December 2017 | Issue #15

THE PERFORMANCE DIGEST

A review of the latest sports performance research

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Welcome to the
PERFORMANCE DIGEST

OWEN WALKER
Founder and Director of
Science for Sport

If you're reading this right now, then I am seriously honoured you decided to invest in yourself and join the Performance Digest. I am extremely thankful for every single member who chooses to join us on our relentless quest to improve this industry for the better. Without you, this would simply not be possible; so thank you.

This issue is special for several different reasons.

Firstly, and although it is the 15th issue, this particular one marks the 1-year anniversary of our monthly research review (Performance Digest) since we launched the service on December 18th 2016. Since it was launched, both the feedback and the amount of members who have joined has simply been phenomenal; we definitely couldn't of asked for any better. So again, thank you.

Price changes: This issue also marks the point in which the Performance Digest subscription prices will be increasing for the first time since we launched the service one year ago. Rest assured though, if you subscribed to the service before January 2018, your subscription charges will be forever fixed at the price you paid when you opted in. In other words, you will not be charged at the new subscription rate. This is a simple display of our gratitude for you joining us on our quest to improve the sports performance industry. So again, thank you, and I hope this gesture keeps you a happy member.

Last but not least, we'd like to wish you all a happy holiday and a prosperous new year! I hope you all have big plans for 2018 and are excited to get the ball rolling with all of them; I know we are.

Thank you and happy new year!
Owen Walker

Reviewers

The research reviewers for The Performance Digest.

Owen Walker
MSc*D CSCS

Chief Editor

Owen is the founder and director of Science for Sport. He was formerly the Head of Academy Sports Science and Strength & Conditioning at Cardiff City Football Club, and an interim Sports Scientist for the Welsh FA.

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The Science of Coaching

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The Science of COACHING

Which psychological attributes underpin elite sports coaches?

[Abstract]

Effective coaching is more than just the application of a coach's knowledge and experience

INTRODUCTION

Those involved in research of the coaching process highlight that coaching is not simply a structured interaction between coaches and athletes in an effort to achieve optimal performance outcomes. Instead, it is viewed as a complex social system with a variety of goals and objectives, with the relationship and the interactions of the coach and the athlete at the centre. For a coach to truly be effective, they must acknowledge the influence they can have on their athletes, not only by designing effective training sessions, but also by the social and behavioural interactions they have with their athletes.

Most of the information available to coaches, or those involved in athlete development, has traditionally focused on the behavioural aspects of coaching practice from a quantitative and observational perspective, with far less focus on the underlying reasons behind these behaviours. In other words, we know what coaches do, but the following question still remains: why do they do the things they do? Because of this, the authors of this study set out to explore what psychological attributes underpin a coach's ability to actually coach.

WHAT THEY FOUND

After interviewing 12 elite coaches, a number of psychological attributes deemed to characterise their ability to be a successful coach were identified:

⇒ Attitude (being tough, focusing on the positives)

⇒ Confidence (communication, acting confident, confident in ability and knowledge)

⇒ Resilience (handling setbacks, dealing with criticism)

⇒ Focus (process or future focused)

⇒ Drive for personal development (open minded, an appetite for learning)

⇒ Being athlete centred (encouraging independence, differentiation, adaptability)

⇒ Emotional awareness (of self and/or others)

⇒ Emotional understanding (influence of emotions, athlete's emotions, consequence of negative emotions)

⇒ Emotional management (control, control in other, expression, encouraging emotional expression)

WHAT THIS MEANS

As stated by the authors, the findings of this research shine further light on the premise that coaching is much more than the transmission of knowledge from coach to athlete, and it extends beyond just the teaching of skills and tactics. In order to be a successful coach, the coach must also understand the behaviours and social requirements of their athletes in addition to understanding what psychological characteristics they must possess themselves. Of particular interest, is the number of attributes associated with the emotional nature of coaching, suggesting that effective coaches are those with an ability to recognise, understand, and manage their own emotions, as well as those of their athletes.

Practical Takeaways

This study suggests that being an effective coach means more than just having a head full of theoretical knowledge and/or developing your athletes' physical prowess and skill level. Instead, the psychological attributes which each individual coach possesses, plays just as an important part in their athletes development and performance. From a personal development standpoint, coaches should therefore not only focus on their knowledge of the sport, for example, but also how their psychological attributes, particularly those associated with emotion (see 'what they found'), can be used effectively to influence the development and performance of their athletes'.

Dr. Will Vickery

Will is a Senior Lecturer of Sport Coaching at the University of Northumbria in Newcastle Upon Tyne, U.K.

Strength & Conditioning

This month's top research in strength & conditioning.

BACK SQUAT: HOW ANKLE ROM AND SEGMENT RATIOS INFLUENCE TRUNK LEAN

Fuglsang E, et al., (2017) Journal of Strength and Conditioning Research, 31(11), 3024-3033.

CROSS-EDUCATION: A SUPER TOOL FOR TRAINING INJURED ATHLETES?

Manca A, et al. (2017) Eur J Appl Physiol, 117: 2335.

MAINTAINING TACKLING ABILITY IN-SEASON: THE ROLE OF THE S&C COACH

Speranza M, et al. (2017) Journal of Strength and Conditioning Research, 31 (12), 3311-3318.

[Abstract]

Back Squat: How ankle ROM and segment ratios influence trunk lean

OBJECTIVE
Past studies have shown that a more upright trunk position in the squat reduces shear forces in the spine. Thus, it is important to investigate the factors presumed to influence trunk angle. Therefore, the objective of this study was to investigate how mobility of the ankle (dorsiflexion range of movement – DF ROM) and segment ratios between the thoracic spine, the thighs, and the shanks influence the trunk angle during the parallel squat (PS).

WHAT THEY DID
While recorded with motion capture, 11 male recreational athletes familiar with weight training (on average 4.1 years of experience) performed 3 repetitions of the back squat at approximately 75% of 1 repetition maximum to a parallel position (thighs horizontal) or lower. Subjects also performed a weight bearing lunge test (knee-to-wall) to determine maximal ROM of the ankle joint. Segment angles of the shank (shin), thigh, and trunk segments as well as ankle joint angles were calculated by 2-dimensional kinematic analysis. Simple linear and multiple regressions were used to test the correlation between the lower extremity angles, segment ratios, and the trunk angle.

WHAT THEY FOUND
On average, subjects had an 11.4o deficit in dorsiflexion ROM between maximal ROM and ROM used in the PS, which was independent of maximal ROM. Ankle mobility negatively correlated with trunk angle, thereby showing that subjects with greater ankle ROM had more upright torsos in the PS position. Ankle mobility was found to account for 45% of the variance in trunk angle.

Even though no significant relationship was found between the segment ratios and trunk angle, the multiple regression models showed that the trunk: thigh ratio was the only variable that correlated positively with the trunk angle. This suggests that a longer trunk or a shorter thigh would result in a more upright trunk in the PS.

Practical Takeaways

This study shows that increased ankle mobility is linked to a more upright position in the squat.

Therefore, if someone is experiencing back pain with squatting, and they have significant forward trunk lean, assess their ankle mobility in a knee-to-wall test. If it is poor (typically defined as <10cm), targeting their ankle mobility may help reduce stress on the back. If mobility exercises are not successful at improving ROM, or if you need the athlete to squat before mobility can be improved, try elevating the heels either through using Olympic lifting shoes or by placing small weight plates under the athlete's heels. Furthermore, another option is to get the athlete to box squat instead, as this will allow them to stay more upright, and also reduces the ankle DF ROM requirements.

Athletes demonstrating adequate ankle ROM in a knee-to-wall test, but still displaying excessive forward trunk lean in the squat might be displaying a motor control issue, and will likely benefit from being coached in and practicing the movement pattern.

Want to learn more?
Then check these out...

Tim's Comments

"This study is further confirmation that there is no one optimal way to squat. Despite what some coaches may say, no two person's squats should look the exact same, as we are all put together slightly different. Individual differences in joint structure often have a profound impact on the level of mobility in our hips and ankles, which can have a significant impact on squat kinematics.

Furthermore, it is important to note that forward trunk lean is not necessarily a bad thing as long as a neutral spine can be maintained, and there is no research to show that it will 'cause' back pain. Reducing forward lean is just a way to reduce stress on the back in people who currently have back pain.

Interestingly, this study shows that the subjects were not able to make use of their maximal ankle ROM during the squat, suggesting a natural deficit between maximal ROM and usage of ankle ROM in the squat. The authors state that it is unclear what causes this deficit."

[Abstract]

Cross-education: A super tool for training injured athletes?

OBJECTIVE
Cross-education is the phenomenon whereby exercise of one limb can induce strength gains in the contralateral untrained limb. The aim of this study was to review the current research findings regarding cross-education (CE) following unilateral strength training, and determine the overall magnitude of the contralateral strength gains.

WHAT THEY DID
The databases MEDLINE, the Cochrane library, Scopus, Web of Science, and PubMed were searched for randomised controlled trials focusing on unilateral resistance training from inception to December 2016. Inclusion criteria included: (1) participants randomly assigned to unilateral training and to a control group receiving no intervention; and (2) at least one group of the study undergoing a unilateral resistance training with a minimal duration of 2 weeks against at least 50% of maximal voluntary strength. Thirty-one studies were included in the meta-analysis, and the risk of bias of these studies was assessed using the Cochrane Risk-of-Bias tool.

WHAT THEY FOUND
The CE effect resulted in a significant 11.9% contralateral strength increase on average. Results differed between body region. The upper-body saw a 9.4% contralateral increase, whereas the lower-body saw a 16.4% contralateral increase. Results also varied according to contraction type used – isometric (8.2%), concentric (11.3%), eccentric (17.7%), and isotonic-dynamic training (15.9%). Finally, a high risk of bias was detected across all studies.

