

THE PERFORMANCE DIGEST

A review of the latest sports performance research





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MEMBERS ONLY GROUP CHAT WITH OUR EDITORS AND OTHER MEMBERS



Welcome to the **PERFORMANCE DIGEST**

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 November 2017 will be included within the November 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. December 2017 issue will be published on the 31st December 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!



OWEN WALKER Founder and Director of Science for Sport



The research reviewers for The Performance Digest.





Dr. Will Vickery PhD

The Science of Coaching

Will is a Senior 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.



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.



James de Lacey MSc

Technology & Monitoring

James is currently the Head Strength & Conditioning Coach with Austin Elite 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. Francisco Tavares PhD Candidate CSCS ASCA L2

Fatigue & Recovery



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.

> **Tom Green** MSc UKAD Advisor

Youth Development



Tom has an MSc in Applied Strength and Conditioning from Hartpury College. He is currently working at Gloucester Rugby Club as an Academy S&C Assistant and has experience in professional boxing, semi-professional football and GB Equine.

> 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 English Football Association alongside the England national squads (men's and women's)



The Science of **COACHING**

Does focus of attention improve snatch performance?

Focusing on the outcome may be better for development then focusing on technique.

INTRODUCTION

The manner in which a coach provides instruction and how they direct the attention of an athlete can have a significant effect on the motor learning and development of an athlete. Specifically, a coach can instruct athletes using an internal or external focus of attention (FOA); both of which lead to differences in movement performance. An internal FOA is when a coach will instruct an athlete to concentrate on specific movements of the body whilst performing a skill (e.g. extension of elbow upon impact of racquet on ball in tennis serve). External FOA, on the other hand, is when the coach will instruct an athlete to concentrate on the movement effect or outcome (e.g. hitting the ball with as much force as possible during tennis serve). You can read more about internal vs. external cueing by reading our Science for Sport article (HERE).

Despite a considerable amount of research suggesting that using an external FOA has greater benefits from a development and performance perspective as opposed to a more internal FOA, much of the coach education information provided to strength and conditioning coaches is still based on the use of internal FOA instructions, particularly for complex skills such as Olympic lifts (take the UKSCA's Olympic lifting assessment for their strength and conditioning accreditation, for example). The aim of this study was therefore to look at changes in performance of the snatch based on the athlete's focus of attention.

WHAT THEY FOUND

Although only a small number of participants and repetitions were used in the current study, the results would suggest that the use of a more external FOA (e.g. "concentrate on moving the barbell back and up rapidly") as opposed to instructions that are more internally focused (e.g. "concentrate on moving your elbows high and to the side rapidly") lead to greater improvement in snatch lifting performance. In particular, the authors found:

- ⇒ Decreased barbell-cervical hip angle at maximum height of barbell during lift following external FOA;
- ⇒ Greater peak instantaneous vertical barbell velocity following internal FOA;
- ⇒ Greater peak instantaneous horizontal barbell velocity following external FOA; and

⇒ Higher number of unsuccessful lifts following internal FOA.

WHAT THIS MEANS

By having the coach provide instructions which allow the participants to focus on external outcomes of the snatch rather than internally focused technical details, the efficiency and performance of the lift appeared to improve. The authors of the current study did note though that no one specific technical characteristic can be attributed to the success of a snatch, however, it is conceivable that the external FOA can play a significant role in the development of this movement amongst those still learning the correct lifting movement.



Dr. Will Vickery

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structions, particularly and has Olympic lifts (take and

Practical Takeaways

As suggested by the authors, coaches would be best served to provide instructions for their athletes in this case within the strength and conditioning environment - which are directed towards the outcome of the movement rather than the mechanics of the movement. This would allow athletes to free their attentional resources through the use of fast, reflexive automatic control processes as opposed to having to focus on the specific technical movements which can be associated with Olympic lifts. This external FOA though can be applied to any coaching environment, and as the evidence would suggest, it is more likely to provide your athletes with a more advantageous learning environment. SPORT

Strength & Conditioning

This month's top research in strength & conditioning.

