CHANGES OF PHYSIOLOGICAL PARAMETERS IN A SPORTIVE DRUMS ALIVE®-DRUMMING ACTIVITY AND ITS EFFECTS ON CONCENTRATION AND AWARENESS PERFORMANCE

THE DRUM BEAT – Chemnitz Drumming Project

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Abstract

Objectives

This article will discuss the interim results of a study that investigated a fitness trend that uses elements of drumming and aerobics called Drums Alive®. The focus of the analysis lies on the behaviour of physiological parameters during this intervention in adults of different ages. This should produce information on the typical work intensity of this exercise. Furthermore, the effects on acute concentration and awareness performance after a session of Drums Alive® in students were investigated. The here presented study is part of a bigger project „THE DRUM BEAT – Chemnitz Drumming Project“, which evaluates the possibilities of using this type of drumming exercise in various areas of fitness, education and therapy.

Methodology

The study design included two sessions to allow the subjects to get used to the movement patterns of Drums Alive® and a third testing session with 27 adults (14 students, 18-22 years and 13 older adults who were between 30 and 65 years of age, described here as AC 30-65). During the testing session physiological data was collected which included heart rate, blood lactate, range of perceived exertion and exemplary spirography data in two subjects as well as concentration and awareness tests using the d2-test in the students group only (N=16; the d2 students intervention group had two more subjects in this group compared to the physiological data). In order to compare the latter data (concentration performance) a control group of 17 students was used.

Results

All physiological parameters showed a significant increase compared to the resting values. The intervention can therefore be described as an effective exercise. The blood lactate values showed a mean increase from 1.16 ±0.31 to 3.75 ±1.91 [mmol/L] in the overall group (students and AC 30-65, N=27), which corresponds with the changes in heart rate. An increase from 84 ±14 to 155 ±16 could be shown. This is also reflected in the high RPE-values of 16 towards the end of the main phase of the Drums Alive® session. The results of the d2-tests showed a slightly better performance in the intervention group (students) compared to the control group, but no significant difference.

Conclusions

This study proved significant physiological effects in the Drums Alive® exercise session and gave hints on a positive effect on concentration performance. However, more research is necessary before a final statement on the effects of this type of sportive drumming exercise can be given.

1 Introduction

Drumming and dancing have been the simplest form of communication since mankind evolved. Even today drumming is still commonly practiced, especially by people in Africa and Asia. It is often the centre of ritual ceremonies and community festivals. The Max-Planck Institute and the University of Manchester for example investigated the acoustic communication forms of Makaka monkeys and found that the drumming with unspecific materials isn't just a side effect of random actions, but a manifest part of their communication and expression repertoire (Remedios R., Logothetis N. and Kayse C., 2009).

Drumming therefore appears to be a universal language – also described by the science of intercultural communication as an *anthropological constant*. Hence, all forms of drumming offer great potential as a universal intervention method. Especially if combined with music and exercise or as a sportive activity in order to generate positive effects. It seems that drumming has great acceptance, not only cross-cultural, but also across social borders and different age groups as well and therefore could be used as a medium to introduce a wider population to exercise. However, looking at the existing scientific literature there don't seem to be any evidence based sport/fitness/exercise interventions using drumming as a key element.

The Chemnitz drumming project "THE DRUM BEAT" aims at contributing to close this research gap. A central element as an intervention here is Drums Alive®, a relatively new fitness trend with a holistic approach combining different types of drumming, dancing and aerobics in a unique way. Drumming on big gym balls with drum sticks paired with various exercises combines physical aspects of training with creative elements of drumming in a group of people.

So far no research has been conducted in the area of sportive/fitness drumming such as Drums Alive®. Thus, publications on conventional drumming and aerobic dancing are the focus of our literature analysis as these are related areas. Drumming specific publications with a physiological background are scarce – one from LOEWY and SCHROETTER (1925) which compared various musical instruments found that drumming with a maximal frequency of 11-12 beats per second increased the energy consumption by almost 100% and therefore was higher than any other instrument. SMITH and DRAPER (2008) found heart rates in professional rock drummers that were similar to professional football players and in individual during a concert above 190 bpm.