Practical Takeaways

This review proposes an evidence-based estimate of the CE effect and indicates that unilateral resistance training induces moderate to large contralateral gains in strength in healthy subjects. This has significant implications for injured athletes who are unable to train properly due to an injury on one side of the body. Using the CE effect, strength gains are better able to be maintained on the injured side without training it directly.

It is important to note that the size of the CE effect varies depending on the body region and the contraction type utilised. This study shows that the CE effect is far more pronounced for the lower-body, suggesting that lower-limb strength can be better maintained around injury. Strength and conditioning coaches should also use both eccentric and dynamic (concentric + eccentric) contractions over isometric and concentric contractions, as these contraction types provide a greater CE effect.

For example, if an athlete is in rehabilitation for a knee ligament injury (e.g. ACL) and is unable to strength train bilaterally, heavy single-leg leg press or weighted single-leg squats should help maintain strength on the injured side.

Want to learn more?
Then check these out...

Tim's Comments

"It is surprising how many strength and conditioning coaches are unaware of the effects of cross-education, it is a powerful tool to help maintain an athlete's strength around an injury.

Interestingly, the magnitude of the contralateral strength gains appears to largely depend on the strength gains obtained ipsilaterally (i.e. with the uninjured side). Therefore, it is important that the athlete is in the correct mindset to train hard and really push to try improve strength on the uninjured side, as this will increase the crossover effect.

This recent review fills an important gap in the research, as the last systematic review on this topic was published a decade ago, and since then, numerous studies have been published on CE. As the authors of this study suggest, more high-quality studies are needed on this topic, due to the high risk of bias in the studies available to date."

[Abstract]

Maintaining tackling ability in-season: The role of the S&C coach

OBJECTIVE

To investigate changes in tackling ability during a competitive season, and determine whether these changes were associated with changes in muscular strength and power.

WHAT THEY DID

12 semi-professional rugby league players (mean age 23.3 years) undertook tests of upper- and lower-body strength (1RM bench press and squat, respectively) and power (plyometric push-up and countermovement jump, respectively), as well as tackling ability, during the pre-season period. Tackling ability was tested using video analysis of a standardised one-on-one tackling drill. Players repeated these tests after round 15 of a 25-match competitive season.

WHAT THEY FOUND

Changes in 1RM squat (r = 0.70) and squat relative to body mass (r = 0.73) were significantly related to changes in tackling ability. Players with the greatest improvements in tackling ability (i.e. "responders") retained 1RM squat and squat relative to body mass to a greater extent than the "non-responders". Changes in lower-body power, and upper-body strength or power were not related to changes in tackling ability.

Practical Takeaways

This study suggests that rugby league players who retain lower-body strength are able to improve tackling ability in-season, whereas reductions in lower-body strength are associated with reductions in tackling ability in-season. Therefore, although there are significant reductions in the frequency and volume of strength training in-season, it is crucial for strength and conditioning coaches to programme an adequate strength training stimulus to retain muscular strength during this phase.

Interestingly, this study demonstrates that tackling ability can be improved in the absence of improvements in lower-body strength. It appears that the stimulus of match-play, training, and coaching is sufficient to elicit improvements in tackling ability, if lower-body strength can be retained. Therefore, strength and conditioning coaches can play their part in improving tackling ability by helping players maintain lower-body strength in-season. This can be done by scheduling at least one heavy (>85% 1RM) lower-body lift (e.g. back squat, trap bar deadlift) per week during the in-season.

Want to learn more?
Then check these out...

Tim's Comments

"This study is important as it is the first to examine this topic, so it fills an important gap in the research. It is also a very practically relevant study, and the findings are plain and simple for strength and conditioning coaches – don't lose strength in-season, if possible!

The study clearly highlights the importance of maintaining lower-body strength for effective tackling performance throughout a rugby league season, by why might this relationship exist? The authors propose that a decrement in lower-body strength may reduce a players' ability to exert force in the tackle/reduce leg drive, therefore impairing tackling performance.

Another important point to note is that while objective criteria were applied to the 'tackling ability' test, there will inherently be a higher degree of subjectivity in the scoring of this test compared to the strength and power tests."

Technology & Monitoring

This month's top research on technology and monitoring.

THE VALIDITY AND RELIABILITY OF THE GYMAWARE DEVICE FOR MEASURING CMJ

O'Donnell, S, et al. (2017) Measurement in Physical Education and Exercise Science: 21 (1), 2018.

FLYING AND ITS EFFECT ON PERFORMANCE: AN EAST- VS. WEST-BOUND TRAVEL COMPARISON

Fowler, P, et al. Medicine & Science in Sports & Exercise: Epub. 2017.

DO MINIMALIST SHOES IMPROVE RUNNING ECONOMY AND TIME-TRIAL PERFORMANCE?

Fuller, J, et al. Journal of Science and Medicine in Sport: Epub. 2017.

[Abstract]

The validity and reliability of the GymAware device for measuring CMJ

OBJECTIVE
The purpose of this study was to assess the reliability and validity of a linear position transducer (LPT) to measure peak velocity and jump height, when compared to a force plate in recreational and elite female athletes.

WHAT THEY DID
A total of 38 females (27 recreational and 11 elite athletes) participated in this two-part investigation. In part one of the study, the recreational athletes were used to assess the validity of the LPT (GymAware) using three CMJs on a force plate. Part two of the study involved the elite athletes performing three CMJs on three separate days on a force plate in order to assess the reliability of the LPT. CMJs were performed using self-selected depths and with hands on hips and the LPT connected to a waist belt. Jumps were performed on a force plate while simultaneously using the LPT. A rest interval of 20-sec was given between each jump.

WHAT THEY FOUND
Validity – A very strong correlation was found for LPT jump height when compared to the force plate (r = 0.90). A low typical error of estimate was also observed (2.4cm). However, the LPT significantly overestimated jump height compared to the "gold standard" force plate (7.0 + 2.8cm). So, in other words, they correlated well, which was probably due to the low error, but the LPT was consistently overestimating jump height.

Reliability – The reliability of the LPT for measuring CMJ performance in elite female athletes was acceptable (CV = 6%). Peak and mean velocity were also deemed reliable (CV = 5% and 7%, respectively). A within-subject reliability for both peak and mean velocity were acceptable (ICC = 0.90 and 0.91, respectively).

Practical Takeaways

While the reliability of the LPT during CMJ in elite female athletes was acceptable, it is important to note that due to the overestimation of jump height, testing apparatus should not be used interchangeably during testing (e.g. contact mats, force plates etc). Furthermore, caution must be taken when comparing LPT jump data with data from other measurement systems due to this discrepancy. In the current study, the LPT displayed similar levels of reliability for jump performance compared to previous studies in females using contact mats and a Vertec device, This suggests that LPT is a viable option when assessing jump performance.

It should be noted that the waist harness the LPT was attached to may have had variation in movement between participants even though it was specifically fitted. Attaching the LPT to a bar across the back may alleviate this problem, however, the reliability of this method versus the waist harness is unknown.

Want to learn more?
Then check these out...

James's Comments

"As coaches, we generally know that we can't switch between testing apparatus and use the data to compare changes from training. This research, however, provides a useful guideline for you if you are ever in a situation where you need to compare your LPT data with force plate data or vice versa. As the authors state, now that the reliability has been assessed in elite female athletes, future research can look at the analysing the smallest worthwhile change in a similar elite female population."

[Abstract]

Flying and its effect on performance: An east- vs. west-bound travel comparison

OBJECTIVE
The aim of this study was to compare the timeline of sleep recovery, subjective jet-lag, fatigue, and physical performance measures related to team-sports following east and west long-haul transmeridian travel.

STUDY FRAMEWORK
10 team sport male athletes with a recent training history of at least 2-3x per week participated in this study. Athletes completed familiarisation and baseline measurements at 2 intervals throughout the day for 4 days. At 9am, CMJ was performed and was repeated again at 5pm along with a 20m sprint test and a YoYoIR1 test. Sleep was monitored using self-report diaries and wrist activity monitors along with a jet-lag questionnaire covering various subjective variables; such as fatigue, mental performance, and mood. Subjects then had an 8 day washout period, before they flew from Australia to Qatar (west); taking a total of 21 hours. Data was collected throughout the first 4 days following the flight. Following a 4 day washout period, data was then collected again 2 days before flying back to Australia (east). During the initial 4 days after the east bound flight to Australia, data was collected again. Subjects abstained from caffeine, alcohol, and napping during these periods.

INTERNAL & EXTERNAL MONITORING
A greater mean reduction in CMJ peak force was found during east travel compared to west across all four testing days. A significantly slower 20m sprint time was detected on day 2 in east travel compared to west. Day 1 reduction in YYIR1 distance in east was significantly different to the increase in distance in west travel. A greater reduction in YYIR1 distance was also found on day 2 after east travel compared to west. However, YYIR1 distance increased on day 4 in east travel more than west travel. Mean sleep onset and offset were significantly later, and mean time in bed and sleep duration were significantly reduced across the 4 days in east compared to west and baseline. The results from the jet-lag questionnaires were significantly worse across all 4 days following eastbound travel in comparison to westbound and baseline measures. The westbound jet-lag questionnaires were also worse than baseline measures.