CAN BLOOD FLOW RESTRICTION IMPROVE 100M SPRINT PERFORMANCE?

Behringer M, et al. (2017) Journal of Strength and Conditioning Research, 31(9), 2462-2472.

BENCH PRESSING WITH A SPOTTER: DOES IT IMPROVE PERFORMANCE AND ADAPTATIONS?

Sheridan A, et al. (2017) Journal of Strength and Conditioning Research.

SPRINT INTERVAL TRAINING: A GREAT METHOD FOR IMPROVING RUNNING PERFORMANCE IN TRAINED ATHLETES?

Koral J, et al. (2017) Journal of Strength and Conditioning Research.





Can blood flow restriction improve 100m sprint performance?

OBJECTIVE

To investigate the effects of practical blood flow restriction (pBFR) of leg muscles during low-intensity sprint training on 100m sprint time in well-trained sport students, and to attempt to determine the mechanism for any improvements seen.

WHAT THEY DID

25 healthy male sport students (19-27 years) familiar with sprinting before the study participated in this study. Subjects performed 6 x 100m sprints at 60–70% of their maximal 100m sprinting speed twice a week for 6 weeks, either with or without pBFR. BFR was applied through elastic knee wraps and placed as high as possible on the thigh. A perceived pressure of 7/10 was used. Leg press maximal isometric force, rate of force development (RFD) and muscle thickness of selected muscles were measured before and after the training period. Furthermore, the acute systemic endocrine response to training was measured after the first training session.

WHAT THEY FOUND

The authors found that low-intensity sprint intervals improved the 100m sprint time in both groups, but that the improvement was significantly greater in the BFR group (0.38 seconds) than in the control group (0.16 seconds). Furthermore, the muscle thickness of the rectus femoris increased only in the BFR group. The maximal isometric force did not change in either group. However, the rate of force development improved in the BFR group. The BFR group also had a decreased level of muscle damage from the sprints.

>> Practical Takeaways

For strength and conditioning coaches, the main takeaway from this study is that speed improvements from lowintensity sprint intervals can be enhanced using elastic knee wraps as a practical method of BFR. This is especially useful considering that it is an inexpensive and simple method to implement.

Probably the biggest practical application of this study is in a rehab context. For athletes who can't sprint maximally due to injury, this method might provide a way to maintain speed in higher level athletes during their rehabilitation. Another important application involves working with untrained athletes or athletes in early pre-season, where low-intensity BFR sprints can be used as a way to enhance sprint performance without exposing the athletes to potentially dangerous high velocities.

A final takeaway is that using BFR for low-intensity sprints might also allow for quicker recovery due to the reduced muscle damage seen in this group versus the control group.

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



Tim's Comments

"We know from an abundance of studies that low-load BFR training using only 20-30% 1RM generates similar muscle hypertrophy compared to high-load resistance training, however, this study is unique in that it looked at the impact of BFR training on speed, which hasn't been examined until this point in time.

Two main mechanisms may explain the improvement in speed seen, including improved RFD and an increase in the size of the rectus femoris muscle (which is an important muscle for sprinting). These results may be traced back to a greater recruitment of fast contracting type II fibres under BFR conditions.

While certainly very interesting, due to the small number of participants and their relatively untrained status, the findings of this study need to be replicated with higher level athletes before I get too hopeful about this training method."



Bench pressing with a spotter:

Does it improve performance and adaptations?

OBJECTIVE

To investigate the effect of spotter presence on bench press performance and the psychophysiological responses during this exercise. It was hypothesised that the visual presence of spotters would lead to improved performance because of an increased desire to perform.

WHAT THEY DID

Twelve recreationally trained male participants (age 21.3 ± 0.8 yrs) with a minimum of 12 months resistance training experience were recruited for this study. One repetition maximum (RM) bench press was determined on the first day of data collection, and then two subsequent experimental trials were performed on separate occasions in a randomised cross-over manner. In these trials, participants performed three sets of bench press to failure at 60% of 1RM. The two trials consisted of spotters being explicitly present, or hidden from view (deception trial). The spotters did not provide verbal encouragement. During the trials, total repetitions, total weight lifted, ratings of perceived exertion, self-efficacy and blood lactate were measured. The true aim of this study was kept hidden from the participants.

