September 2017 | Issue #12

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

Firstly, I'd like you personally thank and welcome you to the Performance Digest, it's honestly an absolute privilege knowing that you're a member and are taking the time to read this. I truly cannot extend my gratitude enough! Thank you.

Secondly, if you're wondering what the Performance Digest is, this should explain it nicely:

"These monthly issues are a gathering of the latest, and best, sports performance research published in that month from peer-reviewed journals. For example, research published within August 2017 will be included within the August 2017 issue - this ensures that you're fully up-to-date with the most recent and talked about research and information relating to sports performance; whether that be eccentric training, velocity based training, cold water immersion, early specialisation, or optimal protein intake for elite athletes. If there is not enough relevant research published in that month (extremely unlikely), studies published in the preceding month(s), or those "in press", will be used to supplement the topic. Each new issue will be published on the last day of the month (e.g. October 2017 issue will be published on the 31st October 2017)."

The sports performance industry is thriving, exciting, and growing at an extortionate rate every single day. As a result of the internet and social media, the amount of information being exchanged everyday is truly overwhelming and seems impossible to keep up. It is for this reason that we decided to develop the Performance Digest so that practitioners had a tool to stay up-to-date with everything that's happening—and do so with minimal effort and have assurance that you're getting a high-quality, trustworthy product.

I would also like to take this opportunity to sincerely thank our team of research reviewers (you can see them on the next page) for their monthly contributions, as for without them, this digest would not be such a phenomenal resource. It is an absolute pleasure working alongside such fantastic practitioners and academics, and I hope to see these relationships continue to grow and prosper.

So, what's new?

For those unaware, the Performance Digest is the new an upgraded version of the *Research Alerts*—may they rest in peace. With this comes some supple changes:

1. Improved design and readability.
2. Inclusion of "The Science of Coaching" (a topic devoted to evidence-based coaching).
3. Inclusion of the "Practical Takeaways" .
4. Expansion of the "Reviewers Comments".
5. Inclusion of "Learn More" links which provide you with additional, high-quality, content on the same topic if you wish to expand your knowledge further.
6. Removal of the "Team Sports" section.

I hope you're all happy with these changes and continue to invest in your education and career in this prosperous industry, and as a Performance Digest subscriber. That is all from me, so again, many thanks and I hope you enjoy!

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.

Dr. Will Vickery
PhD

The Science of Coaching

Will is a Lecturer of Sport Coaching at the University of Northumbria: Newcastle Upon Tyne. Prior to this he has worked with Cricket NSW and Cricket Australia in an array of roles ranging from a sport scientist, development coach and a strength and conditioning coach.

Francisco Tavares
PhD Candidate CSCS ASCA L2

The Science of Coaching

Fran is a strength and conditioning coach at the Glasgow Warriors, Scotland. He is also a PhD candidate at Waikato University, New Zealand, a performance consultant to the Portuguese Rugby Union, and a published author.

Tim Rowland
MSc ASCA L2

Strength & Conditioning

Tim is the Head Strength and Conditioning Coach at the Sydney Rays Women's Rugby Sevens Team, and has assisted previously at the Australian Rugby Sevens. He has a Bachelor of Physiotherapy (1st Class Honours), Master of High Performance Sport and ASCA Level 2.

Tom Green
MSc

Youth Development

Tom has an MSc in Applied Strength and Conditioning from Hartpury College, Gloucestershire. He previously ran the Hartpury Women's FC S&C programme for college and university athletes and supported the Great Britain Equine team.

James de Lacey
MSc

Technology & Monitoring

James is currently the Head Strength & Conditioning Coach with Austin Huns Rugby. He has previously worked in professional rugby in Romania, and with the NZ Women's National Rugby League Team. He is a published author and has completed a MSc in Sport & Exercise Science from AUT, Auckland, NZ.

James Morehen
PhD Candidate

Nutrition

James is a SENr registered performance nutritionist, currently completing his PhD at Liverpool John Moores University. He is also a Performance Nutritionist for the Football Association alongside the England national squads (men's and women's)

The Science of
COACHING

A stressed coach: Does it impact delivery?

Exploring athletes' perceptions of coach stress in elite sport environments.

[Abstract]

INTRODUCTION

In the context of sport, stress is more than just the physical or psychological outcomes experienced by athletes as a result of internal or external stressors. Instead, stress is the process of an individual interacting with their environment and having to review the situations they find themselves in and then make decisions to allow them to cope with any issues that may arise. Coaches from all sports or disciplines routinely have to deal with stress and make decisions, which can affect not only themselves, but also the players under their guidance. Factors (or stressors) that often place coaches into stressful situations, include their relationship with athletes and other staff, external relationships (e.g. parents, media), and even their own coaching performance and personal life. Although recent research has identified certain factors which can lead to coach stress, it has remained unclear as to what influence coaching stress can have on their athletes. Therefore, the focus of this study was three-fold: 1) determine how athletes identify when a coach is experiencing stress; 2) examine the influence of the stressors experienced by coaches on athletes; and 3) explore how effective a coach is when they are stressed from the athlete's perspective.

WHAT THEY FOUND

With regards to the three objectives of the study, the researchers observed the following:

1. According to the athletes, when stressed their coach tended to provide a more negative delivery when providing instructions to players as well as becoming more animated, agitated and flustered.
2. The stressors placed on the coach appeared to mainly have a negative impact on the athletes, not only regarding their relationship with the coach (e.g. feelings of demotivation, change in communication style, increased levels of tension), but also their performance (e.g. reduced confidence in their ability, lack of focus during training, focus moved from process to outcome).
3. The athletes suggested that when stressed, coaches were characterised by an overall poorer coaching performance, which included a lack of awareness during training, and had a reduced level for making effective decisions.

WHAT THIS MEANS

Although not surprising, the stress experienced by a coach appears to have a considerable influence on their relationship with their athletes and on their actual coaching performance. Regardless of the sport or activity being performed, this poorer coaching performance is then likely to lead to stress within their athletes. This may also result in a less than ideal training, and therefore, learning environment which could easily translate into the following competition (e.g. match). Even worse, this negative environment could persist long enough and eventually lead to negative training habits and reductions in long-term development.

Practical Takeaways

Athletes see coaches as performers in their own right and know when a coach is placing undue stress on them to perform. What is of concern, is that coaches may not be aware of the influence these stressors have on an athlete's performance, and the way they interact with athletes in times of stress. In the world of performance sport, all members of the coaching team are constantly under the scrutiny of internal and external stressors (e.g. self-criticism, head coach, performance director, fans, media, etc), as well as their own athletes. Coaches should therefore develop effective coping strategies to manage the stressors in their lives which will hopefully, in turn, lessen the negative impact on their athletes.

Coaches should check out this athlete-orientated infographic (**HERE**) for dealing with stress, but instead apply it towards their own practice as a coach. Coaches should look to employ some of the coping strategies listed in order to prevent the negative impact of stress on coaching performance and ensure consistency.

Dr. Will Vickery

Will is a 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.

STRENGTH AND HYPERTROPHY GAINS: WHICH LOADS ARE BEST?