Practical Takeaways

The results of this study suggest that long haul east bound travel has a greater detrimental effect to lower-body power and intermittent running performance compared with west bound travel. Furthermore, east bound travel had a greater impact on sleep, subjective jet-lag, fatigue, and motivation, especially within the first 48 – 72 hours after arrival. However, performance also decreased after west bound travel compared to baseline. Large effect sizes indicate that jet-lag was still elevated on day 4 in east and west travel. In an ideal world, long haul travelling would be done at least 4 days before a competition or match. However, this is not always possible with tight schedules and budgets.

When travelling west, getting light exposure in the late afternoon for 30-60mins and performing low-intensity exercise on arrival are both good ways of reducing the effects of jet-lag. For travelling east, getting light exposure mid-morning for 30-60mins, and performing exercise in the early evening can also reduce the effects of jet-lag.

Want to learn more?
Then check these out...

James's Comments

"While the above research doesn't give much in the way of interventions to help your athletes when traveling long haul, it provides a good insight into how the direction of travel effects performance and subjective feeling. Armed with this information as a coach, you can start to experiment with your own interventions. While the team I'm currently with don't travel long haul (only cross 1 or 2 time zones domestically), the effects of flying or long bus rides can take its toll. One thing I have tried, is using an ice bath before bed once settled into our accommodation.

While I have not seen any research on this, I think the lowering of body temperature and increasing parasympathetic and decreasing sympathetic activity helps the athletes to relax and fall asleep. Some players absolutely love it, and say that they feel much better the next day. Furthermore, classical massage or self-massage can potentially be another way to reduce the lower-body fatigue and improve relaxation."

[Abstract]

Do minimalist shoes improve running economy and time-trial performance?

OBJECTIVE
This study investigated if using minimalist shoes improved time-trial performance and running economy compared to conventional shoes during a standardised six-week training programme. Footfall pattern, stride rate and length, and ankle plantar-flexor strength were all investigated.

WHAT THEY DID
61 male distance runners (ran at least 15km/week, could run 5km <23mins) who used conventional shoes, had no previous minimalist shoe experience, and were habitual rearfoot footfall (heel strikers) runners were recruited. After a familiarisation session, subjects were split into 2 groups (conventional or minimalist shoe). Baseline tests were performed in their allocated shoe were they were assessed for running economy, kinematics (heel and forefoot sensor), 5km time-trial performance, and ankle plantar flexor strength. All variables were reassessed in the allocated shoes after 6 weeks of standardised training.

The 6 week training programme was adapted from a programme known to improve performance in trained runners. Weekly training involved 4 sessions per week, 2 interval running sessions at 85-90% maximum heart rate (MaxHR) and 2 continuous running sessions at 65-80% MaxHR. Each group gradually increased the use of the allocated shoe and decreased the use of their normal shoe. Week 1 consisted of 5% of their weekly running in the allocated shoe (conventional or minimalist), this then increased to 35% of weekly running in week 6. This matched to 40-50km of running in the allocated shoe.

WHAT THEY FOUND
50 runners completed the training programme (11 subjects dropped out due to injury or couldn't make follow up testing). At baseline, there was no difference in time-trial performance between shoe groups. Training improved time-trial performance in both groups, but a greater improvement was seen in the minimalist shoe group, although the magnitude of difference was small. Small improvements in running economy at 11km/h and moderate improvements at 13km/h were seen in the minimalist shoe group, whilst improvements in running economy were also seen in the conventional shoe group at 13km/h, but not at 11km/h. Minimalist shoes caused a large reduction in the time difference of rearfoot to forefoot foot landing pattern, but only two runners used a forefoot footfall. Stride rate, strength length, and ankle plantar flexor strength were not different between groups.

Practical Takeaways

According on this paper, gradually increasing the use of minimalist running shoes (5 to 35%) over a 6 week training period can improve running economy and time-trial performance greater than conventional shoes. Furthermore, minimalist shoes caused runners to use a less pronounced heel strike, although only two runners used a forefoot footfall. The authors state that it was not possible to determine whether the improvement in running economy and performance resulted from training, or if subjects simply became better acclimatised to running in new shoes. Gradually transitioning into minimalist shoes should not exceed 50% of total weekly running volume over 12 weeks, as previous research has shown increased bone marrow edema in runners who did not follow this prescription. As a result, if you do wish to transition to minimalist shoes, you should look to accommodate for the lost training volume by filling the rest of your volume with running in your normal shoes.

Heel strike footfall has gotten a bad rap in previous years due to the thought of the high braking forces before propulsion. Minimalist shoes and barefoot running were seen as a way to change footfall patterns to a forefoot foot strike and essentially improve running efficiency. Based on this study, only 2 of the runners changed from a heel strike pattern to a forefoot foot strike. Minimalist shoes did however decrease the time between the heel and forefoot transition when the foot was planted. It is unknown whether this improvement in footfall or running economy from minimalist shoe use will transfer when running in conventional shoes.

Want to learn more?
Then check these out...

James's Comments

"The most intriguing part of this study I find is the fact the majority of runners didn't transition to a forefoot foot strike, despite it often being touted as the "correct" running gait during the barefoot/minimalist running movement. However, this may have been due to the gradual build up in use of the minimalist shoes. The biggest downfall that people tend to fall into is transitioning too quickly into minimalist running shoes and then picking up injuries, such as shin and calf pain. However, using minimalist shoes may not have much merit outside of the endurance running world due to the fact that boots (soccer and rugby cleats) could generally be considered minimalist running shoes due to the 0mm heel drop and little padding between the foot and the surface."

Fatigue & Recovery

This month's top research on fatigue and recovery.

ICE BATH VS. COLD WATER IMMERSION: THE IMPACT OF TEMPERATURE ON RECOVERY

Anderson D, Nunn J. Tyler CJ. J Strength Cond Res. 2017;1.

COMPRESSION GARMENTS: WHICH PRESSURE IS MOST EFFECTIVE?

Hill J. et al. Int J Sports Physiol Perform. 2017;1–22.

HOW TO INDIVIDUALISE COLD WATER IMMERSION FOR HIGH-FAT AND LOW-FAT ATHLETES

Stephens JM. Et al., Int J Sports Physiol Perform. 2017.

[Abstract]

Ice bath vs. cold water immersion: The impact of temperature on recovery

OBJECTIVE
The aim of this study was to compare the effect of cold water immersion at 14 ˚C (CWI14), 5 ˚C (CWI5) and no CWI intervention (CON) on recovery from intermittent running exercise.

WHAT THEY DID
Nine male amateur team-sport athletes were exposed to all three conditions (12-minutes lower-body CWI at 14 ˚C [CWI14], 5 ˚C [CWI5], and no CWI [CON]) following 45 minutes of an intermittent running protocol. Measures of muscle function (peak and mean cycling power), quadriceps muscle soreness (DOMS), blood lactate, and creatine kinase (CK) were obtained immediately after the immersion intervention, and then again after 24, 48 and 72 hours.

WHAT THEY FOUND
The authors found that muscle function was affected to a greater extent immediately after exercise in the groups exposed to CWI in comparison to CON.

However, small effect sizes were observed for changes in peak power between CWI5 and CWI14 24 and 48 hours after exercise, with CWI5 being superior to CWI14. CWI5 was also superior for enhancing peak power in comparison to CON at 24 and 72 hours after exercise; although the effect sizes were small.

Moreover, both CWI conditions were more effective than CON for recovering peak power 72 hours after exercise, as demonstrated by the small effect sizes observed. Although, the CON was reported to be more effective for recovering mean peak power than CWI5 and CWI14. DOMS was elevated in all time points on CWI5 and CON, but not 72 hours after exercise on CWI14.

Practical Takeaways

The findings from this study suggest that CWI does not provide a beneficial effect on muscle function recovery after an intermittent running exercise in comparison to CON. Moreover, CWI was demonstrated to slightly negatively affect muscle function immediately after the intermittent running exercise. Therefore, if athletes need to perform in the very short-term (i.e. immediately), CWI should be avoided.

In a longer time-frame (e.g. 24-72 hours), CWI performed at 5˚C may provide some small beneficial effects on peak power output.

Altogether, these findings suggest that CWI can be implemented to promote muscle function after 24-72 hours of recovery, however, if the athletes have to perform in a shorter period of time (i.e. immediately), CWI should be avoided.

Want to learn more?
Then check these out...

Francisco's Comments

The decreased muscle function observed immediately after exercise is not a novelty, as a reduction in muscle temperature from CWI may affect nerve conductibility, therefore impairing muscle function (see Argus et al (2016) study attached).

Although the effects of CWI occurred essentially from the more severe CWI protocol; and even in this condition the effects were minimal, the findings from this study should not discourage the implementation of CWI for the following reasons:

1) Although the running protocol induced some muscle damage (as demonstrated by indirect markers as muscle soreness and CK), the levels of muscle damage are likely to be inferior to sports which involve high eccentric actions and heavy contact/collisions;

2) The test used to measure muscle function is likely to lack some specificity in comparison to the intervention used to induce muscle damage (i.e. running vs. cycling).

Interestingly, the less severe protocol (i.e. 12 min at 14˚C) did not demonstrate to be beneficial for enhancing recovery. Given the recent research demonstrating that CWI may blunt adaptations in muscle growth, and having in mind that there is rationale to believe that the lower the temperature (i.e. 5 vs. 14˚C) the greater the intensity of the CWI, the severe (and I presume painful) protocol implemented by the researchers (5˚C) should be used with caution. Therefore, it is important to consider the following when designing your CWI protocol:

What are the athletes' goals?
What are the goals of subsequent training sessions?
When are the subsequent sessions going to be performed?

[Abstract]

Compression garments: Which pressure is most effective?

OBJECTIVE
The goal of this study was to investigate the effects of two different grades of compression garment on recovery following strenuous exercise.

