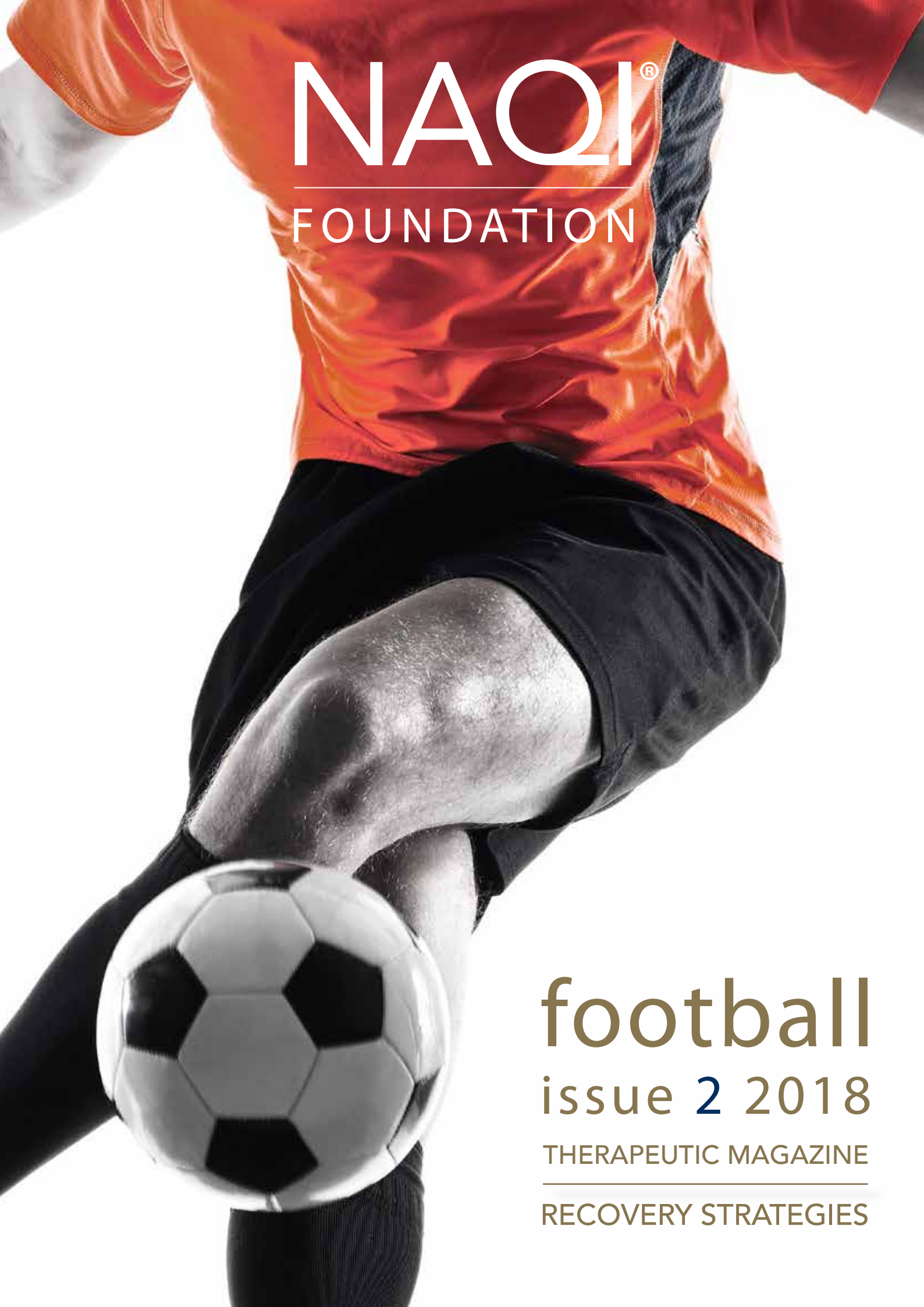

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EDITOR'S LETTER

FOOTBALL RECOVERY STRATEGIES

EDGARD M.GEYSKENS

Editor NAQI Foundation

Recovery strategies have become an integral part of soccer because of the increased frequency of matches, game intensity and internationalization of the sport.

Scientists from the University of Lille Nord de France and of the Neuromuscular Research Laboratory in Zurich (Switzerland) have provided an interesting overview of the effects of a congested schedule on physical performance and injury rate. They emphasize on the required time for full recovery and indicate the related fatigue mechanisms. To blend the practical aspects of science and reality they propose a soccer-related recovery protocol.

Philippe Rosier, PhD Social Sciences, Physical Therapist, and Health & Performance Manager of the Belgian Soccer Federation and of the Belgian National Football Team Red Devils underlines the complexity of how to balance physical and mental recovery. He refers to the scientific evidence based clinical recovery path of each individual Red Devil player.

Jan Van Damme, Sports Physiotherapist, the co-founder of the Belgian Football Doctors & Associates and head physiotherapist at Club Brugge, the Belgian national champion 2018, explains how they tackle recovery with games rapidly succeeding one another. He underlines the importance of an adjusted nutrition program for recovery and the evidence based detailed follow up of the players with programmes like the Groin Bar and the Shape in the Club laboratory.

Jochen De Coene, head Physiotherapist of RSC Anderlecht confirms the scientific recovery approach for the injury prevention of each player on an individual level. With his 6 years experience as physiotherapist of Shenhua Football Club and the Chinese National team he advises that a critical success variable of football is the team spirit, a stable medical staff and youth players.

FOOTBALL RECOVERY STRATEGIES

– by Grégory Dupont, Mathieu Nédélec, Alan McCall, Serge Berthoin and Nicola A. Maffiuletti –

Practical aspects of blending science and reality

FOOTBALL RECOVERY STRATEGIES

PRACTICAL ASPECTS OF BLENDING SCIENCE AND REALITY

DEMANDS OF THE GAME

In elite soccer, the number of competitive matches per season, including domestic, continental and international matches, can be very high for successful teams. Some players can play up to 70 competitive matches per season. In these conditions, the number of weeks with two matches per week is greater than the number of weeks with one match per week. A single match leads to acute fatigue, characterised by a decline in maximal muscle strength[1], which requires several days to fully recover. When the schedule is congested (i.e. two matches per week over several weeks), the repetition of matches can lead to a persisting chronic fatigue among the players who play regularly, as the recovery time between two successive matches may be too short. FIFA recommends at least 2 days between two matches, but this is not a rule, it is solely a recommendation. Anecdotal interviews from managers and head coaches frequently reveal that the players are exhausted by repeated matches. Are these subjective statements justified by scientific evidence? In this instance, a congested schedule can be associated with a decrement of physical performance and with a higher injury rate.