Schoenfeld B, Grgic J and Ogborn D et al. (2017) Journal of Strength and Conditioning Research, 1.

HIP THRUSTS, PAP AND IMPROVEMENTS IN SPRINT PERFORMANCE

Iacono AC, Padulo J and Seitz LD (2017 Journal of Sports Sciences.

CONCENTRIC VS. ECCENTRIC ACTIONS FOR MUSCLE HYPERTROPHY: WHICH IS BETTER?

Schoenfeld, BJ, Ogborn, DI, Vigotsky, AD, Franchi, MV, and Krieger, JW. J Strength Cond Res 31(9): 2599–2608, 2017.

[Abstract]

Strength and hypertrophy gains: Which loads are best?

OBJECTIVE

To review the current body of literature comparing changes in strength and hypertrophy between low- versus high-load resistance training protocols.

WHAT THEY DID

The authors conducted a systematic review and meta-analysis on this topic. Searches of PubMed/MEDLINE, Cochrane Library and Scopus were conducted for studies that met the following inclusion criteria:

- an experimental trial involving both low (≤60% 1 RM) and high (>60% 1 RM) load training
- all sets in the training protocols being performed to muscular failure
- minimum 6-week training protocol

A total of 21 studies met the above criteria and were included for analysis.

WHAT THEY FOUND

Gains in 1RM strength were significantly greater with high- versus low-load training, while no significant differences were found for isometric strength between conditions. Changes in muscle hypertrophy were similar between conditions. These findings indicate that maximal strength gains are realised using heavy loads, while muscle hypertrophy can be equally achieved across a wide spectrum of loading ranges (i.e. low or high).

Practical Takeaways

This paper has a number of key takeaways for strength and conditioning coaches. Firstly, to maximise muscle strength, high loads - greater than or equal to 80% 1RM - should be used. However, to maximise muscle growth, a variety of rep ranges can be used.

This has many implications for athletes. For those in rehabilitation who are unable to use high loads, lower loads can still provide a potent hypertrophic stimulus, providing sets are taken to muscular failure. Furthermore, rep ranges used in hypertrophy training can be periodised to ensure variety for the athlete, and to help balance recovery needs. For example, to reduce load on the CNS, higher rep training can be used to promote hypertrophy, which will cause more fatigue peripherally than centrally.

Finally, when using varying rep ranges in a hypertrophy programme, compound (multi-joint) exercises are more suited to lower reps, and isolation exercises to higher reps. Therefore, a good approach to maximise muscle hypertrophy is to pick a compound exercise (low reps) for one muscle group, and follow it up with an isolation exercise (high reps) for that same muscle group. For example, bench press (5-8 reps) followed by cable flys (12-15 reps).

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

Tim's Comments

"This review helps clarify our understanding of the effects of intensity (% 1RM) on gains in strength and hypertrophy. The paper refutes the existence of a 'hypertrophy rep range' (typically defined as 8-12 reps) and shows that equivalent levels of hypertrophy can be achieved with both higher and lower rep ranges, as long as sets are taken to muscular failure. This has important implications for resistance training programme design. For strength, it appears that heavy loads are needed to maximise results. Future research should explore how best to periodise changes in rep ranges to maximise gains in both strength and hypertrophy, which are often concurrently desired."

[Abstract]

Hip thrusts, PAP and improvements in sprint performance

OBJECTIVE
The aim of this study was to examine the post-activation potentiation (PAP) effects of the barbell hip thrust (BHT) using two different loads (50% 1RM and 85% 1RM), and its impact on subsequent acceleration and sprint performance. A secondary aim was to assess whether stronger athletes realised a greater PAP response, and whether they would experience it earlier, and for longer.

WHAT THEY DID
18 national-level male handball athletes (age 19.8 ± 0.3 years; height 184.3 ± 5.4 cm; body mass 84.2 ± 7.3 kg) performed maximal 15-m sprints before and 15s, 4min and 8min after two experimental protocols. The participants all had a 3+ years of resistance training, jump and sprint training, as well as at least 6 years of high-level practice. The experimental protocols consisted of BHT loaded with either 50% or 85% 1RM (50PAP and 85PAP, respectively).

WHAT THEY FOUND
Sprint performance was significantly improved for the 50PAP protocol 15s after the BHT, but impaired for the 85PAP protocol. At 4 and 8mins, sprint performances were significantly improved in both protocols (50PAP and 85PAP), with very likely beneficial effects. When the two protocols were compared against each other, the 85PAP was more likely to lead to greater improvements in speed at both 4 and 8mins. In addition, the stronger athletes also appeared to experience a greater PAP response in comparison to weaker athletes.

In summary, this study showed that using a BHT with 50% and 85% 1RM subsequent sprint performances can be significantly improved. It also showed that stronger athletes experience a greater PAP effect, but this may not appear earlier or for longer.

Practical Takeaways

Given the considerable amount of research on this topic, I think it's safe to say that PAP is an effective tool for improving subsequent performance. However, there are large variances in its application depending on the athletes in hand. For example, this study showed stronger athletes experience a greater PAP response. As such, the following principles should be used to work from: 3-12 minutes rest; High intensity/ heavy-load (e.g. 90%RM) = longer rest time; Low intensity/ light-load (e.g. 30%RM squat jumps/plyometrics) = shorter rest time; Higher volume sets = longer rest time; Lower volume sets = shorter rest time; Trained athletes = shorter rest time; Untrained athletes = longer rest time; Stronger athletes = shorter rest time; Weaker athletes = longer rest time.

With PAP, doing an exercise (e.g. BHT) and waiting 4-mins to sprint isn't very time-efficient. A recent approach I have considered, which is effectively a 'reversed' version, is sprinting first, then performing a BHT immediately after, and then resting for 3-4 mins before repeating it again. By doing this: 1) you save time; and 2) the subsequent sprint (set 2) may be potentiated from the former set (set 1). The caveat to this, however, is you might not get so much out of the BHT as you've just sprinted before it, but that's a trade-off the coach needs to decide upon. There is no research on this method either, so it would be interesting is something gets published soon.

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

Owen's Comments

"The positive effects of PAP are well-known, but what this study does more so than just add another PAP paper to the pile, is demonstrate the relationship between PAP and the force-vector theory. Put simply, and for those who aren't aware, the force-vector theory refers to a movement's direction of force and how that relates to other movements. For example, a back squat mainly produces vertical force, which is similar to top speed sprinting. On the other hand, a BHT mainly produces horizontal force, which is similar to accelerating (0-15m, as displayed in this study). Luckily for you, we have an article on force-vector training being published on October 15th 2017, see keep your eyes peeled.

In most studies, the effects of PAP are typically only ever investigated in 1 set. Though it has only ever been shown once in another study, it would also be cool to see if the effects of PAP can be continuously realised over multiple sets (e.g. 3-4 sets)."

[Abstract]

Concentric vs. eccentric actions for muscle hypertrophy: Which is better?

OBJECTIVE

The aim of this study was to compare the hypertrophic effects of concentric vs. eccentric muscle actions after structured resistance training.