Comparably many studies have investigated the physiological effects of aerobic dancing, WILLIAMS et al. (1996) for instance found that aerobic classes produced significant cardiovascular. A study of DE ANGELIS et al. (1998) showed that during a typical aerobics class the peak heart rate (HR_{Peak}) was 92,8%, of HR_{max} and the peak oxygen intake ($\dot{V}O_{2Peak}$) was 99,5% of $\dot{V}O_{2Max}$ with mean blood lactate levels of 4,8 mmol/L and thereby demonstrates the high physiological effect of such an exercise. RICKSON et Al. (2006) also demonstrated in this context the high caloric expenditure that occurs during a typical aerobics class. ROCKEFELLER and BURKE (1979) also found in a longitudinal study using a 10-week programme of aerobics as an intervention that the aerobic performance increased by 13%. KIN ISLER et. al. (2000) was able to prove a positive change in blood lipids and lipoproteins in students using an 8-week aerobics programme.

Considering the various aspects of drumming and aerobic dancing as mentioned above, research in this area seems to be necessary in order to use the natural and evolutionary drive to dance and drum in groups as a mean to produce health benefits – physically, socially and mentally.

Therefore the aim of this publication is to discuss the interim results of a first research phase into Drums Alive® as one such group based drumming exercises. Especially the following research problems are the focus of our interest: (1) What effects does a class of sportive Drums Alive® has on selected physiological parameters and on the perceived exertion? (2) What acute effects can be found after a Drums Alive® intervention in concentration and awareness performance?

2 Methodology

2.1 Cohort

A total of 27 subjects (23 female and 4 male) were included in this study and divided into two intervention groups (IG). The average age was 34 ± 7 years. One group consisted of 14 subjects (18 to 22 years) which is from now on described as IG students. The other intervention group consisted of 13 older adults in the age range 30 to 65 years and is therefore described as IG AC 30-65.

Tab. 1: Profile of the cohort - Age Category 18-22 years (students)

	Age	Height (cm)	Body Weight (kg)	Sport activities in h/week
$\overline{x}$	20	169,1	62,2	6,4
S	1,10	7,45	7,44	3,48
Min	18	158	52	1
Max	21	185	77	12

Tab. 2: Profile of the cohort - Age Category 30-65 years

	Age	Height (cm)	Body Weight (kg)	Sport activities in h/week
$\overline{x}$	48	167,6	69,7	3,2
S	7,22	7,27	11,38	2,23
Min	39	154	54	1
Max	59	179	88	9

2.2 Study Design

Intervention

The same choreography was used in both intervention groups which represented a typical Drums Alive Cardio session with a duration of 45 minutes. This duration was chosen as it reflects the minimum of a typical fitness class which normally lasts 45-90 minutes. The session was divided into a warm up phase, a main phase and cool down. Only a low intensity was used in the warm up with very simple movements and basic steps of the Drums Alive® exercise. During the main phase the choreography was slowly build up using the “Add On” principle commonly used in aerobic dancing classes. All elements were practiced in a slow pace (ca. 60-70 bpm), then combined and finally repeated in an optimal pace using ca. 130-140 bpm. Depending on the individual health situation and fitness the subjects were allowed to choose between “low” and “high” impact, i.e. stepping to one side rather than jumping. The cool down phase consisted of basic Drums Alive® movements with a low intensity as well as stretches.

At the end of each phase the physiological data was collected in both groups (see table 3):

Tab. 3: Timings of the data collection

Intervention groups	Resting values [h:min:sec]	After warm up [h:min:sec]	After main phase [h:min:sec]	After cool down [h:min:sec]
IG Students				
Point of data collection	directly before intervention	00:04:44	00:40:06	00:45:19
IG AC 30-65				
Point of data collection	directly before intervention	00:04:22	00:38:03	00:44:26

d2 Control Group

The control group (N=17) for the d2 concentration and awareness test was tested during the same period of the data collection in the intervention groups – January until April 2010. This cohort showed the same age profile as the intervention group 18-22 years of age. The setting for the data collection was before and after a 60 minute long seminar at university. This data was compared with that of the students' intervention group (N=16, the d2 students intervention group had two more subjects in this group compared to the physiological data).

