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THE CONTROL OF TARGET TRAINING ZONE AND ITS SPECIFIC ROLE IN THE PERFORMANCE OF PHYSICAL ACTIVITIES

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ABSTRACT

Objective: The aim of this study was to address the use of the target zone method in training to improve physical appearance, and demonstrate how this method affects the ultimate goal of someone who does physical activities. The methodology used to prepare this article was literature review. The evolution of this science has had an important role in the process of evaluation and results, and has helped point to new methods providing new directions to physical appearance. Working in the target zone helps individuals who are overweight or have a sedentary lifestyle to achieve theirgoal more quickly. The results presented in the researched articles showed that the control and monitoring of heart rate during exercise is very important and has a direct influence on the results, and when the goal is to reduce fat it is imperative to work our within the target zone. This study concluded that a basic understanding of HR measurement, calculations made for the use of HR, and the correct use of the measuring instruments is important for the training to be specific and within the individual's target zone to reach their goal with the correct intensity. Thus, this procedure reduces the risks to the individuals's health.

INTRODUCTION

This study aims to teach students how to obtain higher performance and results by using their target zone it also teaches how to measure HR and benefit from this method in their routine. By using the target zone, the overweight individual may increase the intensity of the exercise and reach the ultimate goal, which would be higher caloric loss. The target zone is nothing more than the calculation of the maximum heart rate of an individual by taking into account the biotype and fitness level. According to the Ministry of Health, Brazil is experiencing a steady increase of obese people. Thus, the use of the target zone as a training method will greatly increase the caloric expenditure and make the practice of physical activities more attractive. Establishing the target zone is knowing exactly what we can achieve with each physical exertion, stop if necessary or continue doing that activity, besides knowing how to identify possible excesses

Beginning of the Literature

With the developments in technology, physical activity is becoming more and more distant from people when it should be the other way around. It is a fact that every day the number of people who have a disease related to the lack of physical activity increases. Faggion (2000) points out that it is not enough to do physical activities just for the activity for the sake of activity nor to compete for the sake of competition. According to him, people have to know what they are doing and the purpose of a particular activity.

By respecting the biological individuality and limitations of each person, people will have full autonomy to carry out the activities and perform them more safely. Sedentary life style is already regarded as the disease of the millennium alongside obesity, the rush of everyday life and the intake of increasingly industrialized food high in fat and low in nutrients contributes to these increasing rates. One way out of this condition would physical exercises. Studies show that 30 minutes 3 times a week would greatly improve the lives of these people who are part of sedentary condition. Arterial hypertension diabetes, obesity and anxiety are some of the diseases related to the lack of exercise. Keeping in mind that a sedentary lifestyle is considered the primary risk factor of sudden death. A way to avoid all these problems would be to have a life with more exercise, avoiding the overuse of tranquilizers and alcohol and eating healthier food.

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Heart rate

Heart rate is each involuntary beat (pulse) the heart does, per second. The number of contractions that this organ performs per unit of time, usually minutes, is called heart rate (Robergs and Roberts, 1996). There are two types of processes to monitor the heart rate (HR).

Invasive method: This method is more accurate and exclusive to laboratories where techniques and the latest equipment are used obtain the results, usually high-performance athletes are the public of these clinics.

Noninvasive method: with the evolution of technology nowadays we have rate monitors that measure very effectively (HR) (HRres) (HRmax), target zone training. Rate monitors are safe and guarantee increased safety to individuals preparing their training plan.

Maximum heart rate: corresponds to the maximum rate of work the heart muscle can bear and translates into the maximum number of beats per minute the heart is capable of producing (Rasoilo, 1998). We emphasize that this index varies from person to person, type of activity, fitness level, gender, among other variables (Janssen, 2001).

Resting heart rate: for this data to be accurate the individual must preferably be in full rest in the morning just after waking up, (Brooks, 2000), these beats range from 60 to 80 bpm for healthy people who do at least 30 minutes of physical exercises three times a week. For high-performance athletes this frequency can reach 30 to 40 bpm (Rasoilo, 1998).