WHAT THEY DID

The authors searched through several academic databases (PubMed, Sports Discus, and CINAHL) from all time points up until December 2016 in order to conduct a systematic review and meta-analysis. After filtration through their inclusion-exclusion criteria, 15 studies were included for the final review.

WHAT THEY FOUND

Although not statistically significant, the results showed that, on average, eccentric muscle actions resulted in greater muscular hypertrophy than concentric actions, with mean muscle growth percentage favouring eccentric actions (10.0% vs. 6.8, respectively). However, given the similarities within the findings, and the fact the difference was non-significant, these data also demonstrate the importance of both muscle actions for muscular hypertrophy. The findings from this review therefore raise the question as to whether eccentrics (i.e. negatives) are actually better for muscle growth – perhaps they are, but only slightly.

Practical Takeaways

Given the results of this study, it is suggested coaches include both concentric and eccentric actions within their programmes for a range of other reasons as well as for hypertrophy. For example, keeping dynamic movements (eccentric to concentric) included for developing reactive strength capacities and early rate of force production.

Considering the two fundamental principles of muscular hypertrophy are: 1) load; and 2) metabolic stress, it may be suggested that eccentric loading is more applicable for #1 (load), whilst concentric actions are more favourable for #2 (metabolic stress). As such, coaches could manipulate these variables during different training phases (e.g. hypertrophy, power, speed, etc.). For example, during an intensified hypertrophy phase/block, coaches could increase the amount of accentuated eccentric loading the athletes are performing, and then follow this up within reps-to-failure during their last set during that exercise (e.g. squats). In theory, this would expose the athletes to both high loads and high metabolic stress – a perfect concoction for muscular hypertrophy. During a power phase/block, heavy eccentrics may be kept in to potentiate power movements and gain some hypertrophic effect, whilst light concentric reps-to-failure may be dropped almost entirely to prevent peripheral fatigue.

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

Owen's Comments

"Perhaps the findings of this study are unsurprising, but if anything, they help to clarify our understanding of what parameters are important for muscular hypertrophy (i.e. growth). Despite this, it must be understood that only 15 studies were included in this review and no criteria was used to assess the quality of these studies. Most commonly, scales such as the PEDro scale are used to assess study quality, but nothing was used in this review. Given this, it's hard to know how good/robust the papers included within this review are, making the results somewhat skeptical. For you, as a reader and consumer of scientific research, it is vital you understand what makes a good study, and what constitutes a poor one.

"Give a man a fish and you feed him for a day; teach him how to fish and you feed him for a lifetime." This explains just one reason why the Performance Digest is so valuable for bringing these things to light."

Technology & Monitoring

This month's top research on technology and monitoring.

CAN HRV ALSO BE USED TO MONITOR NEUROMUSCULAR FATIGUE?

O'Brien, D. J. Aust. Strength Cond. 25(4). 65-71. 2017.

A MAXIMAL RESISTED SPRINT LOAD TEST: A BETTER WAY TO INDIVIDUALISE SLED SPRINTING?

Petrakos, G, Tynan, N, Vallely-Farrell, A, Kiely, C, Boudhar, A, & Egan, B. Journal of Strength and Conditioning Research. 2017. Epub.

IS WHOLE BODY VIBRATION CAPABLE OF POTENTIATING PERFORMANCE?

Duc, S, Ronnestad, B, & Bertucci, W. Journal of Strength and Conditioning Research. 2017. Epub.

[Abstract]

Can HRV also be used to monitor neuromuscular fatigue?

OBJECTIVE
To determine whether HRV is an appropriate tool to establish levels of neuromuscular fatigue in strength and conditioning.

WHAT THEY DID
34 articles were included in this review. Articles with a clinical focus had to meet the criteria of: a means of testing, reliable supportive data, included a time domain and frequency domain measurement that would be reproducible in a sport setting. Articles with a sport emphasis were excluded if they did not produce reliable data, or did not use at least one measurement of both time and frequency domains. Articles were also excluded if they did not produce data translatable to a strength training setting.

WHAT THEY FOUND
HRV has been established as a predictor of reduced quality and duration of sleep. HRV determines SNS activity during sleep and over-activity of the SNS has detrimental effects on sleep/wake cycles, increased stress and related hormones. Several studies used HRV to monitor athlete status during intense endurance blocks of conditioning, and concluded HRV was an appropriate tool for detecting physiological changes. HRV can also be used to detect pre-game anxiety and also assist in post-game recovery. However, there is no research to date with HRV responses to strength, power, hypertrophy, speed and agility.

Practical Takeaways

HRV is another tool which can be used by coaches to monitor overall fatigue in athletes and potentially aid in the reduction of injuries. There seems to be good evidence for the use of HRV in monitoring athletes in endurance sports. Simple Polar HR devices are highly rated for assessing HRV, and according to the authors, measurements should be taken as often in the week as possible, at the same time each day, for a minimum of 2 minutes. The authors recommend a minimum of 20 recordings be taken before making any amendments to training programmes.

Want to learn more?
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James's Comments

"HRV is a relatively cheap monitoring tool that shows promise for use in sports outside of endurance sports. Many team sports have large endurance components so the use of HRV may have applicable use in these settings. Since every athlete generally owns a smart phone, it can easily be done and tracked on the athlete's personal phone. In doing so, you may be able to create some player ownership over their own recovery. However, this could also be unfavourable for players that are somewhat hypochondriacs, where any extra information that they may not be 100% could lead to them not giving 100% at training."

[Abstract]

A maximal resisted sprint load test: A better way to individualise sled sprinting?

OBJECTIVE
To determine the reliability of a maximal resisted sprint load (MRSL) protocol in female field sport athletes. And if reliable, can MRSL determine if various performance tests predict or estimate a female field sport athlete's MRSL (MRSLest).

WHAT THEY DID
17 female field sport athletes (hockey, soccer, Gaelic football) undertook 5 separate days of testing in a cross-sectional study design (observational, no intervention). Days 1 to 3 consisted of anthropometric measures and various jump and sprint tests: CMJ, Broad Jump, ISO mid-thigh clean pull, unresisted sprint, drop jump, 5-repeated bound and CMJ with 50% bodyweight hex bar. Days 4 consisted of trial 1 of the MRSL and day 5 consisted of trial 2.

MRSL was calculated with a 20m sprint. There were 2 labelled sections with 10-15m being section 'A' and 15-20m being section 'B.' If section 'B' average velocity was greater than section 'A', the sprint was considered successful. If section 'B' was slower, then it was considered unsuccessful. Starting at 15% body mass external load, a successful sprint would mean an increase of load by 0.5-5kg for the following effort. An unsuccessful sprint would require a re-run, and if unsuccessful again, a decrease in load by 0.5-5kg. There were no limitations on number of repetitions required to find MRSL. The final MRSL was taken as the heaviest 'successful' effort recorded as %BM.