WHAT THEY FOUND

The performance of three sets of bench press to failure at 60% 1RM was increased by 11.2 ± 8.1%, for both number of reps and total work performed when spotters were visible. Total reps were, on average, 4.5 reps higher, and weight lifted was, on average, 209.6 kg higher with spotters. RPE was significantly elevated in the trials with spotters hidden (difference = 0.78), and self-efficacy was significantly reduced (difference = 1.58). The blood lactate responses were significantly higher in the visible spotter condition following the completion of the three sets (mean difference = 1.19 mmol/L).

» Practical Takeaways

The social-cognitive environment within which strength and conditioning training is undertaken is a key consideration for maximising performance. Coaches should ensure that their athletes perform resistance exercise in the proximity of others, ideally in a spotting role. This not only provides safety benefits, but also likely causes an improvement in total work done. This improved performance appears to be attained through supporting positive self-efficacy towards the task, and lowering perceptions of effort.

Although this study required spotters to not verbally encourage the subjects, in a practical setting this should be encouraged, as it will likely further improve performance. This study highlights the importance of establishing a good culture in an organisation, where support and encouragement can not only help foster relationships between players, but also have a significant impact on the physical performance of the athletes.

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





Tim's Comments

"This study demonstrates, for the first time, that the perceived absence of a spotter has a negative impact on total work performed. This study is novel in that it investigates the acute effects of the close proximity of a small number of people during training, whereas most of the literature has examined the chronic effects of this support on adherence to training.

While there was obviously no blinding of the subjects, all participants confirmed after data collection that they had been unaware of the true nature of the study, and also that they had not detected the spotters during the deception condition. This is important because it increases the validity of the study.

Also of note, is that there was a 5.3-30.7% performance improvement range when spotters were visible, highlighting the large inter-individual response to having a spotter. It is crucial to ensure that those who respond best to having a spotter have one in place for maximal performance."



Sprint interval training: A great method for improving running performance in trained athletes?

OBJECTIVE

To test the effects of a novel, short-term sprint interval training (SIT) method performed on the field, which requires only cones and a stopwatch, on performance in trained athletes.

WHAT THEY DID

12 male and 4 female trained trail runners completed a two-week training block consisting of 4-7 bouts of 30 second shuttles at maximal intensity interspersed by four minutes of recovery, three times a week. Maximal aerobic speed (MAS), time to exhaustion at 90% of MAS and 3000m time trial were evaluated pre- and post-training.

WHAT THEY FOUND

SIT significantly improved all parameters measured in these trained trail runners. MAS improved by 2.3% (p = 0.01), while peak power and mean power increased by 2.4% (p = 0.009) and 2.8% (p = 0.002), respectively. TT3000m was 6% shorter (p < 0.001), while Tmax@90%MAS was 42% longer (p < 0.001).

>> Practical Takeaways

This study demonstrated that just two weeks of SIT significantly improved high-intensity endurance performance in trained trail runners. This shows that SIT is a very time-efficient means of improving performance. Furthermore, it not only improved endurance performance, but also anaerobic performance, which may make it a useful training method for team sport athletes who need a mix of aerobic and anaerobic qualities.

A further point regarding practical application is that this method is very convenient to use as it is nearly costless as no special equipment is needed. Secondly, this method can be employed nearly anywhere as only 30 meters of continuous space is required.

However, it is important to note that while this training method generated rapid improvements in fitness, this type of training is considerably harder to recover from, and has a higher risk of injury than aerobic training. Therefore, it should not be performed frequently for long periods of time.

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



Tim's Comments

"This study is unique in that it is the first study of its kind to be completed in two weeks with the running completed outside of a laboratory setting. This is important as it makes the results more valid for athletes who do not perform in labs!