This aspect will be addressed in the first part of this article. The second question is: How much time does a professional player need to fully, recover?

> The repetition of matches can lead to a persisting chronic fatigue among the players who play regularly...

This aspect will be addressed in the second part of the article. The third part will deal with the actions performed during a match which may lead to fatigue and the potential mechanisms involved.

The fourth question concerns the recovery strategies available to reduce the magnitude of fatigue and to accelerate the time to full recovery. This will be addressed in the fourth part of the article.

EFFECTS OF A CONGESTED SCHEDULE ON PHYSICAL PERFORMANCE AND INJURY RATE

Soccer involves many activities such as sprinting, changing direction, jumping, shooting, passing, tackling and physical contact, which lead to fatigue. In such a case, fatigue is characterised by a decline in physical or muscle performance induced by exercise. During a match, fatigue occurs temporarily after short-term intense periods in both halves; towards the end of the match and after the match. Many non-contact injuries occur during the latter stages of each half[2,3], suggesting that fatigue can be a risk factor of injury. However, fatigue can also come from the repetition of the matches. During periods where the schedule is particularly congested (i.e. two matches per week over several weeks), the

recovery time between two successive matches can be between 2 and 4 days, which may be insufficient to restore normal homeostasis. As a result, players may experience acute and chronic fatigue potentially leading to underperformance and/or injury. Ekstrand et al[4] investigated the relationship between exposure of footballers in European clubs to match play in the months before the FIFA World Cup 2002 and their injuries and performance during that World Cup. They found that 60% of the players who had played more than one match a week before the World Cup incurred injuries or underperformed.Dupont et al[5] also studied match-related physical performance and injury rate when playing either one or two matches per week during two seasons on 32 professional soccer players in a top-level team participating in the UEFA Champions league. Physical performance during official matches, characterised by total distance covered, high-intensity distance, sprint distance and number of sprints, was not significantly affected by the number of matches per week (1 vs 2), while the injury rate was more than six times higher (P <0.001) when players played two matches per week (25.6 injuries per 1000 hours of exposure) compared to one match per week (4.1 injuries per 1000 hours of exposure). Bengtsson et al[6] confirmed these results with a study involving 27 professional teams over 11 seasons. Total injury rates and muscle injury rates were increased in league matches when the recovery time was less than or equal to 4 days compared with matches where the recovery time was more than or equal to 6 days. The present data highlight the need for improved recovery strategies to maintain a low injury rate during periods with congested match fixtures. However, before focusing on recovery strategies, it is necessary to identify the time course of recovery, to determine the fatigue mechanisms as well as the actions in a match that may lead to fatigue. The knowledge of these mechanisms should allow the application of appropriate and rationalised recovery strategies.

TIME COURSE OF RECOVERY

After a soccermatch, physical performance is impaired and requires several days to fully recover. Sprint performance over 20m is impaired immediately after a match by -37 to -9%[1]. Thereafter, the recovery of sprint performance differs largely between studies with complete recovery occurring between 57 and 96 hours[8]. When tested immediately after a match, jump performance decrements range from no decrement[9] to -12%[1]. The time for jump performance to completely recover is between 48 hours[8] and more than 72 hours after the match[7,1]. The post-match decline in knee flexors maximal voluntary strength ranges from -7%[10] to -15%[1,11] and requires 51 hours[7] to more than 72 hours[1,11] to fully recover. Although the validity of biochemical markers for muscle damage is questionable[12], creatine kinase concentrations are frequently used to investigate the underlying physiology of the recovery process. Immediately after a match, rises in creatine kinase concentration range from +75%[11] to +250%[1]. Creatine kinase concentrations peak at 24 to 48 hours after the match and return to baseline between 69[7] and 120 hours[8] following the match. The differences between studies regarding the magnitude of performance decline and the subsequent time course of recovery could be explained by the fact that the recovery process was tracked during the post-football match period [1,7,8,11]. Several studies [5,13] have pointed out the high variability and poor reliability of physical performance such as high-intensity running distance during soccer matches, which depends not only on the fitness level but also on the match status (i.e. whether the team is winning, losing or drawing), quality of the opponent (strong or weak) and the match location (i.e. playing at home or away). Secondly, some extrinsic factors may also influence players' work rate such as the climatic conditions and type of pitch (e.g. grassy, muddy, artificial). As a consequence, the amount of fatigue induced during different soccer matches may vary greatly and affect the time

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course of recovery. This inherent variability to a soccer match makes it difficult to translate findings from one study to another.

In summary, soccer-related physical performance is impaired immediately after the match and recovers gradually to pre-match levels. Several studies failed to observe a normalisation of physical performance within the 3 days consecutive to a soccer match[1,7,1,14], suggesting that performance can be impaired for 72 hours and more. When playing two matches per week, the 3-day recovery time between two successive matches may consequently be insufficient to fully recover. This long-lasting reduction in physical performance testifies the presence of some fatigue processes that recover slowly after the match.

FATIGUE MECHANISMS

Let us focus on the mechanisms that contribute to post-match fatigue. The decrement in performance characterises post-soccer match fatigue. A challenge for exercise physiologists is to identify the factors and mechanisms involved in this post-match fatigue. Long-lasting fatigue may be caused by both impaired excitationcontraction coupling and structural damage[15]. According to Rampinini et al[16], fatigue in soccer is determined by a combination of central and peripheral factors both immediately after the match and within hours of recovery. Central fatigue seems to be the main cause of the decline in maximal voluntary contraction and sprinting ability, whereas peripheral fatigue seems to be more related to increased muscle soreness and therefore may be linked with muscle damage and inflammation.

A challenge for exercise physiologists is to identify the factors and mechanisms involved in this post-match fatigue.