WHAT THEY FOUND
An ICC of 0.95 and CV of 7.6% between MRSL trials 1 and 2 were found, indicating a reliable test. The range of MRSL values show there is significant inter-individual variation within this population studied (20.7 – 58.9%), indicating that a set load at %BM for sled training may not be optimal with multiple athletes. MRSL is moderately to strongly correlated with body composition, linear sprint speed, vertical jump performance (CMJ), vertical power output (CMJ relative peak power and CMJ with Hex bar relative peak power), vertical reactive strength (RSI), vertical RFD (0-200ms), broad jump performance and horizontal bound performance (5-repeated bound).

Practical Takeaways

MRSL is a potential way to prescribe individual training loads for resisted sled sprinting, rather than using a generic percentage of body mass across a whole team. Due to its moderate to strong correlations with a host of performance measures, and its strong reliability, it may also serve as an overall performance indicator tool.

This may provide a way for coaches to rank their players without performing a range of tests, as the more this test is performed, the quicker athletes will be able to find their MRSL. This test may be shortened by starting the test at a particular percentage of estimated MRSL, instead of a set percentage of bodyweight, which will potentially decrease the time for testing.

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

James's Comments

"While MRSL has only been tested in female team sport athletes, it'd be interesting to see if similar results would be found in the male population. These female athletes ranged from senior, junior and university internationalists to amateur club players, so it is unknown if MRSL would show the same outcomes in an elite or professional population. However, MRSL does show some promise as an overall performance indicator at least in the population studied. The only issue with this test is the time it would take, as it took on average 8.7 (4 – 14) repetitions to find MRSL. The higher end of that range would create a lot of fatigue in the athletes, and depending on the size of your team, a lot of time."

[Abstract]

Is whole body vibration capable of potentiating performance?

OBJECTIVE
To investigate the acute effect of adding whole body vibration to dynamic body-loaded squats as preconditioning

WHAT THEY DID
14 trained men performed 2 separate testing sessions in a randomised order separated by 48 hours. Each test session started with an all-out 10sec sprint on a cycle ergometer after warmup as a reference. After 15mins rest, the preconditioning exercise was applied: 30sec of body loaded half squats (15 repetitions) with either whole body vibration at 40Hz (experimental condition) or no WBV (control condition). 1min after the preconditioning exercise, subjects performed a 10sec all-out sprint.

WHAT THEY FOUND
Preconditioning with whole body vibration resulted in significantly larger peak (4%) and mean (4.5%) power output compared with the control condition during the 10sec all-out sprint. Compared to the reference sprint, peak and mean power output decreased significantly after the preconditioning exercise without whole body vibration, whereas whole body vibration showed no significant differences for peak and mean power output.

Practical Takeaways

Whole body vibration preconditioning may have some applicable use within cycling sports that require sprinting abilities. This could be at the start of a short sprint track cycling race, BMX, or mountain bike races where a strong sprint at the start of the race gives you a better opportunity to find the front of the pack. A vibration platform is small enough to have near the start line pre-race where the half squat protocol could be used.

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

James's Comments

"Whole body vibration to enhance post-activation potentiation seems to be an underused modality in today's sporting world. This may be due to cost of equipment, or just lack of mainstream use in higher levels of sport. It would be interesting see if whole body vibration would potentiate sprint running performance, as acute increases in jump height have been observed after whole body vibration. It would also be very interesting for future research to look at long-term effects of whole body vibration on peak and mean power output, as this could be an easy and less fatiguing modality to enhance sporting performance."

Fatigue & Recovery

This month's top research on fatigue and recovery.

COMPRESSION GARMENTS FOR REDUCING MUSCLE SORENESS AND IMPROVING CREATINE KINASE CLEARANCE?

Upton CM, Brown FC, Hill JA. J Strength Cond Res. 2017;(0):1.

CAN THE VERTICAL JUMP BE USED TO ACCURATELY MONITOR DAILY FATIGUE AND READINESS?

Watkins CM, Barillas SR, Wong MA, et al. J Strength Cond Res. 2017;1.

GPS SPEED ZONES: ARE WE REALLY MEASURING WHAT WE THINK WE ARE?

Murray NB, Gabbett TJ, Townshend AD. Int J Sports Physiol Perform. 2017 Sep 5:1-25.

[Abstract]

Compression garments for reducing muscle soreness and improving creatine kinase clearance?

OBJECTIVE

The goal of this study was to examine the influence of lower limb compression garments on recovery in rugby club level athletes after a simulated rugby protocol.

WHAT THEY DID

The researchers divided 19 club level rugby athletes in two groups: compression garment group (CG; n = 10) and a recovery drink group (RD; n = 9). Muscle soreness (DOMS), creatine kinase (CK), maximal voluntary isometric force (MVIC) and countermovement jump (CMJ) were performed pre-protocol, immediately, 24 and 48 post-protocol.

WHAT THEY FOUND

No differences between groups were observed for performance (CMJ and MVIC). However, athletes in the CG demonstrate a significant reduction in DOMS in comparison to RD 24 and 48 post-protocol. A significant improvement in CK clearance was also observed in the CG in comparison to RD.

Practical Takeaways

In sports, muscle damage is one of the main causes of impaired performance and delayed recovery after exercise. In Rugby, muscle damage has been shown to have an association with the number of collisions. Therefore, large elevations in markers of muscle damage have been reported for up to 48-72h after a rugby match. Given that athletes frequently train again less than 48h after a rugby match, inadequate recovery can lead to an accumulated state of fatigue, which, in turn, can reduce training quality, and therefore, reduce the opportunity for adaptation. For this reason, strategies to enhance recovery are a key goal of the coaching staff and sport scientists.

From a practical perspective, athletes should wear CG after exercise for an extended period of time (e.g. 8-48h after exercise), particularly during periods of intensified training (e.g. tournaments). My recommendations for athletes is to wear CG after training or competition days, and use them during days off as long as it does not interfere with sleep quality. Moreover, as research demonstrates a beneficial effect of wearing CG during exercise, I also recommend athletes to wear them during training, providing it does not compromise their performance.

Although there is little information from research regarding the optimal pressure gradient of CGs for enhancing recovery, I suggest athletes buy their CG from brands which have been used for research, as they are more likely to apply a pressure that has been demonstrated to enhance recovery (e.g. ~30mmHg).

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

Francisco's Comments

"This study reinforces the beneficial effects of CG enhancing recovery. Moreover, while some recovery modalities (e.g. cold-water immersion) may have a harmful effect on adaptation from training as they negatively influence protein synthesis, no harmful effects have been reported from the usage of CG. The only potential harmful effect from CG is the influence on sleep quality, due to an increase in body temperature.

The main finding from this study was the beneficial effect of the usage of lower body compression garments on CK clearance and DOMS. As both of these markers are associated with muscle damage, it is suggested that CG enhance recovery from muscle damaging exercise. These findings also agree with previous research (**HERE**)."

[Abstract]

Can the Vertical Jump be used to accurately monitor daily fatigue and readiness?

OBJECTIVE
The goal of this study was to examine the sensitivity of the vertical jump (VJ) to monitor readiness and fatigue on a daily basis.

WHAT THEY DID
The authors examined changes in the number of repetitions performed during two full-body resistance training sessions (separated by 48 hours), scores from the BRUNEL mood assessment questionnaire (BMA), vertical jump height and power measured pre- and post-resistance training, after every session.