2.3 Equipment

Heart Rate

The measurement of the heart rate was performed using the following equipment:

- Laptop with Suunto Team T6 Software
- Suunto Team T6 System
- Suunto heart rate belts

Blood Lactate

The blood lactate values were analysed using capillary blood samples from the ear loops of the subjects. The skin was penetrated using a haemo-stilette and the blood was collected in an end-to-end capillary vessel. Directly after taking the blood sample it was inserted into a vessel filled with glucose-buffer liquid. The final analysis was performed using the BIOSEN C-Line device.

Rate of Perceived Exertion (RPE)-Scale

Before the actual test intervention both groups had a thorough familiarisation with the RPE-scale based on the Borg scale. The figures 6 to 20 on the scale reflect the different levels of perceived exertion and are highly subjective. Two team members questioned the subjects during the 60 second breaks after each phase of the exercise session for their individual RPE score.

d2-Test

The d2-test measures the concentration and awareness ability of a person (Brickenkamp, 2002). The task consists of identifying certain letter and figure combinations in a set time by ticking them off.

3 Results

3.1 Blood Lactate

The resting blood lactate of the students intervention group showed a mean value of 1.14 ± 0.26 [mmol/L], while at the end of the warm up it was 1.4 ± 0.31 [mmol/L]. The mean blood lactate value at the end of the main phase in this group increased to 3.24 ± 1.88 [mmol/L]. The huge range from 1.28 to 8.04 [mmol/L] is notable. During the cool down it decreased again to a mean value of 2.77 ± 1.55 [mmol/L] again with a range from 0.95 to 6.62 [mmol/L]. Hence, the lactate values showed a significant increase between the resting values and the warm up (p=0.006), rest and the main phase (p=0.001) and rest and the cool down values (p=0.002).

In the AC 30-65 group the mean resting values were 1.18 ± 0.36 [mmol/L] which increased to 2.06 ± 0.06 [mmol/L] after the warm up and to 3.99 ± 1.93 [mmol/L] with a notable range of 0.79 to 6.89 [mmol/L]. The blood lactate values decreased only slightly during the cool down and still showed to be 3.59 ± 2.14 [mmol/L]. The blood lactate therefore proved to be significantly different between rest and warm up (p=0.008), rest and main phase (p=0.000) and rest and cool down (p=0.002).