Fatigue occurring in the last quarter of a match is characterised by a decline in the amount of high-intensity running and may be induced by the depletion of glycogen stores[17].

Although this fatigue occurs toward the end of the match, it can also affect the post-match fatigue, as muscle glycogen repletion after a high-level soccer match requires between 2 and 3 days when a specific nutrition plan is provided. Dehydration and thirst could be additional factors involved in the fatigue observed in the last quarter of the match. After a match played in a hot environment (31.2 to 31.6°C), Mohr et al[18] reported a net fluid loss of more than 2% of initial body mass. They found a significant correlation ($r=0.73$; $P < 0.05$) between the net fluid loss during the match and the fatigue index in a post-match sprint test. However, it is likely that dehydration plays a limited role in post soccer match fatigue as the time to rehydrate is relatively short (6 hours) when guidelines are respected[19].

Muscle damage is likely a major factor to consider in an attempt to explain postmatch fatigue. The repetition of changes of direction, acceleration and deceleration throughout a soccer match may induce muscle damage. Muscle damage is characterised by muscle soreness, increased passive muscle stiffness, muscle swelling, morphological changes such as disruption and disorganisation of sarcomeres, sarcolemma and transverse tubular system and a prolonged reduction in maximal muscle force production[20]. Mental fatigue is an additional factor to consider in the attempt to

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explain postsoccer match fatigue. When the competitive fixture list is congested, there may be insufficient time in between matches for players to recover psychologically, potentially leading to lack of motivation and mental burnout. A congested schedule can be associated with a lot of travelling, which may lead to the disruption of circadian rhythms (jet lag or arrival during the night) and increase the level of stress induced by restricted motion, unfamiliar sleeping patterns and poorer quality of sleep.
In summary, central fatigue seems to be the main cause of the decline in maximal voluntary contraction and sprinting ability, whereas peripheral fatigue seems to be more related to increased muscle soreness and therefore seems very likely linked to muscle damage and inflammation. Postmatch fatigue may be associated with glycogen depletion, muscle damage and mental fatigue.

RECOVERY STRATEGY

According to Bishop[21], the general consensus is that the translation of sports science research to practice is poor. In order to reduce this gap between research and practice, a survey on the recovery strategies currently used in professional soccer teams was performed[22]. Thirty-two clubs responded that the aspects they took into account for the recovery of their players concerned nutrition and hydration (97% of the clubs) and sleep (95% of the clubs); while the recovery strategies used after the matches or during the following days were cold water immersion and contrast water therapy (88% of the clubs), active recovery (81%), massage (78%), stretching (50%), compression garments (22%) and electrical stimulation (13%). Following this survey, the level of scientific evidence justifying these recovery strategies was reviewed. For this review, the level of scientific evidence focused on the effects of the recovery strategies on change in the measured physical performance.

NUTRITION AND HYDRATION

Rehydration, carbohydrate and protein consumption after a match are effective recovery techniques for replenishing water and substrate stores and optimising muscle-damage repair. However, guidelines including quantity and timing are required in order to maximise their effectiveness. Complete restoration of fluid balance after a match is an important part of the recovery process as loss of intracellular volume reduces rates of glycogen and protein synthesis[23]. After match-induced dehydration (~2% of body mass), full rehydration status will take 6 hours, if a high-sodium (61 $mmol.l^{-1}$, about 3× higher than the sodium concentration found in many commercial sports drinks) drink with a volume greater than 150 to 200% of the sweat loss is consumed[19]. The addition of sodium to rehydration beverages (500 to 700 mg/L of water) is recommended as it promotes fluid retention, stimulates the thirst while delaying urine production and increases glucose

" During periods where the schedule is particularly congested, the recovery time between two successive matches can be between 2 and 4 days, which may be insufficient to restore normal homeostasis. "

absorption in the small intestine[24]. As a high rate of post exercise fluid consumption also results in a faster fluid balance restoration compared to a low rate of fluid intake[25], it is recommended to drink a large volume of fluid after the match instead of small quantities gradually. However, a small volume of fluid should be prescribed after this initial large consumption of fluid. Addition of a small amount of carbohydrate into the water can also be advised as it stimulates fluid absorption in the gut and improves palatability[24]. In a survey conducted on a professional team from the Italian Serie A followed over 5 years, 66% of the players reported being regular drinkers of alcoholic beverages[26]. However, alcohol consumption should be avoided after a match as it delays the ability to recover. Firstly, alcohol has diuretic properties, which increases urinary output and consequently the level of dehydration[24].

Secondly, it delays the muscular recovery process. The decline in maximal strength at 36 hours post-exercise was associated with muscle damage and was significantly greater in the alcoholic beverage condition (1g. kg^{-1} bodyweight ethanol as vodka and orange juice) compared to an isocaloric nonalcoholic beverage condition[27]. Thirdly, it impairs sleep efficiency[28], a vital function in the recovery process. The time course of muscle glycogen repletion after a high-level soccer match is between 2 and 3 days. Without specific guidelines, muscle glycogen concentration in top-level players was about 50% of the pre-match value 2 days after a match[29]. To optimise the resynthesis of muscle glycogen stores, an intake of ~1.2 g carbohydrate. kg^{-1}. $hour^{-1}$ with a high glycemic index immediately after a match and at 15 to 60 minutes intervals for up to 5 hours afterwards[30]. This enables maximum resynthesis of muscle glycogen stores.

As exercise stimulates muscle protein synthesis and muscle protein breakdown, the absence of protein intake after exercise can lead to a negative net protein balance. A positive muscle protein balance is required to repair exercise-induced muscle damage following a soccer match. Although, the quantity, type and timing of protein ingestion to maximise post-exercise muscle protein synthesis remains a topic for debate, a consumption of ~20 g milk protein or an equivalent of ~9 g essential amino acids seems to be sufficient to stimulate muscle protein synthesis rates during the first 2 hours of post-exercise recovery[31]. A high-protein diet after exercise can also improve subsequent muscle function[32] and cycling exercise performance[33]. Flavoured milk, which is an easily accessible and relatively inexpensive dairy product, is an effective beverage for post-exercise recovery.