WHAT THEY FOUND
Authors found a significant decrease in training volume (e.g. repetitions to failure) in the back squat and leg press exercises from training session 1 to training session 2. Moreover, a decrease in VJ height was observed post-training session 1, and pre- and post-training session 2, in comparison to pre-training session 1. The VJ height decrement at pre-workout 2 was correlated (r = 0.648) with back squat volume decrement between workouts. For the BAM scores, fatigue was greater at every time point in comparison to the pre-workout scores.

Practical Takeaways

Monitoring athlete readiness provides the strength and conditioning coach with important information for adjusting training loads, if necessary. In this study, the authors investigated the sensibility of the VJ to monitor readiness following resistance training, and found it to be a valid test.

Particularly in the back squat exercise, VJ height decreases were correlated with a decrease in back squat repetitions volume; demonstrating the sensitivity of the VJ height to monitor readiness in the back squat. The lack of correlations between the change in VJ and the change in repetitions performed during the leg press exercise, demonstrates some specificity around the monitoring exercise and the resistance training exercise (i.e. the VJ is more similar to the back squat than it is the leg press, so it is likely to be more sensitive to that resistance exercise).

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

Francisco's Comments

"This study investigated the sensitivity of the VJ to monitor the readiness to perform a resistance training session. Changes in VJ were only correlated with performance (i.e. repetitions performed to failure) in the back squat exercise. Therefore, the sensitivity of a test to monitor the number of reps to failure seem to be specific of each resistance training exercise.

While the number of repetitions performed is important for programmes that look for similar goals (e.g. muscle hypertrophy), other kinetic parameters such as power or force output may be more important for athletic performance. Therefore, it would be interesting to understand the correlation between changes in force-related parameters during different exercises (e.g. leg press, back squat) and the VJ."

[Abstract]

GPS speed zones: Are we really measuring what we think we are?

OBJECTIVE
The goal of this study was to investigate the difference between absolute and relative speed thresholds, injury likelihood, and the acute:chronic workload ratio (A:C) during an Australian football season.

WHAT THEY DID
The authors monitored the running load of 45 elite Australian football athletes using Global Position System technology (GPS). Absolute and relative speed thresholds were used to monitor training load, with players being divided in three groups according to their maximal speed: fast, moderate and slow. Acute and chronic workload were also calculated as rolling averages using 1 and 4 week periods, and exponentially weighted moving averages (EWMA).

WHAT THEY FOUND
When compared to absolute thresholds, a significant overestimation of very high-speed running was observed when compared to the relative thresholds of the fast players. In contrast, an underestimation of high and very high-speed running was observed when compared to the relative thresholds of the slower players. Higher relative very high-speed running and absolute high-speed chronic workloads were associated to injury occurrence, and greater relative high-speed chronic workloads were associated to a reduced injury likelihood in slower players. For the fast players, the likelihood of injury occurrence increased with a relative and absolute very high-speed ACWR of >2.0.

As also demonstrated in previous research, the findings from this study suggest that higher chronic loads are associated to a decrease in the likelihood of injury occurrence, and high acute training loads are associated to an increased likelihood of injury.

Practical Takeaways

GPS technology is widely used to monitor training loads in team sports, and this study demonstrates that individualising speed bands relative to maximal velocity has a significant impact in the amount of very high-speed within elite Australian football athletes. Therefore, practitioners are recommended to determine the individual speed bands (i.e. thresholds) for each player in order to calculate and prescribe running load appropriately. As done by the researchers, maximal velocities (and the speed bands) should be updated if a new maximal velocity has been obtained by a player during testing, training or competition. When using relative speed bands, relative very high-speed running, relative high-speed chronic workloads and relative very-high speed ACWR should be monitored in order to prevent the likelihood of injury.

Although the authors categorised high-speed as 55-75% of max velocity and very high-speed > 75% of max velocity, these thresholds may be too low, or the intervals (e.g. 75-100%) to large, to monitor high or very-high speeds. Therefore, an important part of picture can be missing. I would recommend the usage of an extra threshold of > 75-80% of max velocity, to monitor stimulus at a close to maximal speed.

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

Francisco's Comments

"This study aimed to: 1) understand the effect of using relative vs. absolute speed bands to calculate training load and likelihood of injury; and 2) explore the association of relative acute and chronic workloads, and the ACWR with injury risk in elite Australian football athletes.

The findings from this study demonstrate that determining maximal velocities and updating speed bands on a continuous basis according to new maximal velocities achieved by athletes, is highly recommended. Although it is interesting to understand the association between certain running loads with injury occurrence, the reader needs to understand that this analysis is likely to be individual to certain modalities, environments, levels of practice, training age, chronological age, and so on. Future research should aim to compare differences in various running load parameters between different samples."

Youth Development

This month's top research on youth development.

PLYOMETRIC TRAINING FOR IMPROVING AGILITY: THE OLDER THE BETTER?

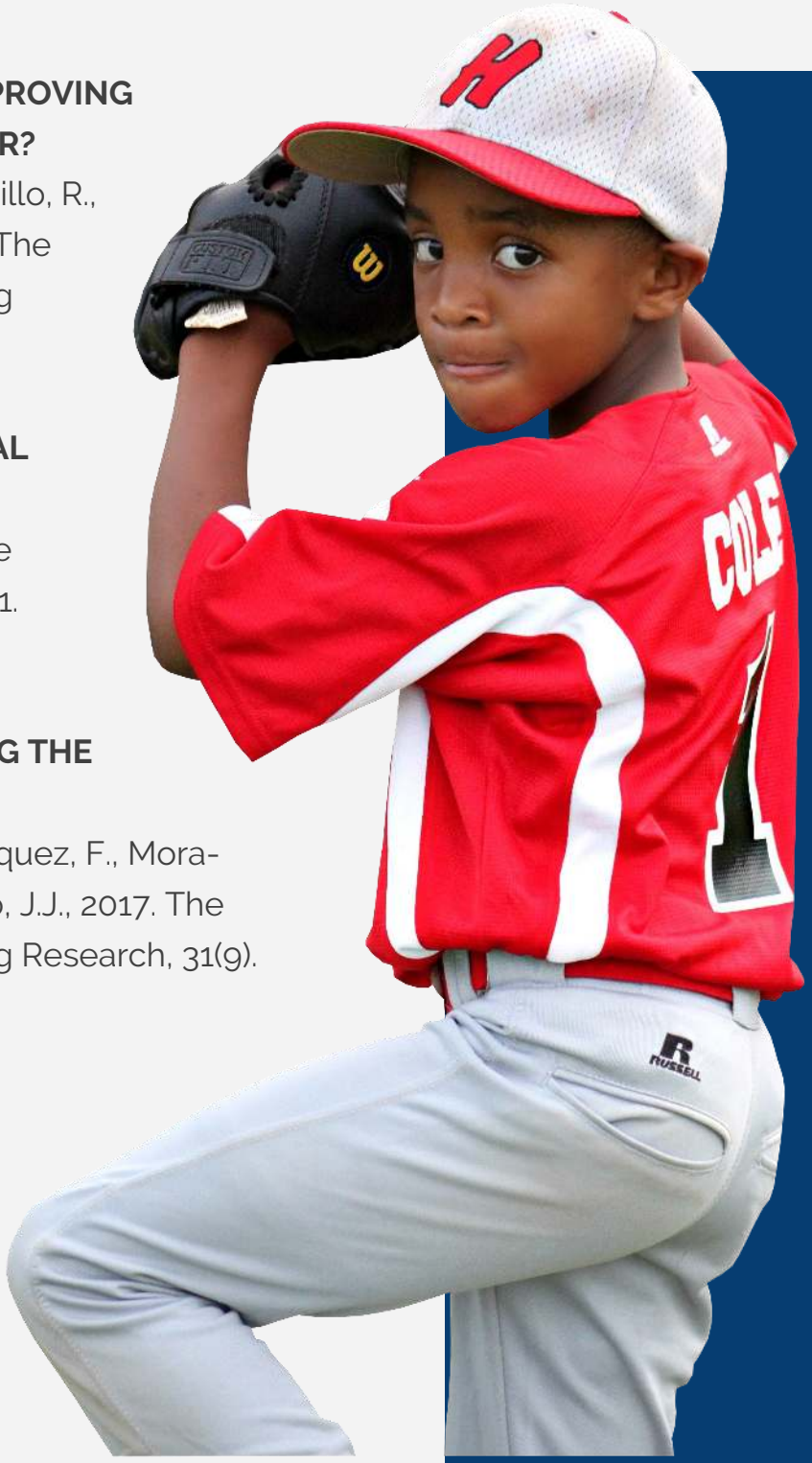
Asadi, A., Arazi, H., Ramirez-Campillo, R., Moran, J. and Izquierdo, M., 2017. The Journal of Strength & Conditioning Research, 31(9), pp.2609-2617.