A further strength of this study is that the participants were truly 'trained', having run three to five times per week for a total weekly distance of at least 50 km for at least three years, and the VO2 max of the participants was ~55 mL/kg/min. This is noteworthy as the majority of existing literature has focused on untrained or recreationally trained subjects.

In conclusion, while the study shows some incredible results, it is important to remember that this type of training should be the icing on top of a bigger base of aerobic work for optimal endurance performance."



Technology & Monitoring

This month's top research on technology and monitoring.

ALTITUDE/ELEVATION TRAINING MASKS: WHAT DOES THE SCIENCE HAVE TOO SAY?

Jagim, A, et al. Journal of Strength and Conditioning Research. Epub. 2017.

TRAINING LOAD MONITORING IN TEAM SPORTS: A NOVEL FRAMEWORK FOR ADAPTATION

Vanrenterghem, J, et al. Sports Medicine. Epub. 2017

USING LACROSSE BALLS FOR INCREASING JOINT ROM: EFFECTIVE OR PLACEBO?

Capobianco, R, Almuklass, A, & Enoka, R. European Journal of Sport Science. Epub. 2017.



Altitude/elevation training masks: What does the science have too say?

OBJECTIVE

The purpose of this study was to investigate acute effects of the elevation training mask (ETM) on resistance exercise performance, markers of metabolic stress, and ratings of mental fatigue in recreational weightlifters.

WHAT THEY DID

20 resistance trained males with at least 2 years resistance training experience and with a bench press 1RM of at least 1 x body weight and back squat 1RM of >1.5 x their body weight were randomly assigned to either an experimental group (wearing ETM) or a control group (no mask: NM). Subjects completed baseline testing including anthropometry and 5RM back squat and bench press. Sessions 3 and 4 were experimental testing with or without the ETM set to simulate "altitude resistance" of 2743m. Prior to each testing session, subjects completed a questionnaire on subjective feelings. Baseline lactate and oxygen (O2) saturation were also assessed. The strength training protocol performed was 6x10 (or as many as possible) at 85% of 1RM with the 7th set being taken to failure. Bar velocity was recorded using a linear position transducer. Blood lactate was evaluated 1-min following the last repetition of the 7th set and O2 saturation recorded 1, 2 and 3 mins following the last repetition. After a 20-min rest period, a 25-sec maximal sprint was performed on the NMT against 18% body mass. Blood lactate and O2 saturation were immediately assessed afterwards.

WHAT THEY FOUND

Peak velocity was significantly greater in the NM condition for the back squat, bench press and sprint test. There was no significant difference in average velocity or total work completed between conditions during the sprint test. Blood lactate values were higher following the bench press and sprint test in the NM condition. Lower O2 saturation levels were observed at 1-min after the squat during the ETM condition when compared to the NM condition. Significantly lower subjective ratings of alertness and focus for task were found post squat, bench and sprint in the ETM condition when compared to the NM condition.

>> Practical Takeaways

According to this study, ETM did not reduce the total volume achieved during the experimental testing. Additionally, ETM did not affect total volume load (reps x workload) in squat or bench press, suggesting ETM does not hinder the ability to complete hypertrophy focused protocols. However, ETM may hinder longer term training adaptations when it comes to peak velocity and power output. If the goal of a training block is to enhance muscular strength and power, the use of ETM may not be a useful tool.

However, the use of ETM did lead to reduced metabolic stress as shown by reduced blood lactate measurements. The authors theorised this was due to the decreased velocity of the lifts shifting the recruitment of fibre type towards the slower twitch muscle fibres as fast twitch fibres produce the greatest lactate response. Therefore, the use of ETM may serve more as a respiratory muscle trainer rather than a hypoxic training device.

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



James's Comments

"While the ETM doesn't seem to affect the volume of work performed, the quality of that work is diminished when using the ETM – according to this paper. It should also be noted that 2 subjects pulled out of the experiment due to physiological discomfort induced by the breathing restriction of the ETM, and 1 subject pulled out due to severe dizziness while wearing the ETM. As such, the use of the ETM may depend on how the individual tolerates the "claustrophobic" nature of the device. Furthermore, ETM may be more of a respiratory muscle trainer rather than a hypoxic training device. In my opinion, I don't see any use for the ETM during resistance training as you can get the same volume of work done with a higher quality (higher peak velocities) and greater focus on the task without the ETM. Potentially, you could use the mask to minimise blood lactate concentrations following heavy volumes of resistance exercise or glycolytic sprints, but if reducing fatigue is your goal, then other means of training are probably better options than using an ETM."