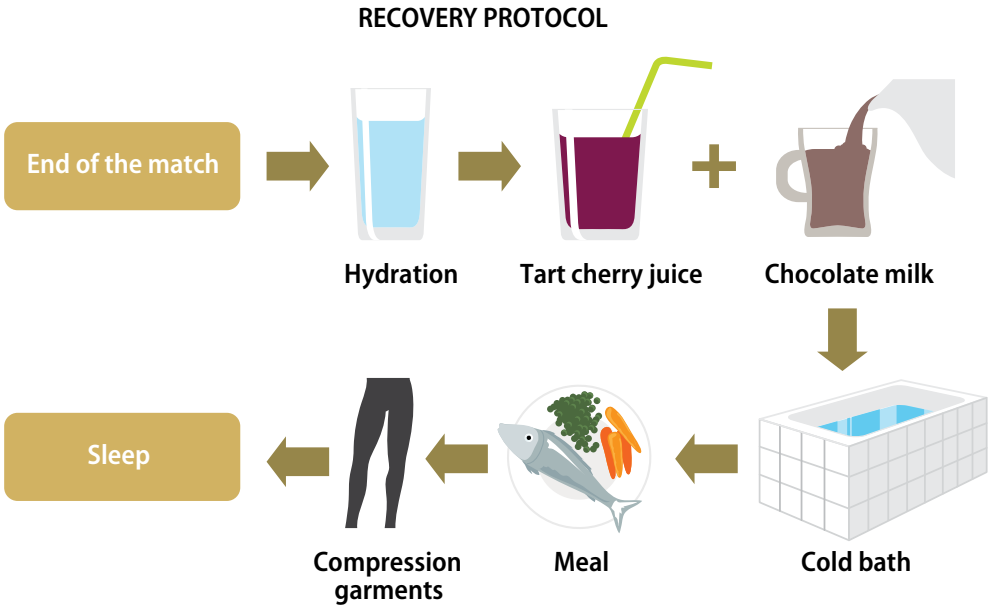

Figure 1: An example of a practical recovery protocol based on scientific evidence.

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It contains carbohydrate and proteins in similar amounts to those used in studies demonstrating improved post-exercise recovery. Many studies have also confirmed the significant effects of post-exercise chocolate milk supplementation on subsequent exercise performance[34,35]. Some juices such as tart cherry juice, tomato juice or berry juice are also recommended for enhancing the recovery process. These juices have a high antioxidant capacity, which reduces oxidative stress and inflammation. The ingestion of these juices prior to and following exercise-induced muscle damage is able to accelerate muscle strength recovery[36,37].
In conclusion, immediately after a match, players should drink a large volume of fluid (about 150% of the sweat loss) with a high concentration of sodium (about 500 to 700 mg/L of water), flavoured milk and tart cherry or berry juice. Then, they should eat a meal containing high-glycaemic index carbohydrate and protein within the hour following play (Figure 1).

SLEEP

Playing a soccer match at night (8 to 9 pm) involves high physical and mental load, as well as a high emotional stress. In addition, post-match routines (medical care, recovery strategies, meal and return trip) frequently lead to a very late bedtime, which may also alter sleep quality and quantity. Sleep loss is associated with reductions in endurance performance, maximal strength and cognitive performance[38]. Close links also exist between sleep and the immune system.

> Long-lasting fatigue may be caused by both impaired excitation-contraction coupling and structural damage

Cohen et al[39] showed that subjects with less than 7 hours of sleep per night in the weeks preceding exposure to rhinovirus are about three times more likely to develop a cold than those with 8 hours or more of sleep. A high-glycaemic index meal, which is recommended for rapid restoration of muscle glycogen stores, significantly reduced sleep onset latency compared with a low-glycaemic index meal[40] and was most effective when consumed 4 hours before bedtime compared with the same highglycaemic index meal given 1 hour before bedtime. Some other nutrients such as those containing tryptophan or melatonin[41,42] are also recommended to decrease sleep onset latency and/or to improve sleep quantity and quality. Tryptophan-containing foods include milk, meat, fish, poultry, eggs, beans and leafy green vegetables, while high concentrations of melatonin are contained in tart cherries.
A poor night's sleep may be compensated by a short post-lunch nap. Waterhouse et al[43] found that a nap, followed by a 30-minute recovery period, improved alertness and aspects of mental and physical performance following partial sleep loss. The ability to nap for short periods during the day may be a useful skill for players especially during a congested schedule. Another strategy to improve physical performance could be to extend sleep quantity over multiple weeks. According to Mah et al[44], extended sleep

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beyond one's habitual nightly sleep contributes to improved athletic performance, technical skills, reaction time and daytime reduces sleepiness in basketball players. Other recommendations for sleep induction include benefiting from a dark and quiet environment by using eyeshades and earplugs, listening to relaxing music and adopting regular sleep-wake schedules. Conversely, consumption of caffeine prior to the match for performance enhancement, alcohol as a means of celebrating after the match and hyper-hydration could lead to sleep disturbance.

Sleep is an essential part of recovery management, as sleep disturbances after a match are common which may negatively impact on the recovery process.

COLD-WATER IMMERSION

Several meta-analyses have confirmed the positive effects of cold-water immersion on recovery of performance[45,46]. Cold water immersion post- exercise provided worthwhile benefits on anaerobic performances i.e. maximal strength, sprint ability and countermovement jump[47,48].

In a meta-analysis focusing on the effects of cold-water immersion on muscle soreness, Bleakley et al[49] found that this strategy was effective to reduce onset of muscle soreness. The percentage of performance change associated with cold-water immersion would be considerably smaller in non-weight-bearing sports (swimming, cycling) compared to weight-bearing sports (running, weight training, eccentric muscle damage models). The positive effects of cold-water immersion on recovery of performance are higher when body contacts leading to damage are involved[50].

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The following protocol could be recommended to optimise the effects of cold-water immersion on recovery of performance: whole-body immersion lasting 10 to 20 minutes at a temperature of 12 to 15°C[45,51] immediately after the match or a hightraining load session[51].