IS PHYSICAL ACTIVITY ESSENTIAL FOR A HEALTHY BRAIN?

López-Vicente, M., et al., 2017. The Journal of Pediatrics, 188, pp.35-41.

COMBINED STRENGTH AND PLYOMETRIC TRAINING: GAINING THE EDGE

Rodríguez-Rosell, D., Franco-Márquez, F., Mora-Custodio, R. and González-Badillo, J.J., 2017. The Journal of Strength & Conditioning Research, 31(9).



[Abstract]

Plyometric training for improving agility: The older the better?

OBJECTIVE
Maturation plays an important role in performance. This suggests that biological age may favour those who are currently involved in sport. As youth athlete's move through maturation, stretch shortening cycle (SSC) development continues to improve before and during peak height velocity (PHV). However, the relationship between age groups (10-18 years of age) remains scarce and should be investigated to support agility, change of direction (COD), and plyometric sessions.

WHAT THEY DID
This study utilised a meta-analysis as its research design. A meta-analysis is a procedure for gathering and combining multiple studies to elevate the awareness of a phenomenon. In this example, the researchers reviewed 16 articles that were selected based on strict inclusion criteria. These studies were read and coded with a focus on descriptive information, sport activity, and the type of plyometric intervention. For the analyses, subjects were categorised into three age groups: 10 to 12.9 years of age (PRE), 13 to 15.9 years of age (MID) and 16 to 18 years of age (POST) PHV.

WHAT THEY FOUND
In all 16 articles, plyometric training improved COD and agility. However, older subjects demonstrated greater performance outcomes than younger subjects. Potential mechanisms underpinning these improvements were improved SSC function, enhanced motor unit recruitment and firing frequency. In conclusion, PT improves COD ability in youths, with meaningfully greater effects in older youths.

Practical Takeaways

According to this study, 2 plyometric training sessions per week enhance agility and change of direction ability. Over a 7 week period, it is suggested that the athlete should produce roughly 1400 jumps, with 75 seconds rest between sets, and 48 hours between sessions. This equates to roughly 200 jumps per week, which may sound a bit overwhelming. However, if we consider that task such as volleyball, gymnastics or evasion games with hopping/jumping variations accumulate a large plyometric volume, this isn't an unreasonable demand, and more importantly, can be programmed in a fun and developmental manner.

Furthermore, whilst it is important to appreciate the mean training load or rate of perceived exertion (RPE) of a session, it is more important that technical prowess and fun are prioritised at this stage of the athletic journey.

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

Tom's Comments

"Assessing the load or intensity of any given plyometric task remains a vexing problem in youth programming as there is so much variability between one athlete and the next. This is made more confusing by other contributing factors such as maturation and the relative age effect. However, the important part here is that you (the reader) leave with an appreciation for what is good, and most importantly, safe practice for a youth athletic population.

This article provides this by supporting the practitioner with a 'volume marker' for young athletes. However, this article unfortunately fails to mention what type of SSC exercise need to be considered. For example, a light hop and a 30cm depth landing yield a very different physiological response, both acutely and over a long term. In accordance to this, the reader is still sadly left with little information regarding the programming differences between those PRE, MID and POST PHV. Future studies should therefore look to investigate why 'older' subjects showed greater adaptations ($p = 0.041$) than less mature athletes, and support the readers understanding of the programming needs in plyometric task."

[Abstract]

Is physical activity essential for a healthy brain?

OBJECTIVE

Healthy lifestyle habits in young athletes are shown to enhance long-term health and wellbeing. However, few studies have investigated the effects of physical and sedentary behaviours on working memory. This is important for youth sport programmes and schools, as a healthy and active lifestyle has been suggested as a fundamental prerequisite of basic cognitive, motor, and social skills in children. Therefore, the aim of this study was to examine the role of extracurricular physical activity and sedentary behaviour on working memory at primary school age and adolescence.

WHAT THEY DID

This study collected data from four regions in Spain. The researchers used a qualitative approach and collected questionnaires from the participant's parents. Each participant was asked questions regarding their current extracurricular activities and hours spent watching TV, playing board games or on computer games. Working memory was tested using the n-back task. In this task, the subject is presented with a sequence of stimuli and is challenged to concentrate and recall previous sequences (working memory). Maternal education (school, college and University) was used to identify socioeconomic status of the child.

WHAT THEY FOUND

Low-levels of extracurricular physical activity at 4 years of age were associated with poorer cognitive performance in terms of working memory at 7 years of age. Sedentary behaviours at 6 years of age were associated with deteriorated working memory at 14 years of age. With regards to watching TV, there were no negative associations with working memory. However, this research failed to monitor the viewing habits and genres of the sample, with violent viewing habits associated with poorer cognitive development in a previous study.

Practical Takeaways

This study showed that low physical activity at pre-school levels may be associated with poorer working memory in later life. It is therefore important that as coaches, teachers and parents, we re-visit the delivery of fun and structured play throughout all ages (before and during school). In addition, poor working memory can be a limiting factor in academic success, which can have long standing implications on an individual's career. Although there are conflicting opinions on the relationship between physical activity and academic performance, it is clear that physical activity can support a child in education, with some studies showing greater grades and achievement.