WHAT THEY DID
Following an eccentric fatigue protocol consisting of 100 drop jumps, 45 recreationally active participants (n = 26 male and n = 19 female) were assigned to a high compression exposure group (HI), a low compression exposure group (LOW), and a sham ultrasound group (SHAM). Participants in the compression garment (CG) groups wore CG for 72 hours after the eccentric intervention, while the participants on the SHAM group received sham ultrasound treatment for 10 minutes. Measures of perceived muscle soreness, maximal voluntary contraction (MVC), counter movement jump height (CMJ), creatine kinase (CK), C-reactive protein (CRP), and myoglobin (Mb) were assessed before and 1, 24, 48 and 72 hours after exercise.

WHAT THEY FOUND
The fatiguing protocol elicited a decrease in muscle function and increase in muscle damage markers. No differences between interventions were observed in the different markers of muscle damage (i.e. CK, CRP, Mb, and DOMS). However, the authors found a beneficial effect of the high compression (i.e. HI group) CG on muscle function, as demonstrated by an enhancement on MVC and CMJ.

Practical Takeaways

The findings from this study demonstrate that the pressure exerted by CG lead to different responses on recovery enhancement, with CG exerting higher pressures (e.g. 15 and 25 mmHg at the thigh and calf, respectively) having a greater effect on the reestablishment of muscle function.

Importantly, CG in this study were used for 72 hours and were only removed when athletes had a shower. Athletes are advised to utilise CG for long periods of time. As not a lot of research has investigated the influence of pressure on muscle function recovery, this study provides excellent information into what may be good practice. As a result, coaches may wish to educate and/or prescribe that their athletes use CG which elicit 15 and 25 mmHg at the thigh and calf, respectively, in order to realise beneficial effects from their use.

Want to learn more?
Then check these out...

Francisco's Comments

"In previous issues of Performance Digest, I have raised the question about the pressure exerted by CG.
This study now demonstrates that measuring the pressure the CG exerts on the body is of utmost importance when trying to understand the effects of CG.

Previously, I recommended athletes to buy their CG from brands that have been used for research, with the expectation that the pressure would be higher and would therefore have a beneficial effect on enhancing recovery. However, because the pressure exerted by the CG will result from the piece of equipment itself and the size of the limb, it is impossible for brands to guarantee that certain model of CG will induce a determined pressure. One company that does manufacture custom-fitted compression garments is IsoBar Compression (**HERE).**

Finally, as I previously commented, athletes should use CG for extend periods (e.g. 24-36 hours) as long as it does not interfere with sleep."

[Abstract]

How to individualise cold water immersion for high-fat and low-fat athletes

OBJECTIVE
The goal of this study was to investigate the effect of body composition on thermal responses to cold water immersion (CWI) and recovery from high-intensity interval training (HIIT).

WHAT THEY DID
Twenty highly-trained endurance athletes were stratified into one of two groups after DXA screening: low-fat group (body fat < 12%; n = 10) and high-fat group (body fat < 18%; n = 10). All subjects completed the experimental trials consisting of either CWI or a control in a randomised counterbalanced order.

Following a HIIT performed on a cycle ergometer, athletes were exposed to either 15min of CWI (whole-body immersion at ~16°C) or a control. Core temperature (Tc), skin temperature (Tsk) and heart rate (HR) were recorded continuously. A 4-min cycling time-trial (TT), countermovement jump (CMJ), and isometric mid-thigh pull (IMTP) tests were assessed at baseline, immediately after HIIT, and at 40-minutes after recovery. Perceptual measures of thermal sensation (TS), total quality of recovery (TQR), muscle soreness (DOMS), and fatigue (Fat) were also assessed.

WHAT THEY FOUND
The primary findings of this study are that CWI had a greater effect for reducing Tc and TS, but not Tsk, in the low-fat group in comparison to high-fat group. Moreover, large correlations were observed between the Tc drop and different measures of body composition (percent body fat, fat mass, body mass index, sum of seven skinfolds, body surface area, and body surface area to mass ratio). Recovery on the TT was enhanced only when the high-fat group were exposed to CWI. No beneficial effects of CWI were observed for any other tests or for TQR, DOMS, or Fat.

Practical Takeaways

As a practitioner, I would recommend those wanting to use CWI to make ice baths at different temperatures to suit differences in body composition. At least two groups should be created: 1) a high-fat group and/or a low body surface area to body mass ratio (BSA:BM) group; and 2) a low-fat and/or high BSA:BM group. According to the groups, different temperatures should be implemented. For example, higher water temperatures (~15°C) should be used for the high-fat/low BSA:BM group, and lower water temperatures (~11°C) for the low-fat/high BSA:BM.BSA can be easy calculated through formulas, although the validity of some of these formulas have recently been questioned when results were compared to CT scanning (see linked article).

When using the traditional bin filled with water and ice, this can be easily done by keeping the water level constant (e.g. draw a line in the bin) throughout the immersion time and measuring the temperature with different amounts of ice (e.g. one or two packages of ice added 15 minutes before immersion). Another complication that practitioners may have, is the fact that the water temperature is likely to increase after a few athletes have done their CWI intervention. When possible, increasing the number of bins, therefore decreasing the time, and number of athletes, each bin is used for will improve water temperature maintenance.

Want to learn more?
Then check these out...

Francisco's Comments

"For me, the main findings of this study are the correlations observed between Tc and body composition measures, reinforcing the need for individualisation when prescribing CWI as a recovery modality. Moreover, the fact that CWI only had a beneficial effect on the high-fat group, demonstrates that CWI can have an overcooling effect, supporting the hypothesis of an optimal cooling threshold.

This study demonstrates that CWI aids recovery. However, the beneficial effect of CWI was limited to the TT test. As noticed by the authors, the individual variability in such tests was high. This is potentially due to that fact that the athletes were cyclists and triathletes, and were therefore not experienced enough to effectively perform the CMJ and IMTP tests. Whilst this assumption may explain the lack of observed effects on these tests, it is simply too complex to know for sure. Nonetheless, based on these findings, practitioners are advised to consider differences on body composition on their athletes when prescribing CWI protocols."

Youth Development

This month's top research on youth development.

PLYOMETRIC TRAINING: USING BOTH STABLE AND UNSTABLE SURFACES

Negra, et al. 2017. The Journal of Strength & Conditioning Research, 31 (12), pp.3295-3304.

EXERCISE FOR BONE IN CHILDHOOD – HITTING THE SWEET SPOT

Naughton, G. et al. 2017. Pediatr Exerc Sci. 1;29(4):437-439.

HOW IMPORTANT IS SPORTS PARTICIPATION FOR HEALTH IN YOUTH POPULATIONS?

Larsen, M.N. et al. 2017. The Journal of Strength & Conditioning Research, 31(12), pp.3425-3434.

[Abstract]

Plyometric training: Using both stable and unstable surfaces

OBJECTIVE

In efforts to keep training both interesting and developmental from a physiological perspective, coaches are continually seeking new and exciting ways to vary training. Depending on the intended focus of plyometric training, practitioners may alter the frequency, height, or in this case, surface (hard and soft) to create markedly different performance outcomes. Therefore, this study has compared hard vs. hard and soft surfaces on fitness components in pre-pubertal male soccer athletes.

WHAT THEY DID

Thirty-three boys were randomly assigned to either a plyometric training group on a stable surface (PTS), or a mixed group consisting of both stable and unstable surfaces (PCS) lasting for 8 weeks. Before the groups began their training, data was collected for: CMJ, standing long jump, RSI, 20m sprint, modified Illinois test, and static and dynamic balance. These were collected again after 8 weeks of training to be compared and analysed through an independent t-tests and analysis of covariance (ANCOVA).

WHAT THEY FOUND

The main findings in this study were that there were no significant between-group differences ($p < 0.05$) post-tests in measures of power, strength, speed, agility, and static balance. However, the mixed group (a combination of stable and unstable surfaces) induced larger performance improvements in dynamic balance, such as the stork balance, compared to the PTS (stable only) group. Both groups improved both pre– and post-tests.

Practical Takeaways

Plyometric training is not only effective in young male soccer players at improving performance, but its inclusion can lead to enhanced physiological characteristics. When a suitable loading strategy is used (week 1 = 4 sets of 6/7 reps; week 8 = 6 sets of 10 reps) accompanied by ground contact (GC) monitoring (roughly an increase of 10 GC per week), both stable and a mix (stable and unstable) improve performance. However, varied surfaces proved more beneficial when looking to simultaneously develop balance abilities, which may be advantageous to develop a more rounded athlete as discussed by Mark Jarvis from the English Institute of Sport in the attached podcast. These sentiments were echoed by the authors, who suggested that a mixture may be more beneficial to pre -pubertal athletes. Therefore, it may be important for those who are programming for youth athletes to include a variety of equipment (foam surfaces, crash mats, bosu balls) in their training regime.

Want to learn more?
Then check these out...

Tom's Comments

"From this study, it is evident that a mixture of stable and unstable surface training can support performance enhancements in strength and power etc, but also on dynamic balance. The ability to stabilise and/or maintain balance has been linked to improved landing mechanics through proprioceptive mechanisms (See Article Link), which can significantly reduce the risk of injury. This is particularly important in female athletes who demonstrate an increase incidence of injury during jumping tasks. These studies show that both stable and unstable surfaces support performance outcomes, with many of the tasks being suitable to include in warm-ups; such as hurdle sticks onto surfaces, drop landings, and horizontal unilateral and bilateral bounds. It is now down to you, the Performance Digest reader, to get creative and find new and exciting ways to train your athlete(s) whilst maintaining health and safety in line with their (the athlete's) ability."