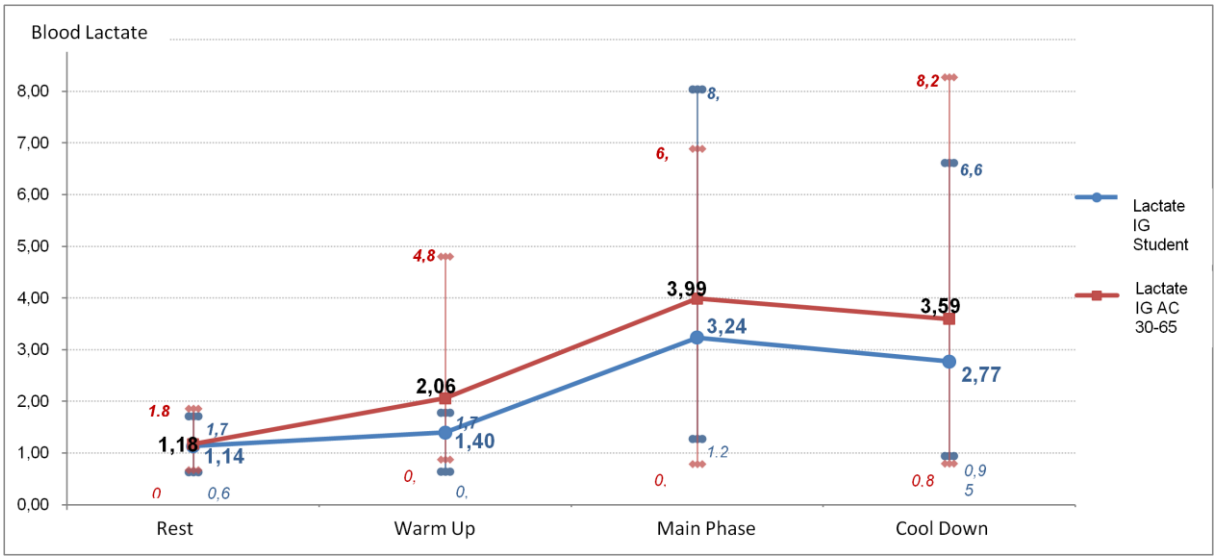

Fig. 1: Blood lactate levels of the IG Students and the IG AC 30-65

3.2 Heart Rate

In both intervention groups an increase of the heart rate (HR) is notable. The mean HR during the whole exercise session in the IG Students was 135 ± 22 [min^{-1}] and in the IG AC 30-65 133 ± 23 [min^{-1}]. The highest mean values were achieved in both groups during the main phase with 156 ±14 [min^{-1}] in the IG Students and 153 ±17 [min^{-1}] in the older IG AC 30-65.

A significant change in HR was found in the IG Students in each exercise phase (warm up, main phase, cool down) of p= 0.000 as well as in the IG AC 30-65.

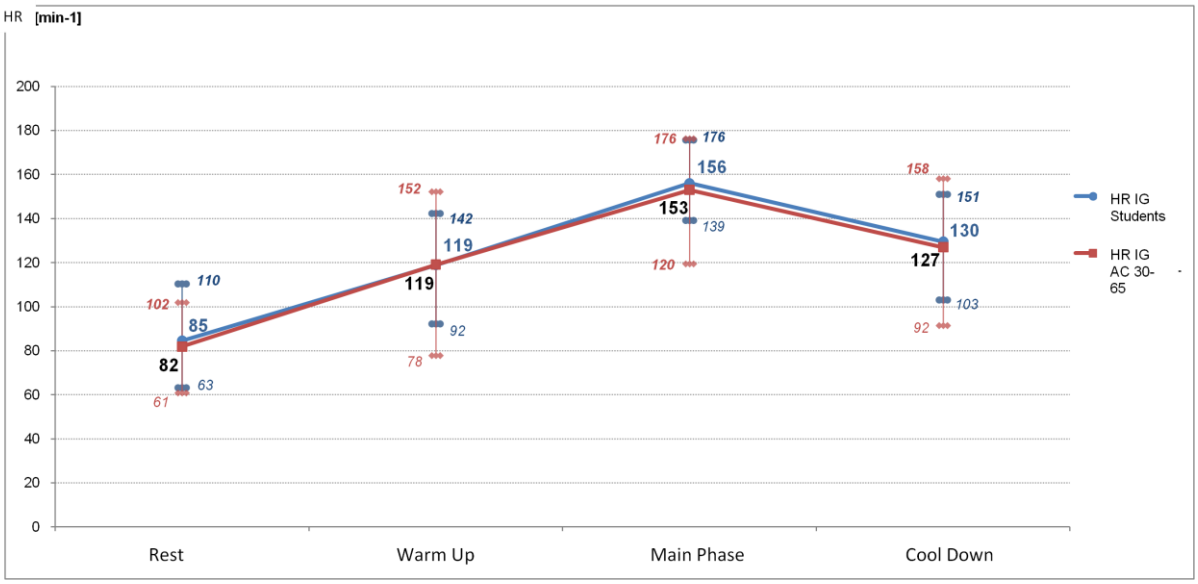

Fig. 2: Heart rate behaviour of the IG Students and the IG AC 30-65 during the intervention

3.3 RPE

The perceived exertion was valued by the IG Students during the warm up as 9 ± 2 and by the IG AC 30-65 as 10 ± 1 on the RPE-scale. This increased during the main phase in both groups the IG Students and IG AC 30-65 to 16 ± 1 and was therefore assessed to be very hard while it decreased again at the end of the cool down to 9 ± 2 in the IG Students and to a value of 10 ± 3 in the IG AC 30-65. Both groups show a significant difference between the warm up/ cool down and the main phase (p= 0,000).