How and where to measure heart rate

In ancient Greece, according to historians, Galen was the first man to propose that the human body has a circulatory system. This proposal was accepted and made it possible to understand the capabilities and functions of the circulatory system. But only in 1856 Faivre measured for first time the blood pressure during the amputation of a limb. There is also information that in ancient Egypt physicians was focused on the importance of blood pulsations as dramatically informed in the papyrus of Ebers (ancient writings in dated scrolls BC). “You can feel with your fingers placed on several body parts to the heart "speaks" through the vessels.” The real relevance of pressure in the arteries would only be understood between the 16th and 17th centuries. After the curious creations of Santorio (thermometer, hydrometer, heart beat meter), as representative of iatrophysics. "With interest in the application of mathematical and mechanical techniques, there were many works from HALES to RIVA-ROCCI (1733), besides Korotkoff (1905) who analyzed historical studies.

How to measure the heart beat

- **Heart beat monitor:** It consists of an elastic strap and a watch.This device has two electrodes set on an electronic transmitter, the elastic strap is attached to the chest. The impulses obtained are sent through an electromagnetic field to a wristwatch that is a pulse monitor without interrupting the workout.
- **Femoral artery:** It can be felt in the groin region where the lower abdomen meets the upper thigh, find the beginning of the pelvic bone (the first bone found when making a movement out of the navel), place the finger about 3cm inside (closer to the navel), and 4cm inwards towards the foot, the femoral artery will be found near the crease between the legs and groin.
- **Braquial artery:** The brachial artery can be difficult to find especially in people with lots of muscles. The fingers should be maneuvered over the muscles in order to maneuver the artery against the bone.

Place the fingers half way between shoulder and elbow or in the middle of the inner arm between the biceps and triceps. Place your fingers in the center of the armpit and slide them to the inside of the elbow, they must be in the correct position. Now it's just a matter of positioning the fingers down and finding the proper fit around some muscles to find the artery.

Radial artery

The radial artery is the most used place and the easiest to measure heart rate. Place the palm of the hand up and use the fingers of the other hand to find wrist. The radial artery is located next to the thumb when the palm is facing up, place the fingers midway between the tendons leaving the center of the forearm to the tip of the arm side. The thumb must be to the right of the wrist. Make sure that a finger is closer to the palm than the others, the fingers must be vertical to the wrist, not touching each the other. We should feel a strong pulse in the region being evaluated.

Carotid artery

The carotid artery runs vertically along both sides of the neck. To find the carotid pulse, put the finger sat the top of the neck just below the jaw, at a midpoint between the ear and chin. This is where we find the carotid artery.

Dorsalis pedis artery

The dorsalis artery is at the top of the foot on the side of the foot tendon. Place finger sat the base of the tendon and the base of the second toe, until the fingers are near the ankle. Dorsalis pedis pulse will be found there.

There are other parts of the body where we can find the heart rate.

- Temporal artery on the sides of the forehead
- Facial artery at the angle of the jaw
- Popliteal artery behind the knees
- Rear tibial artery.

It is known that performing moderate intensity aerobic activity increases mobilization of fat during exercise, but high intensity activities mobilize this substrate even more so in the post-workout period (ALKAHTANI *et al.*,2013). That is why High Intensity Interval Training (Hiit), is becoming a very effective method for burning fat, since the level of excess oxygen consumption after exercise (COPD), is very high. Scientists have assessed that this type of exercise not only provided performance benefits for athletes, but also improved the health of those who do leisure activities. The fitness market is currently experimenting this method that is becominh ever more popular. It involves high intensity physical effort which can vary from 5 to 8 seconds followed by an active recovering period, according to Billat (2001). During an aerobic exercise

