

PHYSIOLOGICAL EFFECTS OF WARM-UP AND PROBLEMS RELATED TO TEAM SPORTS

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Original scientific paper

Abstract

In this paper, the aims will be taken into account and all the factors related to the warm up phase will be taken into consideration, which can have a positive effect on the performance and allow each player a good workout or match, whatever their competitive level. The results of several scientific papers will allow us to better understand and motivate more accurately the methodological choices and procedural attentions, while respecting the characteristics of team sports. In this paper, we will investigate the effects of warm-up, depending on the different procedures and how it can affect sport performance and the prevention of joint muscle injuries. We will then analyze the effects that can produce good or bad warm up and how much the play breaks can affect on the muscle temperature, in team sports games. Finally, which procedure modes can be used to achieve a general effective activation to purpose of sport performance?

Key words: muscle temperature, pauses of game, methodology, exercises, sports performance.

Introduction

Warming up is a practice performed before physical-sports performance to enable the body face up to the workout and match in the best possible conditions, improving physical performance and reducing the risk of injury (Safran et al., 1988). Is a widely accepted practice in the modern sporting environment and that it be essential for attaining optimal performance (Tiziana et al, 2017, McGowan et al., 2015).

It is be essential also for intermittent training to prevent the damages (Rago et al 2017, Gaetano, Rago 2014) and for intensities sports game for particular skills such as service in volleyball (Parisi & Raiola 2014ab). Furthermore, the other aspects of pedagogical value (D'Isanto 2016, Di Tore et al 2016, Di Tore, D'Isanto, 2016) of warm up is to take in relation for the beneficial effects for the athletes.

The main goals of warming are the progressive preparation from a physiological point of view to training or match, the prevention of muscular injuries, the need to recall the technical skills before the start of the race, to achieve maximum concentration and psycho-physical activation (Raiola, 2015ab, Raiola, D'Isanto, 2016ab).

At Physiological level means increasing vasodilation, supplying blood to the muscles and thus promoting nutrient intake and gaseous exchange at muscle in activity, increasing nerve impulses to muscle, improving dross disposal, and increasing Body temperature in the way that the activity of the enzymes, responsible of the production of energy, it may be optimized (Birch et al., 2005). It is believed that increased body temperature through warming up improves muscle function, to muscle elasticity, increased muscle tissue strength to lacerations, greater connective tissue extensibility within the muscle, decreased

muscle viscosity (Szymanski D., 2001), an increase of the metabolic level and the extensibility of soft tissues (Clark et al., 2007). The increase in temperature also has a significant positive effect on muscular strength and power (Kenney et al., 2011) and improves joint mobility (Sapega et al., 1981), reactivity and rate of development of strength (Sargeant AJ, 1987).

A large number of physiological mechanisms have been examined to ascertain their contributions to performance and responses to different warm-up strategies (Raiola, 2011ab). Technological advances over the past decade have also facilitated the emergence of new types of warm-up strategies (Faulkner et al., 2013).

The aim is to investigate the effects of warm-up and how it can influence sport performance and the prevention of joint muscle injuries; Through a careful selection of a series of exercises that should facilitate the achievement of a general and specific goal, such as increased vascularization, central and peripheral temperature, and recall the main technical-tactical qualities associated with sport discipline.

Method and discussion

The approach is argumentative theoretical for the part relating the review of the scientific literature on training theory and interpretive of the results on warm-up. Firstly, to summarize and fordeducting the complexity of scientific idea of research and of as to apply it in the practices of the warming up into sportive games of team.

Warming up is an important phase in the preparation of the race and involves different aspects, from psychological to technical factors (Figure 1).

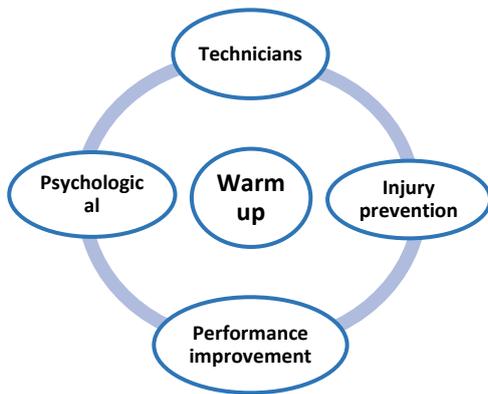


Figure 1. Main purposes of the warm-up.

The warm-up period is recognized as an opportunity to mentally prepare for an upcoming event by providing time for athletes to concentrate on the task (Cirillo et al,2016). Many athletes complete some form of mental preparation prior to competition tasks(Tod et al., 2005).Warm-up is used to raise body temperature, but energy expenditure is needed, this implicate it should not be expensive for the purpose of the race; so is necessary avoid carry out too much intense exercises during the warm-up phase.The main levels involved in the temperature increase is the peripheral muscle level and that central corporeal:

-at peripheral muscle level, the goal is to increase vascularization of the various muscle groups involved in exercise or competition (Mastevoroi, 1964);
 - at central corporeal level, an increase in body temperature of 2° C favors greater effectiveness of the chemical reactions of the organism and this elevation should be achieved through a succession of exercises in which the intensity gradually increases (Jock, Uckert, 2001).