ACTIVE RECOVERY

This strategy involves running, biking or swimming at low intensities for durations of 15 to 30 minutes. This recovery strategy is often implemented after soccer match, as active recovery, performed between 30 and 60% of maximal oxygen uptake and lasting at least 15 minutes, enhances blood lactate removal[53] in comparison with passive recovery. However, lactate removal should not be the criterion used to test the quality of recovery. Faster lactate removal does not necessarily involve better performance during subsequent exercise. In several studies aimed at comparing active and passive recovery modalities, exercise performance after active recovery did not improve, despite lower lactate concentrations[54,55], while other studies showed that passive recovery improved performance in subsequent exercise[56,57].

In addition, some studies have reported that active recovery performed immediately after high-intensity exercises significantly impaired glycogen synthesis [58,59].

In a set of studies on recovery between two soccer matches separated by 3 days in elite female players, Andersson et al[7,60] investigated the effects of 1 hour of active recovery (low-intensity cycling and resistance training) performed at 22 and 46 hours after the first match. Results showed that active recovery had no effects on the recovery pattern of physical performance markers (i.e. countermovement jump, 20-m sprint performance, maximal isokinetic knee flexion and extension), perceived muscle soreness and biochemical markers (i.e. creatine kinase, urea and uric acid), oxidative stress markers and antioxidants. According to these results, active recovery performed after a match does not present any benefit for soccer-related physical performance.

MASSAGE

In terms of recovery of performance, most studies have failed to find a significant beneficial effect of massage on subsequent exercise after local exercises[61] or global exercises[62]. Massage therapy attenuate inflammatory signalling after exercise-induced muscle damage[63] and presents psychological benefits. Massage decreased the subjective symptoms of delayed onset muscle soreness and increased perceptions of recovery[64]. In conclusion, benefits of massage are still lacking regarding recovery of performance. Conversely, the majority of the evidence points towards massage being effective in alleviating muscle soreness and improving perceptions of recovery.

STRETCHING

Elite soccer teams devote a substantial amount of training and match preparation time to stretching. Dadebo et al[65] reported that the English Premiership clubs allocated almost 40% of total training time to flexibility training. Stretching exercises are performed for several reasons: to improve range of motion, to reduce musculotendinous stiffness, to prevent injury, as well as to promote recovery. However, there is no substantial scientific evidence to support the use of stretching to enhance the postexercise recovery of soccer players. In a metaanalysis including 12 studies, Herbert et al[66] reported that stretching is not clinically worthwhile in reducing muscle soreness in the days following exercise. Recovery of physical performance is not improved after stretching[67].

COMPRESSION GARMENTS

The principle of compression garments is to increase the pressure on the ankle and to decrease it on the mid-thigh in order to improve the venous return and thus reduce venous stasis in the lower extremities. A meta-analysis on the effects of compression garments on recovery following damaging exercise was led by Hill et al[68]. Data were extracted from 12 studies, where variables were measured at baseline and at 24, 48 or 72 hours post-exercise. Results indicated that the use of compression garments had a moderate effect on recovery of

muscle strength, muscle power, creatine kinase and in reducing the severity of delayed onset muscle soreness. As studies did not have a placebo condition (i.e. using a garment but no compression), a placebo effect due to wearing the garments should not be excluded. Another potential limitation of studies on compression garments is that the actual pressures applied by the garments to subjects are not measured. In conclusion, the use of compression garments may provide an easy-to-use recovery strategy in a team. They could be useful during air travel, especially during long flights, to reduce the risk of deep vein thrombosis[69].

ELECTRICAL STIMULATION

Electrical stimulation involves the transmission of electrical impulses via surface electrodes to peripherally stimulate motor neurons thus eliciting muscular contractions. Transcutaneous electrical nerve stimulation and low-frequency electrical stimulation are the modalities most frequently used for recovery purposes.

The effects of electrical stimulation on the recovery of strength production capacity and on the reduction of muscle soreness were reviewed by Babault et al[70] . Among the 12 studies reviewed, 11 studies failed to find a significant effect of electrical stimulation on the ability to maintain performance after exercise, while three out of nine studies reported a significant effect of electrical stimulation on the reduction of muscle soreness. In conclusion, while electrical stimulation is often used for recovery purposes, no scientific evidence exists regarding its ability to maintain physical performance.

The level of scientific evidence concerning the effect of electrical stimulation on subjective ratings such as muscle soreness is also limited.

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conclusion

In summary, some recovery strategies such as hydration, diet, sleep, cold-water immersion and compression garments are effective to accelerate the recovery process. An example of a practical recovery protocol based on scientific evidence is proposed in Figure 1.
As described in the Figure 1, the recoveryprotocol includes six steps and should start immediately after the match:

1. ***The first step*** *is* ***hydration****; the mass of the players* ***should be measured*** *and* ***compared to the pre-match body mass*** *in order to propose the* ***appropriate quantity of fluid to drink*** *(150% of body mass lost). The fluid should contain a combination of water and* ***a large amount of sodium*** *(500 to 700 mg/L of water).*
2. ***The second step*** *consists of drinking a tart cherry juice and chocolate milk in order to* ***restore glycogen****, to* ***reduce oxidative stress*** *and* ***inflammation,*** *to* ***stimulate muscle repair*** *and to* ***promote quality and quantity of sleep****.*
3. ***The third step*** *is the* ***cold bath****. The players should* ***immerse themselves up to the neck*** *at a* ***temperature between 12 and 15°C*** *for* ***10 to 20 minutes*** *to* ***accelerate*** *the* ***recovery process.***
4. ***The fourth step*** *is to* ***wear*** *a* ***compression garment*** *until* ***bedtime.***
5. ***The fifth step*** *is to* ***eat*** *a* ***meal high in carbohydrate*** *with a* ***high-glycaemic index*** *and* ***protein within 1 hour of the end of the match*** *(for example soup, well-cooked white pasta or mashed potatoes, chicken or fish, yogurts or cake).*
6. ***The final step*** *is to* ***have*** *a good* ***night's sleep.***

Scientific evidence for the other strategies reviewed, such as active recovery, stretching, massage and electrical stimulation is still lacking in the ability to accelerate the return to the initial level of performance. This does not mean that these strategies do not help recovery, but that the protocols implemented up until now were unable to accelerate the recovery of physical performance.