the heart performance is based on the heart rate and the amount of blood pumped per beat (systolic volume). The cardiac contractility, or force, of each combined to heart contraction increase blood flow, providing oxygen to meet the demands of the muscles. The skeletal muscle contraction of the heart also increases venous return (blood flow), and significantly improves the cardio-vascular system (E Joyner Coyle, 2008). To (Ekender *et al*., 1996) a significant effect of high intensity exercise is to keep the resting metabolic rate at high values over an extended period of time after the physical exertion, and consequently higher energy expenditure. Studies show that intermittent high-intensity exercise maintained these levels for an extended period. This metabolic rate varies from person to person, taking into consideration items such as age, sex and color. We know that to keep its vital functions the body requires an energy reserve. Lanforgia and collaborators (1997) attribute this effect to the higher metabolic stress caused by the high-intensity effort, thus causing a greater energy expenditure upon returning to homeostasis condition. As a result of his study, the author states that the exercise (INTERMITENT),the high-intensity (1 minute 20 repsat 105% of VO2 max),kept the (Epoc), above resting levels for 8 hours after ending the physical effort.

Fernandez and collaborators (2004), conducted a study using the methods of continuous aerobic training (AT), and intermittent anaerobic (IT) in obese male adolescents (15-18 years) for 12 weeks. The 28 subjects received nutritional counseling and were divided into 3 groups: TA (40-60 minutes on the exercise bike at 60-70% VO2max); IT (also on the exercise bike, 12 shots of 30 seconds at a load of 0.8 x 25 watts body weight at maximum speed, with active recovery intervals of 3 minutes); and a control group without exercise. The TA and IT groups showed significant reduction of body mass; IT was more effective reducing fat from the lower limbs. Also according to Bahr *et al* (10), some of the papers studied attest to the Epoc contribution in weight loss programs, balancing the daily negative energy between intake and spending. Several studies have considered the Epoc an important factor in weight control, as long as the exercise demanded intense activity, working in a target zone of 65% to 90% of the heart rate. The quick progress of results related to Epoc can affect many factors such as muscle mass in exercise intensity and the duration of EPOC. Thus studies have suggested that exercise of greater intensity recommended extends the action of EPOC. There is an increase of 20% to 35% in the lipolytic response in adipocytes after high intensity exercise.

Method to apply physical activity in the target zone

When prescribing physical activity and customized training, exercise with aerobic and anaerobic characteristics can be recommended (AMERICAN COLLEGE OF SPORT MEDICINE, 2000). We use the TARGET ZONE method as determined by the Karvonen, & al 1957 formula, so we can have parameters of how to apply the most effective activity or training for each individual. With an increasing world population the number of people who do physical activities has increased significantly. This population also includes people with special needs, the elderly, people with hypertension, cardiac and others. According to (FIATORORE *et al.,* 1990; Wagner *et al.,* 1995; Verril and Ribisl, 1996 and Pollock *et al.,* 2000) the biggest demand is for activities aiming to gain aerobic capacity and muscle strength.

In this scenario we can use some parameters for measuring HR. The formulas created to find the target zone use the maximum HR as the central point, and is the most used formula even with its margins of error, besides Karvonen formula that says:

Maximum HR = 220- age of subject (Karvonen *et al.,* 1957) but as we know, every equation has a margin of error and this one was widely questioned by several authors and researchers who say that the margin is + or - 10 to 12 BPM when it is used to estimate the maximum HR compared to the ones of Johnson and Prins, 1991 Whaley, 1995 Brudet *et al.,* 2002 Robergs and Landwehr, 2002, Acsm, 2003). As the Karvonen formula is not very accurate due to technological developments, other formulas were created to obtain maximum HR and target zone that would give more efficient results when prescribing training. One of the researchers who revolutionized and set a better parameter for maximum HRwas Sheffield when hecreated two formulas based on trained and untrained individuals. Although they are not safe formulas, they help when prescribing a workout, but do not completely replace the ergospirometer examination according to cardiologists:

Trained individuals (SHEFFIELD and col, 1965), **RHmax = 198 – (0.42 x age)**.
Untrained individuals (SHEFFIELD and col, 1965), **RHmax = 205 – (0.42 x age)**.