[Abstract]

Exercise for Bone in Childhood – Hitting the Sweet Spot

OBJECTIVE
It has been suggested that in the years prior to the onset of puberty, the bones in a child's body are incredibly responsive to an exercise stimulus. This study aimed to disseminate existing literature by challenging this long-held notion by reviewing the current research available.

WHAT THEY DID
This study adopted a literature review as a research methodology, with careful observation for any misinterpretations made in previous studies. To elaborate, Beck (2017) argues that in previous research the 'stage' of puberty based on the Tanner's stages of puberty (See Attached video) has been wrongfully assessed. For example, a child who is at stage 3 may have been identified as being at stage 1. This is understandable, as quantifying a stage of puberty can be somewhat invasive or ethically challenging. As a result of this, the notion that bone stimulation occurs optimally prior to the onset of puberty can only be deemed valid when compared to those circa/post-puberty anchored in solid and empirically supported definitions.

WHAT THEY FOUND
It is apparent from the evidence that exercise can support an increase in bone mineral density and help to prevent osteoporosis through both childhood and early adulthood. However, there appears to be very few efficacious studies that support a "window of opportunity" regarding bone health and growth prior to puberty. However, a majority of these studies showed improvements in bone mineral density (BMD). BMD is the amount of mineral per square centimetre in bones and is used as a clinical indicator of osteoporosis and fracture risk. For more information on BMD, the attached article provides an in-depth review.

Practical Takeaways

This study promotes the notion that weight-bearing physical activity has significant and long-term effects on BMD and bone mineral content (BMC). However, in its review of research, it has also concluded that actual bone strain exposure has been difficult to measure due to varied and inconsistent research terminology. This makes it extremely difficult (based on this study) to provide practical advice regarding load prescription.

In this review, a majority of the samples were 'ordinary' children participating in sport and physical education. For the strength and conditioning coach, it may be suggested that an appropriate S&C programme that incorporates plyometric and weight-bearing activities may invoke greater alterations in bone strength compared to the children in this study, although this is purely speculative based on other research. For example, in one of the reviewed papers in this study (**HERE**), it was suggested that the increase of BMD by 10% can reduce the onset of osteoporosis by 13 years. It may be reassuring to hear that even moderate physical activity can support a child in their development of bone growth and health. Whilst BMD measurements can be useful to the coach, they do require a DEXA scan, which can be costly and time consuming.

Want to learn more?
Then check these out...

Tom's Comments

"These results suggests that both children and youths will benefit from exercise, with the associated benefits (increased BMD and reduced likelihood of osteoporosis) clearly having both an acute and long-term benefit for the individual. These benefits may not appear apparent to a child during activities, but may become more apparent in the latter stages of life. For example, one longitudinal study reviewed over six years demonstrated that regular physical activity in youths resulted in 9-17% increases in whole-body bone mass compared to less active peers. This is particularly helpful to older populations, where falls and knocks can lead to bone fractures. With this in mind, future studies may consider the benefits of resistance training to bone growth whilst considering the optimal-load response and/or dose-response relationship; with other factors such as socio-economic status, nutrition and competition level considered. As such, in the near future I hope to see research which attempts to identify what is optimal loading for inducing maximal bone accrual and, thus, reduce the risk of fractures during sport participation and the prevalence of osteoporosis in later life."

[Abstract]

How important is sports participation for health in youth populations?

OBJECTIVE
Regular physical activity has been linked with improved health and wellbeing in both adults and children. However, a lifestyle with high-levels of physical competence has been allied to increased sports participation and enjoyment. The aims of this study were to explore the relationship between physical fitness, body composition, and age (8-10) in sports club participation.

WHAT THEY DID
Larsen and colleagues employed a cross-sectional research design, investigating physiological variables (cardiorespiratory fitness, motor fitness and skills etc.) among 447 third grade pupils from 8 schools in Denmark through a series of tests. These included:

- Yo-Yo Intermittent Recovery Level 1 Children's Test
- Postural Balance
- Maximal Horizontal Jump Length
- 20m Sprint Test
- Gross Motor Skills Test
- Resting Blood Pressure and Resting Heart Rate
- Anthropometric Measures

These results were compared as baseline groups and were analysed using a 1-way ANOVA test.

WHAT THEY FOUND
The main findings of this study were that 8-10 year olds involved in sports clubs showed improved fitness and anthropometric qualities than their less active counterparts. Interestingly, 8-10 year olds involved in ball game activities (football, rugby etc.) have higher aerobic and musculoskeletal fitness, sprint performance times, postural balance, coordination ability, and improved anthropometric scores than those involved in other sports clubs (i.e. dance club). It was suggested that this was due to higher frequencies of complex movement tasks (e.g. evading, dodging, and timing) at high intensities, elevated body and spatial awareness, and an increased metabolic demand due to the utilisation of mixed energy systems.

Practical Takeaways

In the 'practical applications' of this study, the authors recommend that sports clubs can provide a 'broad spectrum and positive impact on schoolchildren's health'. Whilst I agree with this statement and have suggested the same in previous Performance Digest issues, the true message for me is how can sports coaches, parents, and teachers get those involved who are currently not?

Furthermore, with this study showing that those involved in sports clubs had a 16% lower fat mass index (FMI) than those not active, initiatives that encourage participation may save healthcare systems lots of money, both in the short– and long-term. For more information on FMI, please see the attached article to read at your leisure. In addition, the authors reiterate the importance of ball-based sports clubs, which showed superior results in many performance and physiological variables that may need to be considered in treating obesity and/or poor health.

Want to learn more?
Then check these out...

Tom's Comments

"Once again, the Performance Digest reader is provided with more evidence that the privileged few that are supported in their athletic careers seem to continue a long and prosperous pursuit of health-related hobbies. Unfortunately, with the introduction of transport, video-games and fewer opportunities to be social and active, I cannot see this improving in the next few years. One benefit of this is that coaches, teachers, and parents have an opportunity to be highly influential on their children. However, they must find ways to be creative and market their 'service' and the benefits of regular physical activity to the needs of the population. In doing so, it is hoped that children can find their own interest and enjoyment in sport. It is now the job of practitioners to identify individuals that require a tailored and individual response, so that they can maintain their interest, development, and improve confidence over time."

Nutrition

This month's top research on nutrition.

CAN GLUTAMINE SUPPLEMENTATION REDUCE GASTROINTESTINAL DISCOMFORT FOR ENDURANCE ATHLETES?

Pugh JN et al., (2017) European Journal of Applied Physiology, 117 (12), pp. 2569-2577.

TAURINE + CHOCOLATE MILK: A NOVEL STRATEGY FOR REDUCING OXIDATIVE STRESS?

Carvalho, F.G. et al., (2017) Frontiers in Physiology, 8, 710.

WEIGHT-MAKING ATHLETES: HOW TO GET THERE SAFELY

Wilson, et al. (2017). European Journal of Sports Science, 1-8.

[Abstract]

Can glutamine supplementation reduce gastrointestinal discomfort for endurance athletes?

OBJECTIVE

To test the dose-response relationship of acute glutamine supplementation upon markers of intestinal permeability and gastrointestinal (GI) symptomology in recreationally active runners, and secondary subjective symptoms of GI discomfort in response to running in the heat.

WHAT THEY DID

Ten recreationally active healthy males completed a total of four exercise trials following a familiarisation trial: A placebo trial and three glutamine trials separated by 1 week, at doses of 0.25, 0.5 and 0.9g per kg of fat-free mass consumed 2 hours prior to commencing exercise. Each exercise trial consisted of a 60-minutes treadmill run at 70% of VO2max in an environmental chamber set at 30˚C. Blood samples were collected pre, immediately post and 45mins post-exercise for glutamine concentration, I-FABP, and serum IL-6 measurements. GI permeability was assessed using ratio of lactulose to rhamnose in serum and GI symptoms were recorded every 5 minutes during each experimental protocol using a GI discomfort scale.

WHAT THEY FOUND

Authors demonstrated that acute glutamine supplementation can attenuate GI permeability even at low dose of 0.25 grams per kg (although higher doses may be more effective). However, its use to reduce GI symptoms that are typically associated with endurance exercise in the heat, remains unknown in this study. Consequently, acute glutamine supplementation prior to exercise may benefit endurance athletes exercising in the heat to maintain GI integrity.

Practical Takeaways

GI discomfort is often reported in endurance athletes during prolonged competitive events such as marathons and triathlons. Deleterious GI symptoms related to such exercise involve nausea, vomiting, diarrhoea and abdominal cramping. With a high number of competitors volunteering to such events during the summer months each year, this recent investigation has therefore examined glutamine in an attempt to lessen such GI disruption.

Although GI permeability and I-FABP increased during exercise trials, ratings of GI symptoms, either during or in the following 24 h after exercise were low to mild, suggesting that there may be apparent discrepancy in symptom expression between field and laboratory environment studies; including mental stress (which could exacerbate GI symptoms due to further decreases in splanchnic blood flow) associated with competitive events and not with laboratory studies. Taken together, the authors confirmed that doses as low as 0.25g per kg of acute glutamine supplementation may have some benefit.

Want to learn more?
Then check these out...

James's Comments

"It remains unclear whether acute glutamine supplementation can lead to reductions in GI symptoms in the current study. The exercise modalities used in this laboratory study could have potentially been lower in relative intensity and shorter in duration than what is seen in a real-world setting. Therefore, it would be interesting in future studies to compare these different doses at higher intensities or longer durations, particularly as these might be more associated with subjective symptoms. Furthermore, there may also be specific nutritional strategies employed pre-competition in the real world that may induce GI symptoms and that are not used during training cycles; such as carbohydrate loading and carbohydrate ingestion during competition. Finally, athletes competing at both the amateur and professional level will just simply experience nervousness, and as much as we can control other factors related to gut health, the adrenaline of performance will always play a big part!"