In the survey on recovery administered to the professional soccer teams, practitioners revealed that recovery strategies are combined in recovery protocols. Although it remains important to isolate each strategy to determine its effects in the future research, it would also be interesting to analyse the interactions between the techniques. Longitudinal research protocols should also be led to take into account the chronic effects of cellular to molecular adaptations.

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References, Available at www.aspetar.com/journal

HEALTH & PERFORMANCE MANAGER WITH THE ROYAL BELGIAN FOOTBALL ASSOCIATION

" The number of sprints per game increases by two to three percent every year. "

- Philippe Rosier -

Philippe Rosier is a physiotherapist, psychopedagogist, lecturer and last but not least, Health & Performance Manager with the Royal Belgian Football Association. In that capacity, he ensures the Red Devils are fit and healthy, gearing them up for the upcoming FIFA World Cup in Russia and giving them the best chances of earning that coveted top spot. He has a PhD in Social Sciences and specialised in Psychopedagogy. His research focused on the impact of fasciatherapy on the physical and mental recovery of top athletes. In a nutshell, there is no one who can give us a better insight into the recovery of top footballers.

Dr Rosier, what are the greatest challenges in post-match recovery?

The greatest challenge is to find the right balance between physical and mental recovery. In recent years we have gained access to quite a few scientific tools to boost the players' physical recovery. We know what they should eat and drink to promote a better recovery, we know exactly how cold an ice bath should be, whether or not they should bathe their entire body and so on. We are also aware of the effects of massages and stretching. A lot of research has been conducted into the physical side of things. That being said, strenuous activity and playing football under pressure also result in a lot of stress. And that is a major challenge. How do we keep players focused and fresh mentally? I would definitely argue for a greater focus on and more research into mental recovery, linked with the implementation of strategies based on this research.

Photo of Philippe Rosier

And of course, modern football is quickly evolving...

That's right. The intensity and the number of games is increasing, and there is a lot of travel involved. That puts the players under enormous strain... In the past, players would train for games or championships at the seaside. Nowadays, they train on the other side of the world. That's why recovery is becoming increasingly important. Ten years ago, the intensity of the games was much lower, so there was no need to focus on recovery as much as we do today. Now the number of sprints per game is increasing by two to three percent every year, so over a ten-year period, we are talking about more than twenty percent. Therefore, customisation of the process and a thorough scientific approach are a must..

" Three nights of bad sleep double the risk of injury. "

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How do you deal with the recovery of the Red Devils?

We have adopted an evidence-based approach. The strategies we use are scientifically tested and we apply them in a scientific manner too. For example, quite a few people like to use ice baths. But how cold should that bath be, how soon after the effort should you take it and for how long? If you answer these questions correctly, you will use ice baths correctly and they will have a beneficial effect. If you fail to answer them correctly, you will probably end up causing damage.

We offer a whole range of recovery strategies. Some are obligatory for the whole team, such as active recovery, which is undoubtedly very important. Two examples are cycling and compulsory yoga sessions. Apart from these, we also offer optional strategies. The players can actually develop their own personal recovery programme. They can opt to have a massage or visit the osteopath, they can choose the flavour of their recovery drink and so on. Needless to say, everything is closely monitored and discussed.

What is the impact of a bad recovery on performance and the risk of injury?

Many studies have been conducted on this matter. Research shows that when a player indicates he has slept badly for more than three nights, the risk of injury doubles. So it is very important to monitor the players' sleep patterns, particularly the way they experience their sleep. There are similar studies on the effects of hydration and food. Many subaspects of recovery have been analysed and it turns out that when you do not recover well, you are at greater risk of injuring yourself. Your performance also drops, as does your ability to quickly react to different stimuli. Moreover, your stamina and speed are negatively affected. Your immune system is also compromised, making you more prone to illness.

" It is mainly a chronic workload that can eventually have a negative impact. "

People sometimes say, "They're pros... How can they be tired playing two games a week?" Is this too short-sighted?

Ideally, you would have 72 hours in between games. It is important to make a distinction between an acute and a chronic (work)load. Playing a few mid-week games is not necessarily a problem. However, it is the sum of those efforts - the chronic load - that can become problematic over the course of an entire season. People rarely see what goes on behind the scenes. The Red Devils, for example, are in the midst of their *periodisation** for the FIFA World Cup in Russia. During the event, they will be playing a game in Kaliningrad at 8 pm, meaning the players won't be in bed before 3 or 4 am. That is a very short night, so the following day is dedicated to recovery. What's more, a mere 48 hours later they will be playing again. For that next game, they need to travel from Kaliningrad to Moscow and then from Moscow they will be heading elsewhere. That is a lot of travelling! So there is much more to it than just kicking around a ball, having a pint at the bar and then heading back home to sleep. It is a very complex process.

" We use GPS tracking to collect that same data from training sessions. That gives us data from both training sessions and games for every player, which we then pour into algorithms. "

And then there are the different clubs and competitions the players are involved in...

All games in competitions are tracked, so we know how many accelerations and how many changes of directions a player has made, and how many kilometres he has run. We use GPS tracking to collect that same data from training sessions. That gives us data from both training sessions and games for every player, which we then pour into algorithms. That gives us an insight into the players' external load.

Based on that, we develop a highly customised programme. Some play for teams with very intense training sessions, and they have a lot of pitch time. With them, we need to focus strongly on recovery. There is no need to boost their condition. Speaking of which, the best way for players to improve their condition is to play games. Players who are mostly on the bench and therefore have less pitch time are at greater risk when they suddenly start playing more, particularly when their chronic load is over 110% of what they are used to. Those players require specific assistance.

** Periodisation, reference: NAQI THERAPEUTIC MAGAZINE: The Olympic Issue 2/2016, Training periodisation p.11-19*

SPORTS PHYSIOTHERAPIST AND THE CO-FOUNDER OF BFDA

"When games quickly succeed one another, we see a drop in physical preparedness."

- Jan Van Damme -

Jan Van Damme is a sports physiotherapist and the co-founder of BFDA, Belgian Football Doctors & Associates, an association that brings together the medical staff of Belgian professional football to pool and share knowledge. But above all, Van Damme is head physiotherapist at Club Brugge. Day in, day out, he works with professional footballers who need to be physically and mentally prepared for a series of strenuous efforts. Needless to say, a good recovery is essential in this process.