After an active warm-up, there is an increase in total VO and a blunted blood lactate response during exercise compared to no warm-up (Gray S. and Nimmo M., 2001). These results have suggested that the elevation in muscle temperature after an active warm-up indicated a potential for increased blood flow to the working muscle, thereby increasing the aerobic contribution to energy metabolism at the onset of exercise. One of the main outcomes associated with warm-up is an increase in body temperature. Increases in muscle temperature are reportedly accompanied by increases in muscle metabolism (Gray et al., 2011) and muscle fibre conduction velocity (Pearce et al., 2012).Performance improvements in exercise tasks preceded by a warm-up are generally attributed to temperature-related mechanisms (Racinais and Oksa, 2010).

Effects that were dependent from increase of the temperature	Effects that were not dependent from increase of the temperature
-Reductionmuscleviscosity	- Increasedconsumption of O ₂
- Reduction in muscularrigidity	
- Increasednervousconduction	
- Increased degradation of the ATP and PC	
- Increase of the thermoregulation	

Figure 2. Effects resulting from temperature increase (modified by Bishop, 2003).

The increase in muscle temperature results in a reduction in viscosity in the muscles and joints, resulting in decreased of risks of adhesion and possible breaking of muscular fiber, thus obtaining in better articular fluidity due to decreased passive resistance of the joints (Fig. 2).Stewart et al. (2003), they studied, by electromyography, the effects of active heating, conducted using a cycloergometer at an intensity of 45% VO² max (about 15 minutes, until at obtain an increase in Muscle temperature of 3° C).The electromyographies values showed an increase in the average frequency in the experimental group compared to the control group; Therefore, they concluded that the major speed of conduction of the nervous stimulus had been determined of warm-up.The increase in temperature leads to increased glycogenolysis, glycolysis and degradation of the ATP and of the phosphocreatin (Febbraio et al., 1996).

In Fig. 3 we can observe the influence of muscle temperature on anaerobic process of synthesis of ATP, especially when the temperature passes from 35 ° C to 40 ° C.

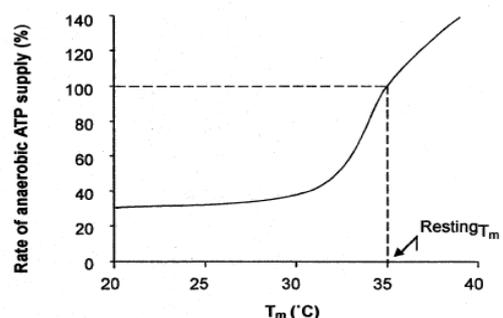


Fig. 3. Anaerobic adenosine triphosphate (ATP) supply during exercise at different muscle temperatures (Bishop, 2003)

Increasing muscle temperature implicate an accumulate of heat in the body and this aspect represent a limiting factor for performance, therefore, in long-term efforts, such as in team sports (football, basketball, volleyball, etc.), is not desirable elevate too much the muscular and central temperature. Among the effects that do not depend on the temperature increase, it is good to note that if you increase the O² consumption level, by appropriate warming up, you will face the match with a higher contribution of aerobic mechanisms, while anaerobic reserves can be restored, in a large part, during the minutes separating the end of the warm-up phase and the start of the match.

This procedure is fundamental for team sports, because even if the pause between the end of the warm-up and the start of the match exceeds the 5 minutes, the O² level decreases and the advantageous effect obtained it would be lost. The efficacy of this warmig up procedure is confirmed by several studies that demonstrate a greater contribution of aerobic processes or a lesser debt of oxygen (Prampetro et al., 1970). Athletes competing in field-based team sports, such as football, basketball and volley, typically complete an active warm-up compromising running and mobility exercises, as well as sport specific drills with or without the ball prior to a competitive match (Zois et al., 2011). These pre-match warm-ups on average last 30 min, with a 5-10 min transition between the end of the warm-up and the start of the match. A 10-15 min break between the first and second halves is also common (Towilson et al., 2013).

Methodological indications for good muscular warming

Increase in muscle temperature depends on local vascularisation, to achieve this result must be utilize localized muscle contractions through analytical movements, with a minimum of amplitude and intensity, and a minimum resistance (between 20% and 50%). Masterovoi (1964) has shown that certain methods used as warm-up do not produce the desired result. In fact, if we analyze, the classic exercises typically used in the team sports you will notice that are used exercises like the slow running, stretching, etc.

The slow running, for example, often used by players in team sports, both at the beginning of training and of the match, produces contractions of the muscles of legs that are less suitable for effective vascularization. Instead, it is exactly the shortening-elongation phase that stimulates vascularization and hence a more effective local termic increase. The same stretching exercises (passive stretching) seem to be less suitable to stimulate vascularization. Alter (1996) has shown that stretching results in isometric high muscle tension and causes a break in blood irrigation, a completely opposite result at the vascularization effect to be sought; In fact, in many scientific conclusions, is been share that the stretching as a method of warming carries a negative effect on the performance capacity of athletes (Altavilla, 2014,Raiola, 2014, Gaetano, 2012).