According to this study, sedentary behaviour may negatively influence later cognitive maturation at adolescence, but only in boys. This study could offer no real explanation for this phenomenon, but suggested that further studies should include a larger sample size and compare the effects of gender over time.

As practitioners, it is important that our sessions nurture and develop the athlete appropriately, given their context. Throughout maturation, areas of the brain responsible for problem solving, rational thought and information processing are also developing. Therefore, drills that provide little information about the rules that govern a task (an implicit task), and drills that are 'task focused' (an explicit task), may be beneficial as they 'train' both conscious and invested thought and unconscious, natural expression. An example of an implicit task may be a simple relay race, where you, as the coach, are assessing sprint mechanics whilst they are simply running. This task could also be explicit in nature, if you ask them to think about their technique and run with 'high knees' shifting their attention inwards on their knee. Both serve a different function in motor skill acquisition, but could benefit your sessions.

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

Tom's Comments

"Long-term athletic development plans often consider the physical adaptations that accompany growth during childhood and adolescence. However, cognitive performance is clearly affected by development and should potentially be considered when programming. Such initiatives have been discussed in the work on implicit and explicitly designed sessions, which show greater thought processing skills and long-term retention in learning (See Article link).

An interesting factor to consider that hasn't really been investigated, is 'how long' the performance enhancements to working memory last following a bout of physical activity. For example, we know that aerobic activity can relieve stress and enhance memory and reasoning skills. However, does a physical activity carried out on a Monday enhance working memory in the following hour, day or week. These questions may support Sports Scientists making their arguments 'for' physical activity and potentially the justification of an implicit or explicit exercise. Another interesting finding was that children whose mother had a lower education level spent more time watching TV. This requires more investigation, but may suggest that further efforts need to be made to empower adults with greater knowledge."

[Abstract]

Combined strength and plyometric training: Gaining the edge

OBJECTIVE
High speed strength training can enhance performance, and is a key determinant of success in sport. With particular reference to soccer, the ability to reach a ball in a tackle or intercept a pass is more prominent in players who can reach higher speeds. However, few studies have investigated certain training modalities across varied age categories to enhance performance. Therefore, this study aims to explain the influence of age on high speed strength characteristics.

WHAT THEY DID
This study compared the effectiveness of low-load, low-volume weight training combined with plyometrics on strength, sprint and jump performance to assess the influence of age, Eighty-six players were categorised into three groups (U13, n = 30; U15, n = 28; U17, n = 28). These were then randomly assigned into 2 subgroups, a strength training group (STG) and a control group (CG). This study lasted for 6 weeks, with 2 sessions per week implemented in both interventions utilising a squat, speed drills and a change of direction task.

WHAT THEY FOUND
Overall, the results of the present study found that all strength training groups (U13's, 15's and 17's) obtained significant and practical improvements in strength, jump and sprint performance than the control group. STGU13's and STGU15's showed significant improvements in all assessed variables (1RM, CMJ, 10m, 10-20m & 20m sprint time and average velocity) when compared to the control groups for the same age. However, STGU17's proved effective at improving only sprint time and maximal strength, with other physical attributes appearing to decrease with age.

Practical Takeaways

Weight training with a low load and maximal voluntary velocity training and plyometrics proved more effective than soccer training alone. These findings reinforce the notion that adding a high-speed training programme to the 'typical' field soccer session is an effective strategy to enhance muscular strength, and other factors critical to soccer performance, irrespective of age. Furthermore, youth athletes do not need to work until muscle failure to benefit from a programme.

As age increased, the training stimulus decreased. This is expected, as there is a 'learning effect' to a new task or what may be termed as 'newbie gains', where a period of increased muscle strength and size accompany a new stimulus. This is important for practitioners to understand as acute enhancements in performance can not only be exciting, but also out of touch with the long-term improvements that may be seen after a few weeks of structured training.

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

Tom's Comments

"Although this study was interesting, this is a prime example of a methodology that has been poorly designed. For example, subjects had no experience in weight training and hadn't been involved in any strength sessions. This is where a good study can be misleading with what is termed the 'novelty bias phenomenon,' where a 'learning effect' which creates positive changes is observed. In other words, people who participate in a new phenomenon often experience an accelerated learning effect that can present unreliable results.

Another limitation of this study lies in the assignment to either the strength training or control group. It appears that this study utilised a 'random assignment' study design. However, this design can create many threats to internal validity, such as all of the 'stronger' or 'weaker' members falling into one category (strength vs control). A study that utilised 'matched random assignment' may have proved beneficial to create a more reliable and accurate report on high-speed training. However, this study has supported the idea that a strength training programme combined with high speed training is greater than just high speed training alone."

Nutrition

This month's top research on nutrition.

PROTEIN + ANTIOXIDANTS: IS IT BETTER THAN PROTEIN ALONE?

Ives, S. J., et al., (2017). Journal of the International Society of Sports Nutrition, 14, 21.

FISH OIL FOR REDUCING MUSCLE DAMAGE, SORENESS AND CREATINE KINASE

Philpott, J. D., Donnelly, C., Walshe, I. H., Dick, J., Galloway, S. D. R., Tipton, K. D., & Witard, O. C. (2017). International Journal of Sports Nutrition and Exercise Metabolism, 1-28.

PHENYLALANINE FOR FAT OXIDATION: THE GOOD, THE BAD, AND THE UGLY

Ueda, K., Sanbongi, C., Yamaguchi, M., Ikegami, S., Hamaoka, T., & Fujita, S. (2017). Journal of The International Society of Sports Nutrition, 14, 34.

[Abstract]

Protein + antioxidants: Is it better than protein alone?

OBJECTIVE

To determine whether a combined protein and antioxidant supplement is more effective following damaging eccentric exercise (ECC) (which releases reactive oxidative species causing oxidative stress) at alleviating muscle soreness and reducing the impairment of muscle function, compared to protein supplementation alone in males aged 18-30.

WHAT THEY DID

Researchers used a randomised, single-blind, placebo controlled, parallel design to determine how measures of muscle function (isometric (PIMT) and isokinetic (PIKT) torque) and muscle soreness (MS) differed between a control group (carbohydrate drink) (CHO), a protein drink group (PRO), and a combined protein/antioxidant drink (PRO + AO) group. The assigned drinks were consumed immediately after and 6hrs after the ECC and also 2hrs prior to the 24hr follow-up measurements. PIMT, PIKT and MS were measured immediately after eccentric exercise and then 1, 2, 6 and 24hrs afterwards. A two-way mixed ANOVA was used to determine the effect of the supplements on dependent measurements.

WHAT THEY FOUND

After 24hrs, there was improved relative PIKT (as a % of baseline) in both PRO (11% difference) and PRO + AO (17% difference) when compared to CHO. PRO and PRO + AO groups also had significantly higher, on average, PIKT than the CHO group. The PRO + AO group had significantly lower scores of muscle soreness compared to PRO and CHO.

Practical Takeaways

Athletes are often involved in events involving eccentric contractions and high intensities of work with short turnaround times, and thus inadequate time for full muscle recovery. For example, tennis tournaments, CrossFit games and powerlifting competitions.