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With games succeeding one another extremely quickly, it cannot be easy to get and keep all players fit...

That's right. When working under normal circumstances, so without European or cup games, we have about six days to recover from a match, and we adopt a fairly standard strategy. That really gives the players enough time to recover thoroughly. Of course the greatest challenge is to help the players recover between two games that are closer together. We have noticed - and there are various studies confirming this - a drop in physical preparedness when games quickly succeed one another.

How do you tackle recovery concretely?

We have a set recovery ritual after the game, but in reality it all starts when the players are still on the pitch, because we always make sure they drink enough. We even use a custom approach, with isotonic drinks adapted to each player. The salt content of these drinks is adjusted based on the (sweat) tests the players have undergone. Those who tend to sweat more obviously need more salt. The quantity of thirst-quencher is also determined using this same approach.
Immediately after the game, we give our players a 'full recovery shake' - a protein shake containing all the necessary carbohydrates. It is also important for the players to consume adequate amounts of protein within the first half hour after the end of the game. We have a range of different flavours to meet everyone's personal preferences. It is really essential that they drink these shakes, so the entire staff strictly monitors the players. After they have had a shower, the players head for the players' home, where they have a meal containing the necessary carbohydrates, such as pasta.

"Our recovery protocol goes beyond just the first few hours after the game."

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You are mainly discussing diet-related efforts, but do you use any other recovery techniques too?

For home games, we can use our ice bath. Unfortunately that does not always work for away games. We do have a portable bath, but experience has taught us it is not the most practical solution. It needs to be filled, we need to make sure we take enough ice with us, we need to get the temperature right and so on. That's why we hardly ever use it. For European games, the opponent sometimes gives us access to their ice bath, but in Belgium we have not reached those levels yet.

We also always make our players wear compression socks after games, especially if they have a long bus trip ahead of them and they need to sit still for a long time. Many players also wear them overnight.

So that is what happens in the hours after a game. But of course you go beyond that...

That's right, our recovery protocol extends into the following days. We carry out biochemical analyses in which we check the players' urine and saliva. They also undergo a series of physical tests, for example with the 'groin bar', a device to test the muscles around the hip joints, the adductors and abductors.

"If the high-intensity metres are high, the players have a harder time recovering. "

We carry out this test the second day following the game. First, the players cycle for fifteen minutes and then we ask them to come to the groin bar. We measure how many Newtons the muscles can push and we compare the ratio between the adductors and the abductors. Then we check whether the previously set benchmark - a standard so to speak - has been reached. Based on these results, we can determine whether or not a player has fully recovered.
After the groin bar test, the players also do a 'counter movement jump'. At the beginning of the season - when the players are still at their peak - we ask them to jump, to establish their maximum jump count. We then look at the percentage of the maximum they can reach. This is once again a good indicator to determine to which extent they have recovered.

In modern football, a massive amount of data is collected during games. Do you use this data to boost the players' recovery?

Absolutely. We analyse all the GPS details, which tell us, on average, how many kilometres our players have run during each game and with which intensity. Training sessions are monitored too and about an hour after, all the data has already been uploaded by the Physical Coach.

In doing so, we adopt a very detailed approach and we even look at the accelerations and decelerations of each player during both training sessions and games, or simply put, how often they speed up and slow down. The evolution of those parameters also allows us to properly estimate the players' recovery potential. The more details we collect, the better our insights. We can accurately check each player's average actions and running track record, and monitor their performance during periods with a lot of games. But above all, it helps us understand how they recover.

Eventually, all the pieces fall into place and we get a better understanding of the physical preparedness of every player. We then discuss the results with the coach and jointly draw up a training programme the players should follow.

If a player himself says he is tired, what's the next step?

All players have an app on their smartphone on which they need to answer seven questions every morning. We call it 'Shape'. These questions focus on physical preparedness, how they slept, how they feel about the training session they had the day before and so on. Their answers are immediately sent to our Club lab - which we are incredibly proud of, by the way - and if necessary, we can have a word with the player before the training session and possibly change the programme.

Concretely, what is the impact of a bad recovery on the team results?

That partly depends on the types of games they are playing. Some games are high in intensity and require a lot of running. We have noticed that the higher the number of 'high-intensity' metres - at 21 km per hour or more - the harder it is for the players to recover. If there is a game on day three after the last one, some players start struggling. In these cases, an additional day to recover is very beneficial. We have tracked this in the past few years, comparing recovery and results, and we have found that we tend to lose slightly more points when there are just two or three days between two games.

Credits©Peter De Voecht/Photo News

SPORTS PHYSIOTHERAPIST

"Power training for the upper body gives a hormonal boost. "

- Jochen De Coene -

Jochen De Coene worked with AA Gent for ten years. When he was 27, he moved to China, where he assisted Shenhua Football Club and the Chinese national team for six years. In 1999 he joined RSC Anderlecht, where to this day, he draws up the medical assistance plans. His team ensures that the purple-whites feel great, both physically and mentally.

Jochen, working with top clubs, like RSC Anderlecht, must come with some serious responsibilities...

Our task is clear and simple: we need to get the players fit again as soon as possible after a game. An Anderlecht player often has two or even three games a week, and an average of 70 to 80 games per season. Needless to say, a good and fast recovery is essential, not in the least because it prevents injuries. We offer the players a comprehensive package that includes massages, ice baths and the like, but we also focus a lot on nutrition and hydration. We check their urine to make sure they have had enough to drink and to adjust their intake if necessary. After all, the players are only human. They can feel overwhelmed from time to time, which can 'break' their body so to speak. The result? Annoying injuries that keep them off the pitch, sometimes for long periods of time. Our task is to prevent this, because we mustn't forget that every time a player skips a game, that translates as a financial loss for the club.

Times are changing and so is football. Scientific evidence is more important than ever before. This is presumably a blessing, both for you and for the players?

