	**30 min**
x	126,1	143,9	161,2	112,6	132,9	148,7
stand.dev. smerod.odchýlka	10,34	8,68	7,34	10,24	8,65	8,33
median	129	145	165	112,5	132	146,5
min.	100	124	145	90	116	135
max.	138	154	168	137	152	177
range variačné rozpätie	38	30	23	47	36	42

On the classes of water aerobics during second measurement (figure 2) we have measured the average values of heart rate as the internal response of organism on physical loading higher than subjective perception and its point values in aerobics mostly in the first and second measured section, where the average heart rate was 120 beats/min and the value RPE 105. In the second and third measured section in second measurement the values of objective and subjective valuation were comparable and they have shown a bigger identity in values that we have got in both methods as in the first measurement. We can state that the subjective feelings of students matched with values of their heart rate.

Table 5 The basic mathematical-statistical characteristics of values of RPE (measurement 2).
Tabuľka 5. Základné matematicko-štatistické charakteristiky hodnôt RPE (2. meranie).

Measurement 2 2.meranie	Aerobic /RPE Aerobik/RPE			Aqua/ RPE Voda/RPE		
RPEx10	**10 min**	**20 min**	**30 min**	**10 min**	**20 min**	**30 min**
x	111,0	129,3	154,0	104,7	132,7	150,3
stand.dev. smerod.odchýlka	13,98	12,58	11,02	14,79	10,15	15,20
median	110	130	150	100	130	150
min.	90	100	120	70	110	110
max.	140	150	170	130	160	180
range variačné rozpätie	50	50	50	60	50	70

When we compare the results of first and second measurement, we can say that that the values of heart rate which we have got from the objective measurement were higher than the values of RPE. The difference in the first section was 24 (first measurement) and 15 (second measurement) in aerobics. Difference in the heart rate and RPE aquaerobics were 21 (1st measurement) and 15 (2nd measurement). Differences in heart rate and RPE in aerobics in the second watched section were 21 (1st measurement) more precisely 15 (2nd measurement), in aquaerobics the difference in values was

12 (1st measurement) more precisely 4 (2nd measurement). In the last watched section differences between heart rate and RPE were 12 (1st measurement) and 7 (2nd measurement) in aerobics, in aquaerobics the differences were 8 (1st measurement) and 3 (2nd measurement). We conclude that students could take measure more adequately to the intensity of loading in the second mea-surement than in the first one. We point out that certain adaption on moving facilities showed in the 2nd measurement. To the results that we have got could to some extent contribute facts such as learning the basic elements and improving the quality of exercising. On the basis of the results that we have got, we can conclude that the identity of objective and subjective method of evaluation the intensity of loading during aerobics and aquaerobics have shown up during the modeled content with the rising range of heart rate, so in the second and third watched section.

With the analysis of subjective feelings in particulate moving activities, we point out that students felt the subjective intensity of loading almost the same during both moving activities in both measurements. Water environments and factors, which had affected and influenced students during the realization of program, can be the explanation, that objective evaluation and subjective feelings of the intensity of loading were getting close and in the last measured parts they were showing almost the same progress.

Based on the empirical experience, which we got during realization of suggested programs on the lessons of aqua aerobic in differentiated environment, we can point out that both motivational factors; technical handling of moving shapes in different environment, specific water environment but also external conditions, space conditions can enhance the effort or have a negative impact on it.

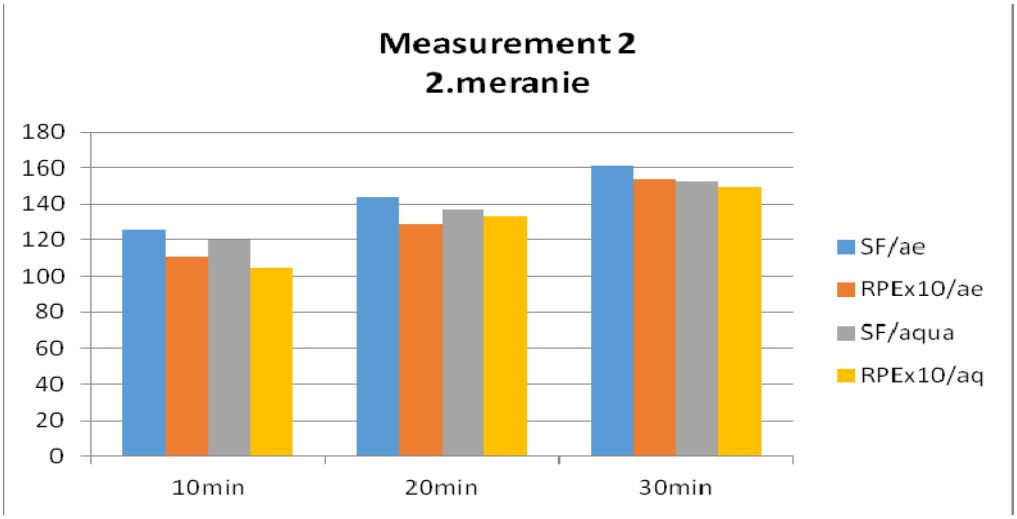

Figure 2 The comparison of objective and subjective valuation of intensity of loading in aerobic and aerobic in water in single timed sections (measurement2).
Obrázok 2. Porovnanie objektívneho a subjektívneho hodnotenia zaťaženia v aerobiku a aerobiku vo vode v jednotlivých časových úsekoch (2.meranie).

Conclusion

With the comparison of two different methods of intensity of loading during three watched sections and two measurements we have found out that differences that we have got from objective and subjective method came out in the second measurement. We could see that the results were from comparable even identical. This could be seen in the modeled content with the rising range of heart rate, so in the second and the third watched section in both measurements. Overall, the only small differences in values between used methods in both measurements were found out during the lectures of aerobics.

From the results and our experience which we have got during the realization of the research we incline to the opinion, that subjective method of evaluation of intensity of loading is more propriety to moving activities in different environment with the intensity in the middle or higher area of aerobic loading.

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