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NO REASON FOR HEAT BATTLES IN FOOTBALL GAMES

Thermal analysis in professional football – Test reports with E.COOLINE cooling shirts

Some match days are painful. Kickoff at temperatures reaching up to 40° C. Too much - even for well trained football professionals. The world cups in Brazil 2014 and Qatar 2022 cast their shadows ahead and discussions are all about heat stress of players.

E.COOLINE is a cooling system able to reduce the heat stress of the body. As any sport, football has its own laws and a working cooling system must not only base on logistic capacity but also on applicability. This means that processes during the game are not disturbed and – at the same time – performance of the players is improved even in high temperatures. For this purpose, comprehensive tests were carried out with players of an European national football team.

In order to achieve an optimum effect of cooling on performance, various methods of cooling can be applied.

In a first phase, „PRECOOLING“ is recommended to be carried out as a preparation before the game in order to release the body from thermoregulation by sweating during warm-up. PRECOOLING is also recommended for substitute players preparing at the sideline or sitting on the bench in the hot sun.

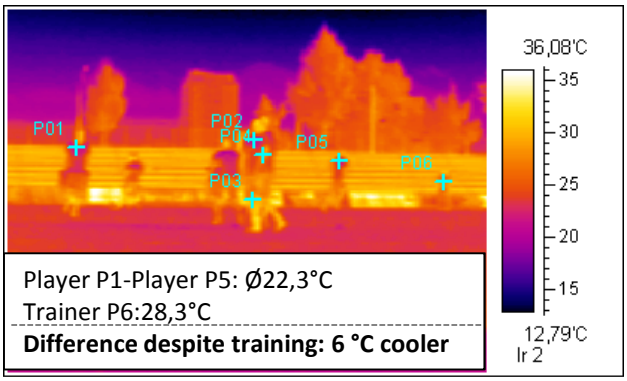
„INTERCOOLING “ in a second phase during halftime or before extra time and „POSTCOOLING“ as a final phase for regeneration after the game or as preparation for the next game.
As there lie only 45 minutes between warm-up and break, an adequate cooling system must be re-applicable within this period of time. Additionally, the system must consider high ambient humidity both on the field and in the dressing rooms.

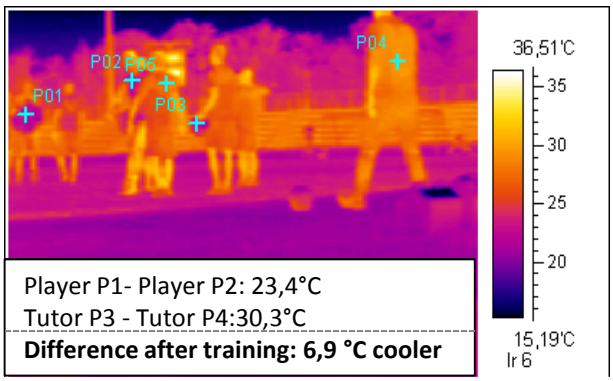
The cooling system must also work during extra time or penalties.
The aim of the cooling measures is to keep the energy required by the body for thermoregulation during sweating as low as possible. This results in less dehydration, reduced loss of minerals and less energy consumption. All these factors will increase performance and can be crucial for the outcome of the match.

On the level of professional football, as in other sports, differences in performance of 1% are already a question of winning or loosing.
Sport science studies dealing with applied cooling confirmed values of 3-10% more performance.

This implies that the right temperature and the energy consumption of the body required for thermoregulation play an important role – parameters which must be adjusted to both the cooling system and the course of the match.

Fig. 1 Results of the heat tests: The thermal images show a good cooling effect already during the 20-25 minute warm-up. At the end of the training, the cooling shirts and upper bodies of the players are cooler than the shirts of the waiting tutors.