Years ago, recovery was largely pure guesswork. Everyone just did what they felt was best. But when you rely on your gut feeling when using a specific treatment or approach, you will not necessarily achieve the intended effects. An example? Today, we do upper-body power training one or two days after a game, which we never used to do in the past. This results in a hormonal boost, which, in turn, speeds up the recovery process. Nowadays, we have a more science-based approach. That's why the club has invested heavily in data collection too, because figures - black on white - can help us determine whether or not a player has sufficiently recovered. It is our job to coach the players on the pitch and beyond. We need to convince them to live like real pros, gearing their lifestyle to it.

Credits©Vincent Kalut/Photo News

What are your preferred recovery techniques?

Any recovery technique, regardless of its intensity and timing, is important. However, a custom approach is also a must, because every player is different. An example? We administer food supplements based on blood tests to ensure a quick and optimal recovery after a major effort. This recovery is not only physical but mental too. These supplements contribute to a greater fat-free mass, for example, as well as additional muscle strength and a better muscle structure. Above all, they promote the repair of muscle damage following intense efforts. We also focus on active recovery the day after the game, ensuring the players train at the right heart rate. All of this contributes to a custom approach.

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" Training at the right heart rate, that too is a custom approach. "

You often see footballers wearing compressions socks. Do you use them too? What is their purpose?

Yes, our players wear those too, especially if the game is followed by a long bus journey. Intense efforts break down cellular tissue in the muscles, which negatively impacts microcirculation. Compression socks put more pressure on the muscle mass to push the excess moisture, including the waste products of the combustion process, back into the bloodstream. The decreasing pressure of the sock, from ankle to knee, ensures the blood is properly sent back to the heart.

"You don't need to motivate players for a game against Club Brugge."

As you said earlier, the greatest challenge is for the players to properly recover in between games. That is no easy feat for a club that plays at European level every season...

Our players are high-level professionals, of course. Their bodies have adjusted to intense efforts, and they can handle them. They can also count on professional medical assistance, which ensures they can usually be prepared for the next game on time. Of course no two players are the same. Some have greater speed and explosiveness than others, and so on. Every player also recovers in his own way and at his own pace.

What about the mental recovery?

That is underestimated far too often. If you are playing a Champions League game in Russia at 8.45 pm on Wednesday and on Sunday of that same week you are playing against Club Brugge, you will undoubtedly be more intrinsically motivated than for a match against Moeskroen, for example. Mentally, it is easier for players to prepare for a top-level match, and that is only human. But it is our job to give everyone a good motivational boost at all times.

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"Every player also recovers in his own way and at his own pace. "

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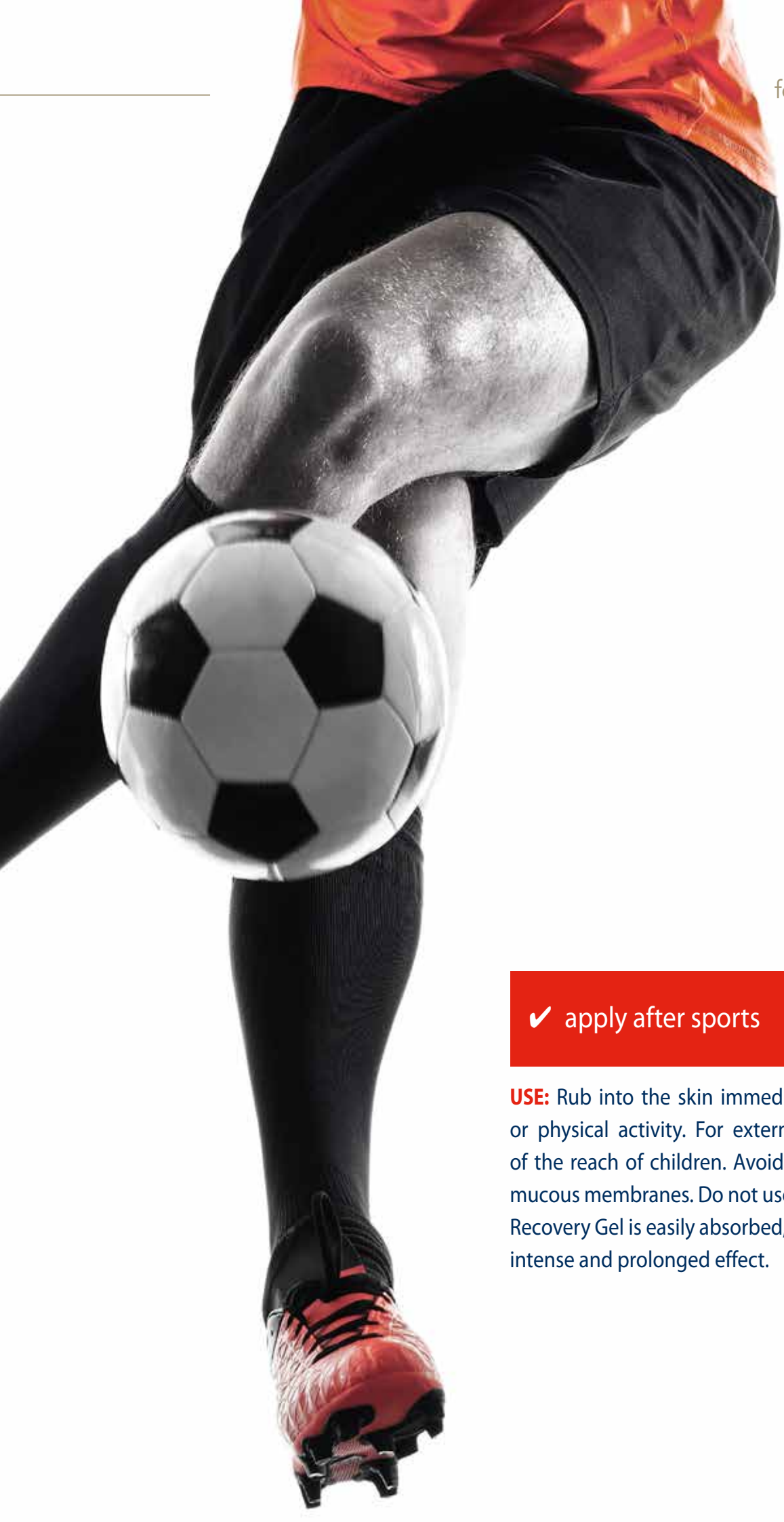

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