This study confirms the well-known fact that protein supplementation following damaging exercise facilitates recovery by improving muscle function and reducing the impact of delayed onset of muscle soreness (DOMS). Interestingly, the results suggest that combining protein with some form of antioxidant can further alleviate muscle soreness and minimise the reduction on muscle function. It would therefore be beneficial for athletes that are short of recovery time to start supplementing with antioxidants as well as protein. This should be straightforward to implement as both supplements can be included in the same post-exercise beverage.

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

James's Comments

"The research demonstrates the effectiveness of adding additional supplements (antioxidants in this instance) to a post-exercise recovery beverage. Combining protein with antioxidants improved muscle function and alleviated muscle soreness better than protein in isolation, which would allow for better performance in the absence of adequate recovery times between bouts of exercise. Although additional supplements come at an extra cost to coaches and athletes, the benefits are clear and would certainly aid in post-exercise recovery. I would also like to highlight the benefits of consuming such antioxidants from food-based sources too."

[Abstract]

Fish oil for reducing muscle damage, soreness and creatine kinase

OBJECTIVE
The purpose of this study was to examine the influence of a fish oil (FO) versus protein (PRO) versus carbohydrate (CHO) beverage on markers of acute muscle recovery after 3 days of eccentric exercise in competitive soccer players following a 6-week ingestion period. They hypothesised that the FO beverage would reduce muscle soreness, decrease the inflammatory response to damaging exercise, and improve soccer-specific performance when compared to the PRO and CHO beverage.

WHAT THEY DID
30 competitive male soccer players visited the lab on five separate occasions, which formed allocation into one of three supplementation conditions. The FO (fish oil, whey protein, leucine and carbohydrate), PRO (whey protein, leucine, carbohydrate) and CHO (carbohydrate only) beverages were administered over 6 weeks. An eccentric exercise protocol was used to damage the hamstrings muscle, with muscle soreness being rated via a validated Likert scale, and followed by muscle function being assessed through a single leg isokinetic/eccentric MVC. Finally, the Loughborough Soccer Passing Test (LSPT) was used to assess each players' soccer skill performance.

WHAT THEY FOUND
A successful 58% increase in blood n-3PUFA (FO) occurred following the 6 weeks of supplementation versus no change in the PRO or CHO supplementation. This demonstrated a reduction in perceived feelings of muscle soreness and serum creatine kinase (CK) in the FO group, although this did not modulate the systemic inflammatory response or reduce the decline in muscle function and the LSPT during exercise recovery. The authors suggest that adding fish oil to a multi-ingredient supplement effectively protects the muscle from damaging eccentric-based exercise, resulting in reduced muscle soreness during exercise recovery in soccer players.

Practical Takeaways

The authors suggest that ingesting the FO beverage over a 6-week period may elicit a protective role to maintain structural integrity of the damaged muscles, and therefore, reduce the severity of muscle soreness. This can be particularly important for athletes and support staff during periods of intensified fixtures, such as public holidays and tournament scheduling when it is not untypical to see upwards of 9 games in 6 weeks, if the final stages are reached. It appears that a loading period of 6 weeks is sufficient to increase blood levels of n-3PUFA by 58%, and as such, it should be considered when approaching such intensified fixture windows.

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

James's Comments

"This manuscript clearly shows the successful use of a 6-week ingestion phase of a fish oil supplement on reducing perceived feelings of muscle soreness. Authors speculate the potential of a local, rather than a systemic, inflammatory response within the perimysium and epimysium of the muscle fascia. However, since no muscle biopsies were taken, this warrants some interesting future work to be performed. Additionally, the authors highlight how the damage was caused to a single muscle over an acute recovery period, and that in the real-world setting soccer causes damage to multiple muscles."

[Abstract]

Phenylalanine for fat oxidation: The good, the bad, and the ugly

OBJECTIVE
Amino acids are often supplemented in mixtures (e.g. a BCAA mixture of Leucine, Isoleucine and Valine) and are thought to be an effective method of accelerating fat mobilisation when combined with exercise. This study sought to investigate the effect of supplementing a single amino acid, in this case phenylalanine (PHE), on hormone secretion, substrate catabolism and fat oxidation during exercise in healthy, active males.

WHAT THEY DID
In this double-blind, placebo-controlled, crossover trial, 6 healthy, active, male volunteers were randomly assigned to ingest PHE (3g dose) or a placebo. At 30 mins following ingestion, each subject performed workload trials on a cycle ergometer for 60 mins at 50% of their maximal oxygen consumption. Blood samples were taken pre-ingestion, 30, 60, 90 & 150 minutes' post-ingestion to measure Glycerol, Free fatty acids, Total ketone bodies, Glucose and Lactate.

WHAT THEY FOUND
The authors state than when compared with the intake of the placebo, ingestion of the PHE supplement significantly increased the concentrations of glycerol and glucagon in the plasma of exercising subjects. This suggests that whole body lipid oxidation increased, and that pre-exercise ingestion of PHE stimulated fat oxidation.

» **Practical** Takeaways

The British Journal of Sports Medicine nutritional supplement series identifies the minimum daily requirement of PHE to be 39mg per kg a day for healthy athletes (~75kg bodyweight). To put into context, a similar amount can be obtained from about 50g of egg protein. Therefore, is there any need for athletes who follow a solid nutritional intake with adequate energy and protein sufficient to meet metabolic demands to supplement PHE in the first place? My honest opinion is no.

Additionally, PHE has been routinely used in aspartame of popular drinks, of which many athletes would typically try and avoid. Weight making athletes, or those looking to elicit greatest fat oxidation rates, would be directed to some of the well-cited work from Luc Van Loon's lab on substrate utilisation at different exercise intensities (See article link #2).

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

James's Comments

"It is important for practitioners to provide their athletes with clear and evidence-based practices which firstly aim to improve their health, and secondly enhance performance. This study used 6 recreational subjects, a clear limitation when trying to rationalise the results of this study to athletes. Dietary intakes from the subjects were self-recorded, and as such, readers are unaware of the 24h nutritional intake before the study begun. By tooth picking the results section further, you can see that subjects began the exercise protocol with RER values at 0.83 and 0.85, which increased to 0.90 and 0.97 PHE versus PLA at 40 minutes, respectively. This appears to be very high considering they are exercising at 50% of their max.

Therefore, this poses two questions: 1) the subjects are extremely unfit as they are utilising a high percentage of carbohydrates at 50% of their maximum output (in contrast to Van Loon et al. 2001); and 2) they haven't arrived at the lab in a typical fasted state. Further, it takes 120mins for the PHE to have a significant effect on RER substrate utilisation versus the placebo trial. Even when this does occur, it decreases dramatically from 0.93 to 0.74 in the PHE group, a change which appears sceptical. Even if these averages appear true, the authors should show the individual changes of subjects in this study for readers to digest further. Lastly, many athletes now have very busy training, sponsorship, media and family schedules (to name a few), therefore, convincing them to perform 120mins of exercise at 50% intensity maybe a tough battle to win, especially when there are far better ways to elicit fat oxidation."

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