[Abstract]

Taurine + chocolate milk: A novel strategy for reducing oxidative stress?

OBJECTIVE
This study intended to determine the effects of taurine and chocolate milk supplementation on oxidative stress, protein metabolism markers, and aerobic parameters in triathletes.

WHAT THEY DID
Ten well-trained semi-professional male triathletes took part in a double-blinded, crossover study design with a 2-week washout period between the treatments. Participants were assigned to ingest the following supplementation: 3g Taurine or a placebo in capsules combined with low-fat chocolate milk (400 ml) immediately after exercise, and again 2 hours after exercise every day for 8 weeks. Oxidative stress markers, and 24 hours urinary nitrogen, creatinine, and urea excretion were measured before and after training throughout the 8-week study period of training and supplementation. A maximal incremental running test on a treadmill was also performed to evaluate the aerobic responses.

WHAT THEY FOUND
The main finding from this investigation was that taurine with chocolate milk for an 8-week period did not improve any aerobic performance parameters (heart rate, rating of perceived exertion, and blood lactate). However, the taurine with chocolate milk was significantly effective in increasing taurine plasma levels and decreasing oxidative stress markers. Therefore, the authors suggest that the supplementation prevented the utilisation of antioxidant markers (GSH [reduced glutathione] and Vitamin E) against free radicals and improved the activities of the antioxidant defense system. Taken together, the authors suggested taurine supplementation can potentially prevent oxidative stress in triathlons.

Practical Takeaways

Triathlon is a high-intensity sport and has become very popular in recent years. The event can cause increased oxidative stress which may compromise an athlete's physical performance. It is well-known that overproduction of free radicals may damage cellular components, and therefore the use of antioxidant compounds after exercise aims to prevent oxidative stress, without limiting free radical production. Taurine supplementation has been referred as a potent antioxidant due to the presence of sulfonic acid, and therefore may prevent oxidative damage. Additionally, chocolate milk has been found to be an effective post -exercise recovery aid. Therefore, combined supplementation with taurine and chocolate milk may be a useful strategy for decreasing oxidative stress and may assist competitive triathlons train at a higher intensity; although strong evidence to support this is still lacking.

Want to learn more?
Then check these out...

James's Comments

"Although the performance results did not detect any significant differences, it is important to highlight that there was a short increase in maximum aerobic velocity (VO_2) and a decrease in heart rate in post-treatment with taurine and chocolate milk compared to pre-treatment. Further investigations will be helpful to assess muscle damage and exercise recovery post-treatment since there were little performance improvements observed in this study. It would be interesting to see if the results differed if the study was replicated on both untrained and trained professional riders."

[Abstract]

Weight-making athletes: How to get there safely

OBJECTIVE

This study had a clear aim: to provide evidence to promote the ability for jockeys to 'make weight' safely and, above all, improve athlete welfare. To achieve this, the authors wanted to understand what the Total Energy Expenditure (TEE) of professional jockeys and the Total Energy Intake (TEI) was during two different time points of a competitive season.

WHAT THEY DID

Eight professional jockeys took part in this study during two in-season weeks (May and August). The Doubly Labelled Water (DLW) technique was employed to assess the TEE of all jockeys during the testing period. TEI was completed via two 7-day food diaries with jockeys asked to include pictures and labels of the food. Jockeys were also asked to provide details of other physical activities, for example, cleaning the stables, or looking after the horse to allow a physical activity level to be derived.

WHAT THEY FOUND

Mean TEE during August and May was 10.83 and 10.66 MJ/day, respectively, which when compared to other athletes of similar weight, is not high in absolute terms (e.g. 14.6 MJ/day for football players). Researchers found no significant differences between the two testing weeks regarding TEE and TEI showing no seasonal changes. Individual differences in the amount of extra physical activity jockeys performed was seen, with some doing none at all, and others performing up to 5 hours of extra structured physical activity. Self-reported TEI was significantly lower that TEE during both collection phases, although jockeys appeared to stay at a similar weight throughout the testing periods.

Practical Takeaways

This study provides clear evidence that conventional sport nutrition guidelines, typically advising high carbohydrate and energy intake are probably not applicable for jockey's, and, therefore, specific nutritional guidelines for this population should be followed.

Although there are limitations to reported food diaries and therefore TEI, this is consistent with others that have studied professional athletes. Additional methods may want to be exploited like a recent 'snap 'n' send' method which utilises the Whatsapp messaging service to send pictures between athlete and support personnel, or even the use of wearable camera technology to visibly see what the athlete is eating.

Further, the authors discuss the benefits of jockeys performing extra structured exercise to notably increase TEE, and, in-turn, assist weight-control. For example, a nice addition to this study is the understanding of what athletes are doing outside of their normal sporting role, and not just while they are at the club, stable, racecourse, or track, and how this may contribute to TEE. However, it is important to remember that activities performed outside of the sporting environment aren't always very physical in nature, as it was highlighted by the authors of this study that a lot of jockey time is spent sedentary because of traveling to, and from, race meetings.

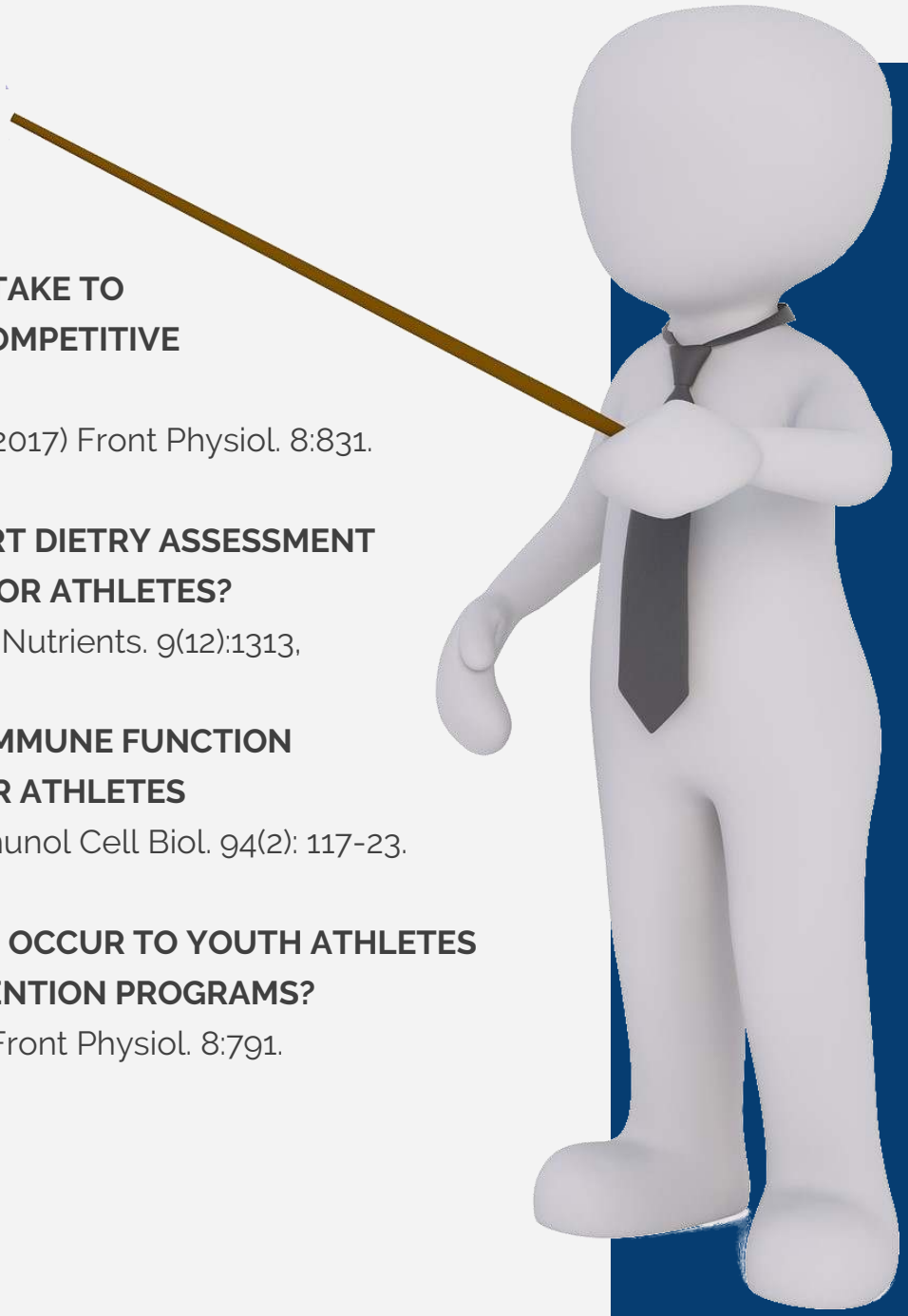
Want to learn more?
Then check these out...

James's Comments

"Although this study was only performed on 8 jockeys, the jockeys involved are clearly high-levels athletes in their respected sport. Therefore, the data provided really does give us an insight into what the professionals are doing in this unique sport. No differences in time points provides an indication that these athletes are performing this arduous routine year-round, exclusive in its own right when compared to other weight-making sports that have a clear 'camp' (e.g. boxing). Finally, the authors refer to the need for jockey-specific guidelines which supports the rationale of understanding your athlete's requirements. For example, rugby and football both come under "team sport" guidelines, but require very different nutritional needs considering the differences in distance covered and physical contacts."