Numerous studies indicate and guide that the individual should remain within their Training Target Zone to achieve their goals (ACSM - Source: Filho, José Fernandes, 1999). So Jones *et al.,* 1975) created the calculation for target zone in which he uses maximum HR plus HR at rest, preferably obtained in the morning when the bpm are low. This frequency is also called the Basal heart rate and finally the reserve HR that is the calculation of HR max - HR rest. That is how (Jones *et al*1975) created the four formulas, for the target zone. They are:

HRmax = 210 – (0.65 x age) (Jones and col, 1975)
HRmax = HRrep + 0.6 (HRmax – HRrep) = Inferior limit (IL)
HRmax = IL + 0.675 (HRmax – IL) = Upper limit (UL)
HR Recovery = HRrep + 0.56 (HRmax – HRrep).

Thus there are six "Target zones" which correspond to intensity levels and different exercises based on different metabolic and respiratory transport mechanism in the body. (ACSM - Source: Filho, José Fernandes, 1999). Therefore, to calculate the target zone for individualized training as shown in the table above we used the percentage and the maximum HR and HR at rest, the calculation is:

Training HR = (HRmax – HRrep)x % + HRrep

Physical activity has grown in the world, therefore the search for qualified professionals in gyms, studios and parks for prescribing practice is increasingly common. Professionals will have to pay attention to different situations to help students, keeping in mind that each individual has his/her own limit. If the professional or person does not respect this limit, injuries could happen. So, knowing how to identify some signs that our body sends us is very important, heart rate has a big role in obtaining results, knowing the real level of conditioning in which the student is can also guide professionals.

	Frequency zone	HR max	VO2 max	Duration	Workout system	Maximum rhythm	Workout rhythm
1	Regenerative activity (rehabilitation)	40 – 60%	Up to 40%	Aprox. 20 min.	Cardio-vascular or musculoskeletal rehabilitation	_	Individual rhythm
2	Moderate activity área	50 – 60%	Up to 50%	+ than 30min	Metabolic rate	Brisk walking	Light rhythm
3	Wright control zone	60 – 70%	Up to 50% to 60%	+ than 60 min.	Cardiorrespiratory	Marathon	Basic work
4	Aerobic zone	70 – 80%	Up to 60% to 75%	8 – 30 min.	Aerobic	10 km	Long
5	Anaerobic threshold zone	80 – 90%	75% to 85%	5 – 6 min.	Lactate absorption	3 km to 5 km	Time
6	Maximum effort área	90 – 100%	85% to 100%	1 – 5 min.	Anaerobic	800m to 1500m	Short

Heart rate can be measured in some points of the body manually or with rate monitors which are more accurate. But for more intense workouts we have to pay attention to other variables, such as maximum heart rate. Namely for people who want to decrease the percentage of fat, aerobic 90-95% bpm heart rate. Another very important factor is the evaluation of the actual fitness level of people doing the physical activity through the heart rate at rest. To obtain this information the individual should be in complete rest preferably in the morning still in bed Brooks, 2000). According to (Janssen, 2001), a good workout depends on the proper intensity of work capable offully activating the energy system requiredfor the activity; low-intensity activities are not conductive to the necessary adjustments and very intense exercise can deteriorate the performance as a result of over-training. The evaluation of the correct intensity of training is as much an art as a science.

An effective training that can lead to results of optimum performance is only possible if the principles of energy supplements are well understood and applied, as well as maximum oxygen consumption, linear metabolic transition , linear lactate, ventilatory linear and heart rate. However Faggio, 2000), points out that it is not enough to do physical activities for the sake of activity, nor to competefor the sake of competition. According to him, it is necessary to have students build knowledge that will lead to understanding the activity. So that students can understand and experience the learning that will lead them to a change in behavior and to engaging in new attitudes. To (Robergs and roberts, 2002), even nowadays despite technological advances and developments in the understanding of the physiology of exercise on training control indicators (HR) heart rate is the most used indicator by many professionals working in the field of physical exercise due to its practicality, cost or relationship or even its with other activities. However, the (ACSM, 2000), reports various training control methods by (HR) Heart rate, such as the use of the (HB x Vo2) plot method or data of the direct usage percentage of (HBmax) and the (HRreserve) method (difference between MHR and HRrest), also known as (Karvonen) method. BROOKS, 2000 presents another parameter of heart rate that can give us some indication of the individual's profile: the resting heart rate.