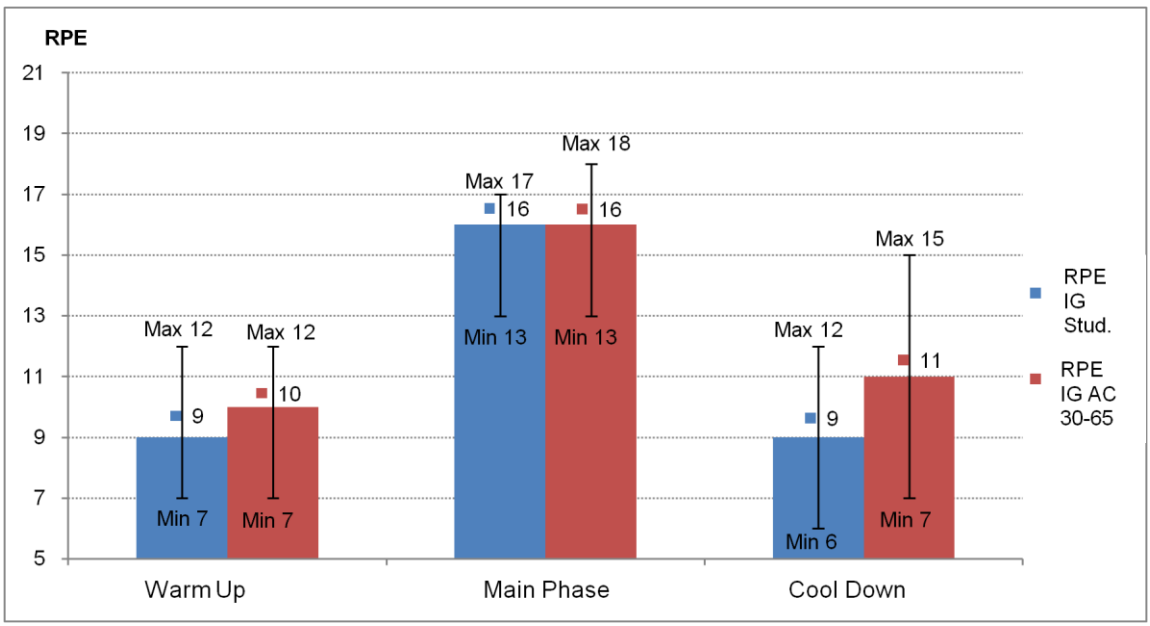

Fig. 3: RPE-scores of the IG SYtudents and the IGAC 30-65 during the intervention

3.4 d2 Concentration and Awareness Test

The analysis criterion for this test is the difference of the concentration performance value before and after the intervention. A descriptive comparison of the groups' mean values showed a better concentration performance in the Drums Alive® group (IG Students) than the control group. The mean value in the IG Students was 41.13 (SD=16.88) compared to the mean value in the control group of 34.53 (SD=17.79). But this difference couldn't be proven to be significant using inference statistical analysis: T(31) = 1.091; p=0.284.

4 Conclusions

This study needs to be seen as an explorative study which tries to build a basis for future research in this area. The results point in a direction which identifies Drums Alive® as a physiologically effective type of exercise. All objective parameters namely heart rate and blood lactate as well as subjective parameters such as the RPE scores increased significantly during intervention which qualifies Drums Alive® for the use in fitness sports and in health orientated areas as an exercise alternative. However, the relatively high blood lactate values in the age group of 30-65years (3.99 ± 1.93 [mmol/L]) is at the borderline of the anaerobic threshold. The mean heart rate of 153 ±17 [min^{-1}] is in accordance with the blood lactate levels. Hence, this Drums Alive® intervention needs to be considered as a relatively high intensity workout from a recreational/health perspective for this age group (48 years). This might be of importance when working with certain risk groups. In this context KINDERMANN (2004) emphasizes that exercises close or above the anaerobic threshold are almost irrelevant from a health point of view.

Nevertheless, it needs to be said that there are various forms of Drums Alive® and the intervention used in this study only reflects on the cardio type of Drums Alive® which in this case proved to be an effective training session. Regardless of exercise intensities it seems that this type of exercise has one major advantage which is the motivation and fun factor of drumming in a group. This effect was notable throughout the period of the intervention, but unfortunately wasn't measured.

Considering the concentration and awareness performance no significant difference between the intervention group and the control group could be proven. Because of the low test power of 0.28; d=0.38 it seems advisable to carry out research in this area in order to confirm these results.

However, a final assessment of this method of exercising cannot be given on the basis of an N=27. Hence, more research is necessary. Especially, longitudinal studies are necessary into the health benefits of Drums Alive® and the use in education and therapy, i.e. in the treatment of depressive patients.

5 Literature

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