Infographics

A round-up of our monthly research infographics.



HOW LONG DOES IT TAKE TO RECOVER AFTER A COMPETITIVE SOCCER MATCH?

Brownstein CG. et al. (2017) Front Physiol. 8:831.

SHOULD SELF-REPORT DIETRY ASSESSMENT METHODS BE USED FOR ATHLETES?

Capling L. et al., (2017) Nutrients. 9(12):1313,

STEPS TO IMPROVE IMMUNE FUNCTION WITH NUTRITION FOR ATHLETES

Gleeson M. (2016) Immunol Cell Biol. 94(2): 117-23.

WHAT ADAPTATIONS OCCUR TO YOUTH ATHLETES USING INJURY PREVENTION PROGRAMS?

Faude O. et al., (2017) Front Physiol. 8:791.

HOW LONG DOES IT TAKE TO RECOVER AFTER A COMPETITIVE SOCCER MATCH?

SCIENCE for SPORT

@ScienceforSport

WHAT THEY DID

16 semi-pro soccer players

PRE-MATCH tests

90 min competitive soccer match

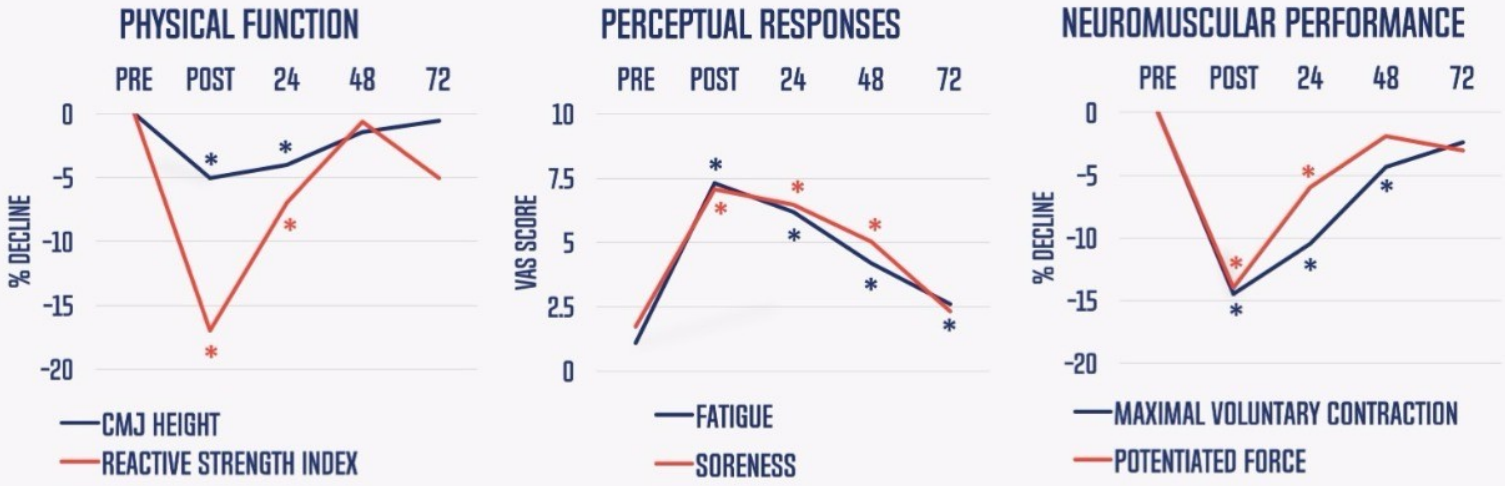
POST-MATCH tests

ADDITIONAL TESTS 24, 48, 72 hrs post-match

What was tested?

- physical function
- perceptual responses
- neuromuscular function

WHAT THEY FOUND



WHAT THIS MEANS

"Competitive soccer matches result in substantial declines in neuromuscular function, physical performance and subjective measures of fatigue. These impairments may last up to 72-hrs post-match and should be considered when devising training schedules."

Study: Brownstein CG, Dent JP, Parker P, Hicks KM, Howatson G, Goodall S, et al. Etiology and Recovery of Neuromuscular Fatigue following Competitive Soccer Match-Play. Front Physiol. 2017;8:831.

SHOULD SELF-REPORT DIETARY ASSESSMENT METHODS BE USED FOR ATHLETES?

SCIENCE for SPORT

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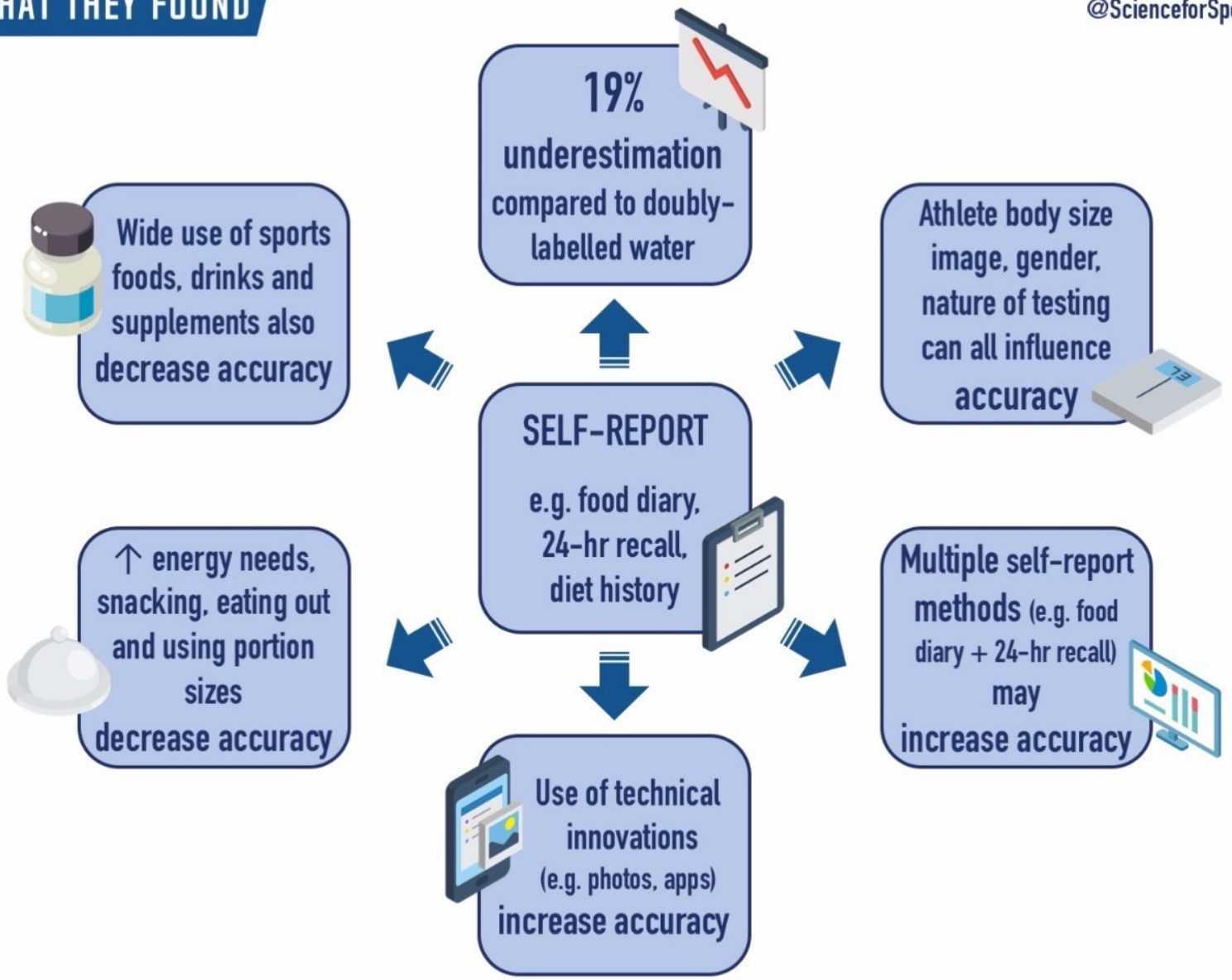
WHAT THEY FOUND



WHAT THIS MEANS

"Self-report methods of assessing energy intake tends to underestimate intakes in athletes and also are subject to a number of additional factors that decrease accuracy further. Self-report may not be suitable for weight-conscious athletes or those with high energy expenditure. However, ever-advancing technological innovations may improve accuracy"

Study: Capling L, Beck K, Gifford J, Slater G, Flood V, O'Connor H. Validity of Dietary Assessment in Athletes: A Systematic Review. Nutrients. 2017;9(12):1313.