It represents the number of heart beats per minute (bpm) when the individual is completely rested. For this reason the measurement must be performed immediately after waking up, before the individual has raised from bed. Also according to this author the resting heart rate in most people is between 60/80 beats. However with exercising and better physical training the resting heart rate tends to decrease. In high-performance athletes whose sports require medium/long-term efforts, this indicator is lower than the average staying around 30/40 bpm. RASOILO 1998 emphasizes that the heart rate that allows to accurately determine the intensity of exercise of each athlete during sports is a percentage of maximum heart rate. It corresponds to the maximum rate of work the heartcan bear and translate into the maximum number of bpm, the heart muscle is capable of performing. This variable is also a highly individualized reference, which means that different players of the same age may express different values of maximum heart rate and others of different ages may have identical rate.

Conclusion

we can conclude from this study that it is important to understand the basic knowledge of HR, the calculations made for the use of HR, the correct use of instruments such as the heart rate monitors, so that the training is specific and works in the Target Zone of each individual, besides achieving the goal with the right intensity without risks to the health ofthe person. Considering all the methods used and that have been growing over the years and the stimulations for health improvement presented in the media, our research will help the careful autonomous individual who does not train with the help of physical education professionals to get closer to their goals. It also concludes that the use of the Target Zone in the training regulations, whatever it may be brings results, such as cardiovascular fitness, maximum oxygen consumption, linear metabolic transition , linear lactate, linear ventilatory and heart rate.

REFERENCES

Alkahtani, S.A., *et al*. Effect of interval training intensity on fat oxidation, blood lactate and the rate of perceived exertion in obese men. Springer Plus 2: 532, 2013.

American college of sports medicine Guidelines for exercise testing and prescription. 6 ed. Maryland: Lippincott Willians & Wilkins, 2000.

Billat, L.V. Interval training for performance: a scientific and empirical practice - special recommendations for middleand long-distance running. part I: aerobic interval training. Sports Medicine, Auckland, v.31, n.1, p.13-31, 2001.

Brooks, G. A. Intra and extra-celular lactate shuttles. Medicine and Science in Sports and Exercise, Madison, v. 32, no. 4, p. 790-799, 2000.

Faggion, C. A. A prática docente dos professores de educação física do ensino médio das escolas públicas de Caxias do Sul. (Dissertação de Mestrado). Escola de Educação Física da Universidade Federal do Rio Grande do Sul – UFRGS. Porto Alegre: 2000.

Fernandes, J. F. 1999. A Prática da Avaliação Física. RJ: Shape.

Hales a Rica-Rocci S - Un nuovo sfigmomanometro. Gazzetta Medica di Torino 1896; 50: 981-96.

Janssen, P. G. J. M. Lactate threshold training. Champaign: Human Kinetics, 2001.

Jones, J. M. 1975. The r-k selection continuum. American Naturalist, 110:320-323.

Karvonen, M. J; Kentala, E; Mustala, O. 1957. The effects of training heart rate. A longitudinal study. Annales Medicinae Experimentalis et Biologiae Fenniae, 35:307-315.

Korotkoff N.S. To the question of methods of determining blood pressure. *Rep Imp Milit Med Acad.* 1905; 2:365-7.

Rasoilo, J. 1998. Utilização de monitores de FC no controle do treino. Treino Desportivo, 5 (3): 39-44.

Robergs, A.K., Roberts, S.C. 2002. Princípios fundamentais de fisiologia do exercício: para aptidão, desempenho e saúde. São Paulo: Phorte, 2002.

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