Media communiqué

Materials Science & Technology

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Empa Science Apéro devoted to «the King of Sports»

Football – science plays a part too

For months now players and teams have been preparing intensely for the World Cup through physical and mental training, and analysis of opponents' tactics. However, a footballer's "working clothes" also play an important role in his performance. At the recent Empa Science Apéro in St. Gall the two topics of discussion were the physical strain to which players' bodies are subjected during the game and new developments in the field of functional clothing.

When the Football World Cup kicks off on June 11th in South Africa the players will whip the mass of spectators into a frenzy with their athletic performances. What most viewers do not realize is the enormous physical strain which the players undergo. Bruno Damann, FC St.Gall's Club Doctor, confirmed that the game has become significantly harder and faster over recent years. Because of the enormous sums of money involved, the competitive pressure is continuously increasing. "The competition comes not so much from the opposing team as from a player's own colleagues," he said to the Science Apéro audience. In order to gain and maintain a place in the first eleven, a player has to train very aggressively, and it is in this phase that most injuries occur. According to statistics complied by Suva, the Swiss Accident Insurance Fund, every year in this country 191,000 football-related accidents occur. Technological progress in some cases also leads to new types of injuries. For example, today's football shoes offer excellent stability to a player's feet and lend improved grip on the playing surface. At the same time this increases the load on the knee, consequently leading to players suffering more knee-related injuries

Textile «doping»

«Faster, longer, further», is the footballer's credo. Faster means getting to the ball before the opposition, longer means more endurance and staying power. In order to help a player achieve these goals sports equipment suppliers face difficult challenges. Ever more sophisticated clothing systems help improve the body's performance, with compression clothing being just one example. Developed for swimmers at the end of the 1990's, these tight-fitting garments are now commonly used in many different sports, including football. Adidas, with its «TechFit» range, is one of the leading names in functional sports clothing, as its representative Berthold Krabbe explained to the Science Apéro audience. The pressure exerted by compression garments on particular parts of the body increases the blood flow by about two per cent. In addition, muscle vibration is reduced. Both effects help to improve sporting performance, according to Krabbe. Furthermore, lactate reduction during the recovery phase is accelerated so that athletes are ready to

go again sooner. Despite these advantages, not all footballers like the tight fitting compression garments because the materials from which they are made still do not “breathe” well.

Body temperature in focus

Improving materials for clothing is also the aim of Markus Weder, an Empa researcher whose focus lies primarily on sports garments which allow the optimal control of body temperature. Taking footballers as an example, this means ensuring that they do not overheat during a game. However, just as important, according to Weder, is that an athlete’s muscles do not become cold during periods of lower activity. If this happens, and a footballer must then suddenly sprint for a ball, the consequences can be very serious – torn muscles fibers, for instance.

The requirements which sports clothing must fulfill are therefore rather high. As Weder explained, the material must possess optimal thermal insulation properties, even under varying conditions such as those now being encountered in South Africa, where temperatures in June and July can vary between 0 and 30 °C depending on the venue. Merely choosing long or short-sleeved functional jerseys is simply not enough. Weder described various materials and their characteristics, based on laboratory investigations using sweating body parts and robots, explaining which materials are most suitable for particular conditions.

The progress which textile technology has made is illustrated by a comparative test between three different jerseys – an old army model, a current FC St. Gall jersey and a T-shirt newly developed by Empa for the Swiss army. The new material keeps the body cool and thus prevents excessive perspiration. At the same time it is by far the fastest drying type and therefore cools the body the least of all three examples. In the case of the official FC ST. Gall jersey, it was noticeable that players sweated copiously where the sponsor’s logo was printed on the chest. The “breathability” of the material (its permeability to water vapor) is practically zero in that area.

Further information

Markus Weder, Protection and Physiology Laboratory, Tel. +41 71 274 77 74, markus.weder@empa.ch

Editor / Media contact

Daniela Heiniger, Empa Communication Dept., +41 44 823 49 16, redaktion@empa.ch

Empa researcher Markus Weder explaining how functional sports clothing maintains the body at an optimal “working temperature” even during highly strenuous activity.

Measuring the rate of humidity transport with liquid perspiration on the test torso in a climate chamber at Empa.

The images in print-quality resolution and the text in electronic form are available from redaktion@empa.ch