STEPS TO IMPROVE IMMUNE FUNCTION WITH NUTRITION FOR ATHLETES

SCIENCE for SPORT

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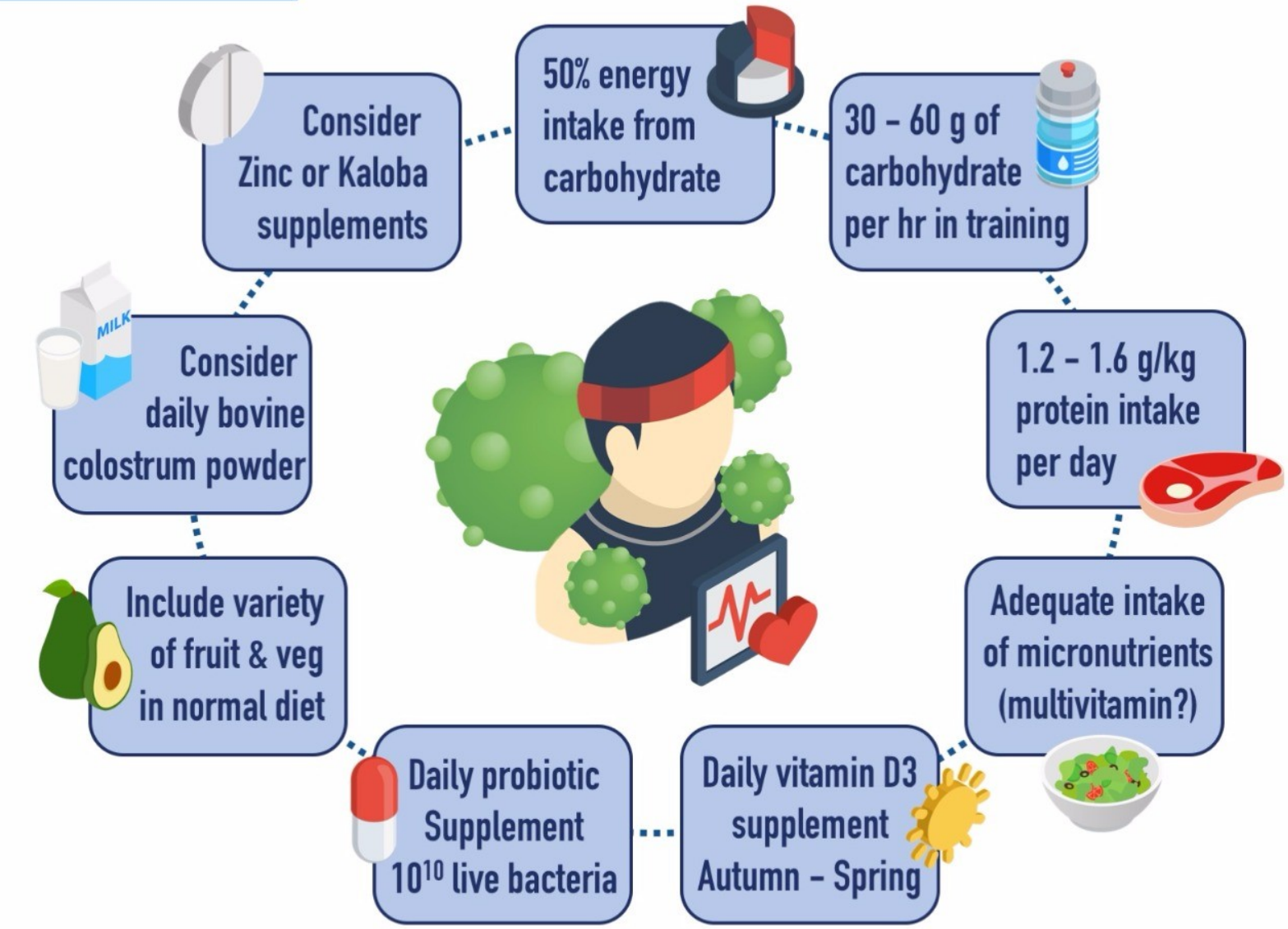
WHAT THEY FOUND



WHAT THIS MEANS

"Athletes who engage in intense training have increased risk of developing infections from depressed immune systems. Following nutritional protocols such as ingesting carbohydrate during training, consuming a varied diet and some specific supplementation can support immune function and decrease risk of illnesses developing"

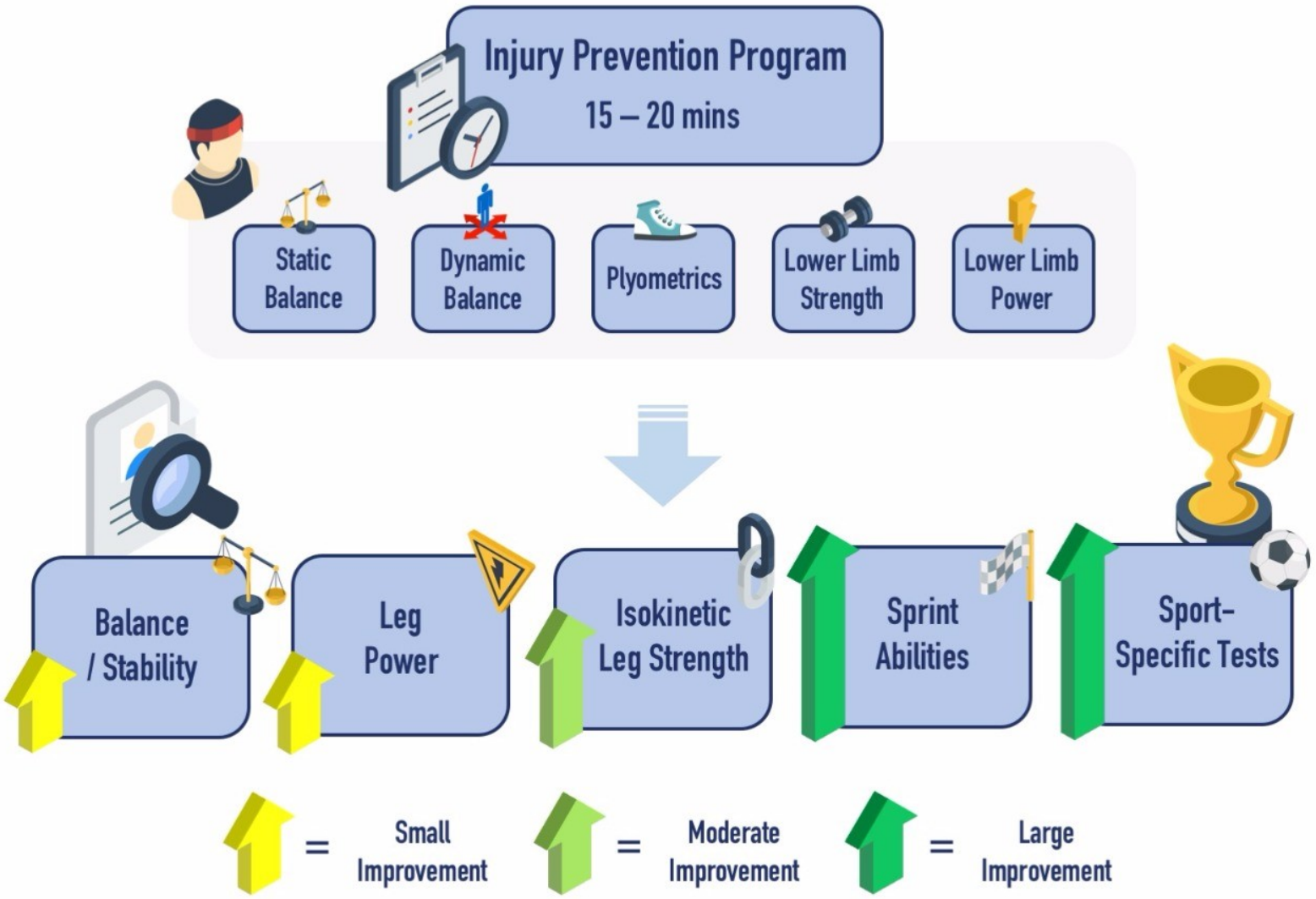
Study: Gleeson M. Immunological aspects of sport nutrition. Immunol Cell Biol. 2016;94(2):117–23.

WHAT ADAPTATIONS OCCUR TO YOUTH ATHLETES USING INJURY PREVENTION PROGRAMS?

SCIENCE for SPORT

@ScienceforSport

WHAT THEY FOUND



WHAT THIS MEANS

"Multimodal injury prevention programs (IPP) lead to a number of neuromuscular adaptations. These adaptations may partially explain the reduced risk of injury associated with IPP implementation. A 15 – 20 min IPP can be used as an effective warm up and have significant benefits to young athletes during critical stages of their development"

Study: Faude O, Rössler R, Petushek EJ, Roth R, Zahner L, Donath L. Neuromuscular Adaptations to Multimodal Injury Prevention Programs in Youth Sports: A Systematic Review with Meta-Analysis of Randomized Controlled Trials. Front Physiol. 2017;8:791.

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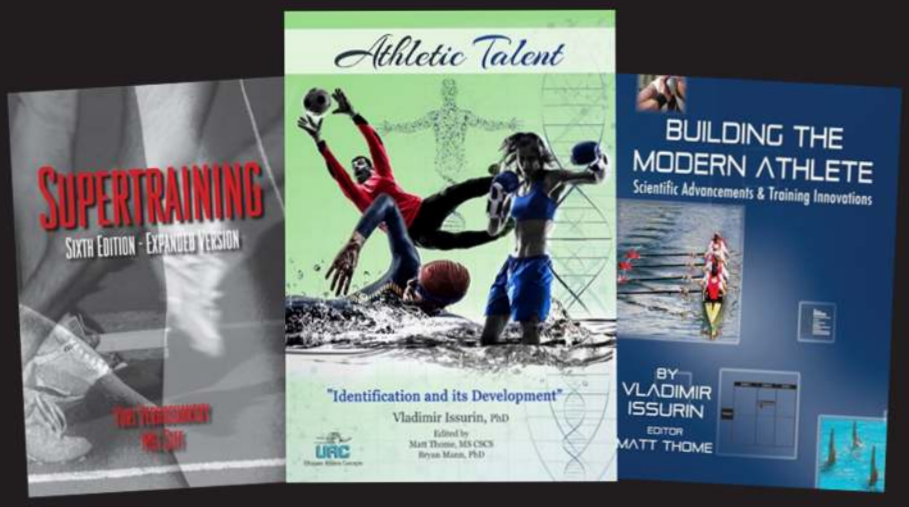

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