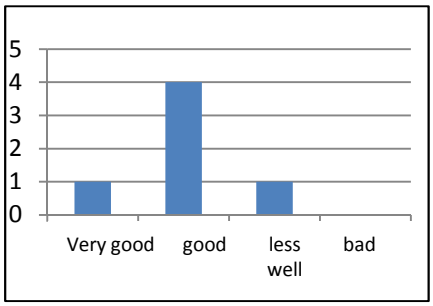




Interviews with players wearing pre-cooled shirts

How do you judge handling and comfort?

83% of the players judged handling and comfort as good to very good

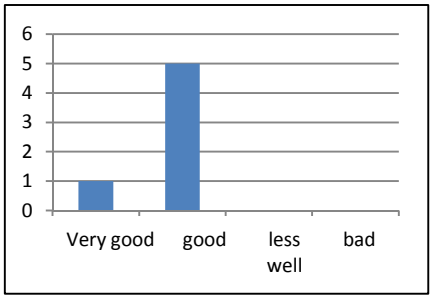


How do you judge the cooling effect despite high temperatures and efforts?

83% of the players judged the cooling effect as good.

How do you judge performance after today's warm-up compared with warm-ups without cooling?

100% of the players judged performance as good to very good



Therefore, various tests were carried out in cooperation with the medical department of a European football team. In one of the tests, the players were equipped with cooling shirts during warm-up training. During the warm-up training, players, tutors and trainers were monitored by an IR camera (thermal imaging camera) (Figure 1).

The right temperature

In a second test, the players additionally received standardized questionnaires where they had to scale their heat sensation before and after the warm-up training.
Furthermore, cooling shirts were used both with and without pre-cooling. Studies carried out so far used E.COOLINE cooling textiles with up to 10% performance improvement which had just been activated by normal tap water.
Due to the high humidity encountered in some countries, such as Brazil, this cooling effect might not be sufficient or can be improved by the quick and easy pre-cooling method „Cool To Go". In this test it was also very important to obtain the subjective perception of the players with regard to the „cooling sensation" of pre-cooled and not pre-cooled cooling shirts.

In the test, the team had been subdivided into three groups. One group went without cooling. A second group was cooled by cooling shirts which had been activated with water and a further group had received pre-cooled cooling shirts.

Cooling effect confirmed

The temperatures reported by the players without cooling had averagely increased on the heat scale by 4.7 points reaching averagely 12.7 (of a total of 14 points). This increase of temperature is two times higher than the increase of the players with cooling shirt (2.3) and more than three times higher than the one of the players with pre-cooled shirts (1.3) who did almost not heated up at all.

Without cooling, the heat stress of the body was therefore significantly higher after the warm-up training. 2 out of 3 players who had received pre-cooled shirts even reported that they felt slightly cooler than before the warm-up program. Thus, the goal to reduce heat development during warm-up had been achieved.

Positive results

The thermal images show that also after warm-up training a good cooling effect was achieved, the pre-cooled shirts showing however a slight advantage. With the pre-cooled shirts the cooling sensation of the players was best.
This is confirmed by the interviews of the players (Figure 2).

83% of the players who warmed up with pre-cooled cooling shirts confirmed that comfort and handling of the shirts was good to very good. 75% of the players who did not wear pre-cooled shirts also judged the comfort of the cooling shirts to be positive.

83% of the players with pre-cooled cooling shirts judged the cooling effect positive as did 83% of the players without pre-cooled shirts. 100% of the players with pre-cooled shirts confirmed furthermore that their performance after warm-up was good to very good compared to warm-up training without cooling.

On the basis of these results the use of E.COOLINE® is recommended for pre-cooling in warm-up training. Especially in hot countries with high humidity the use of pre-cooled cooling shirts makes sense.

Logistical feasibility

As the material in E.COOLINE cooling textiles absorbs temperature faster than any other material due to its 3D-structure, this system can also be used in the logistical processes of a football match. This test gave positive results, as well. The Shirts were ready again in 30-40 min. Also before extra time and penalties the cooling temperature is sufficient.

E·COOLINE®

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