Consequently, if the vascularization process is badly conducted and can not be completed during the warm-up phase with changes of direction, sprint, sliding, ie with all those movements that recall the technical of sports discipline (Altavilla & Raiola, 2014, 2015), you do not get it the vascularization effect, so the muscle temperature will not increase, rather it could be even lower and the players will be in the condition of "no warming" until the end of the training or the match. Team sports have their own model of performance, in fact, they provide for an efforts of short-term, linked together, in repeated sequences many times and for a long time. It has been attribute considerable importance at the pause between the two playing times in sports games of team; In fact, as can be seen from figure 4 (Mohr et al., 2004), during the game interval (between 1st and 2nd time of game), a significant decrease in muscle temperature is observed, especially for the control group that did not have carry out warm-up during the pause between 1st and 2nd time of game; while the experimental group that carried out the warming up phase during the pause, between 1st and 2nd time of game, maintains a temperature approximately equal to that achieved during the 1st time of game. Consequently, an appropriate strategy should be set up to keep the temperature reached just after the warming up phase and prolonged pauses of game.

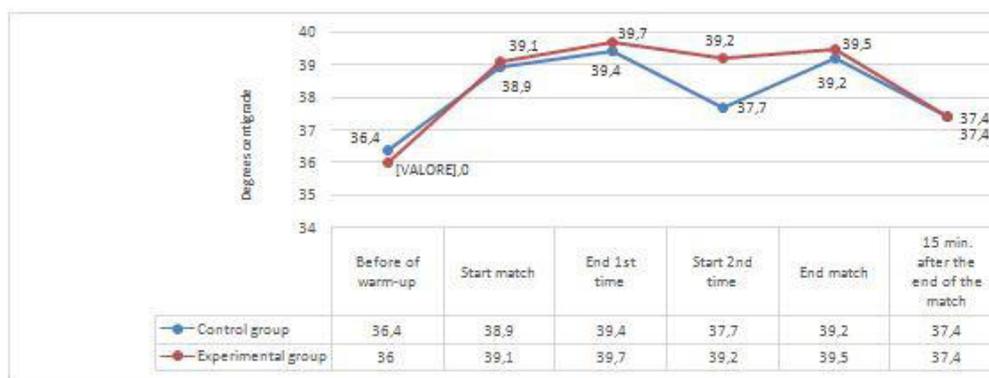


Figure 4. Tendency of quadriceps muscle temperature, between an experimental group and a control group, during a professional football player match (Mohr et al., 2004).

Previously, in team games, have been highlighted some problems on maintaining muscle temperature, both during the gaming interval and for the players in bench. The figure 4 permits of acquire some concrete indications for maintaining the muscle temperature at a temperature such that performance does not decay it; therefore it is necessary to:

- a. Practice always, during the game pause (between 1st and 2nd time) a muscular activation with localized contractions and exercises related to the technical movements of the sports discipline;
- b. As for the players in bench, to practice, where possible, a minimum muscle activation every 5 minutes, using analytical exercises with localized contractions;
- c. Use the electrostimulation for the vascularization of quadriceps, ischio-crural and triceps, so players will minimize the lowering of their muscular temperature and at the same time remain focused on actions of game and on tactics indications by the coach.
- d. In addition, if a player is replaced, it is necessary to cover it immediately with garments appropriate that will slow the lowering of the muscle temperature.

Conclusion

The choice of exercises must contribute to the achievement of a general objective such as warm-up, and several specific objectives such as increased vascularisation, central and peripheral temperature, preparation for contact and recall of the main technical qualities - tactics needed for the

sport discipline. In team sports, it is important to do a good muscle activation so as not to adversely affect sports performance and to avoid injuries during training and the match. Let us now summarize in some simple methodological principles some modalities to be realized or to avoid in order to obtain an optimal activation:

- The warm-up phase should be started with an activity that favors increased vascularization (avoid slow travel);
- Use explosive dynamic exercises and articular mobility exercises (oscillations), binding them to the technical movements of sport discipline;
- Include of specific technical movements with use of ball, after completing the phase of muscle temperature increase and of articular mobility.

It should be remembered that muscle activation must be programmed and realized in such a way from it does not waste too much energy, as it will then be used in the final stages of the race; Knowing that the increase of temperature in body and muscle represents an important factor for sport performance, so that is essential to keep the temperature at an optimum level (about 39°). Also Psychological feedback, including the athlete's and their coach's comfort with warm-up routines for future use, should be evaluated alongside physiological measures in future studies.

Finally, you should always use a muscle heating in the interval between the two playing time of the match and do not forget that the management of the players on the bench is important for both the player in entered the match (it is desirable to use exercises with localized contractions or the use of the electrostimulation) and both for the replaced player, which must always be covered so as not to lower the muscle temperature too much.

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Received: March 6, 2018

Accepted: June 15, 2018

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