Training load monitoring in team sports: A novel framework for adaptation

OBJECTIVE

The aim of this paper was to propose a novel framework in which the physiological and biomechanical loadadaptation pathways are considered separately and to present how some scientific evidence on measures of external and internal training load could be interpreted according to these separate pathways.

STUDY FRAMEWORK

The framework presented involves splitting training load into physiological and biomechanical internal and external loads. Some examples of these are: metabolic power (external physiological load), heart rate (internal physiological load), accelerations and decelerations (external biomechanical load), and perceived soreness (internal biomechanical load). When fatigue is taken too far in either domain, certain physiological or biomechanical "failures" can occur such as immune deficiency or bone fractures, respectively.

INTERNAL & EXTERNAL MONITORING

External monitoring through devices such as GPS are a valid and reliable way of monitoring player activity. However, physiological loads are difficult to quantify accurately with metabolic power in non-steady state locomotive sports due to the constant acceleration and decelerations. Accelerometers may provide another metric where a summative measure of the kinetic demands may provide an estimate of external biomechanical load. Internal physiological loads are most often related to oxygen consumption and cardiac output. Simple heart rate (HR) monitoring can assess cardiorespiratory output, while blood lactate reflects an accumulation of efforts. RPE is also well correlated with HR based internal load. Monitoring internal biomechanical stress requires measurement of joint contact forces or muscle -tendon forces which is not possible in a field context. However, RPE for how the players 'legs' or 'breathing' were affected may be able to separate between biomechanical and physiological load, respectively.

>> Practical Takeaways

Athlete monitoring can be tracked through a range of devices and pieces of software. However, certain measures or devices may only track internal or external loading through either physiological or biomechanical systems. Internal loads can be difficult to measure directly from both a physiological and biomechanical perspective (e.g. blood lactate and muscletendon forces, respectively). However, subjective measures such as RPE may be a suitable alternative that reflects both types of internal loading.

It has been suggested that accumulated accelerometerbased outcomes, such as PlayerLoad, are valuable to estimate the extent to which the player, through their activities, experiences accelerations and hence biomechanical load of the body as a whole. Being able to differentiate between physiological and biomechanical loading may influence a training plan. For example, if players' physiological loads are high, playing a small-sided game with a smaller pitch size reduces physiological load and likely increases biomechanical load. On the contrary, performing something like HIIT delivers a high physiological load, but a low biomechanical load.

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



James's Comments

"With the amount of data you can potentially collect and the many various tools you can use to do so, it can be overwhelming as a coach when deciding what will provide value to your player monitoring. A simple RPE measure is a cheap, suitable monitoring tool that may reflect physiological and biomechanical internal loading. In turn, this will allow you to use the data to influence training for your athletes by reducing physiological or biomechanical loading, rather than guessing how you will reduce training load as a single metric. Furthermore, taking and recording RPE data costs nothing so it's perfect for coaches with little-to-no budget. Monitoring external load is much tougher and more costly with the use of GPS and accelerometers. However, if you do have access to GPS. keeping track of distances run, highspeed meters, acceleration/ decelerations etc can be good a way of monitoring biomechanical load and help inform the coach of players at a potential risk of structural injury."



Using lacrosse balls for increasing joint ROM: Effective or placebo?

OBJECTIVE

The purpose of this study was to assess the influence of modulating sensory input with either TENS (e.g. Compex) or selfmassage (e.g. lacrosse ball rolling) on maximal ROM of the ankle joint when stretching the calf muscles. The secondary purpose was to determine the influence of the two conditions on MVC torque and force steadiness.

WHAT THEY DID

22 recreationally active adults completed 3 protocols separated by at least 5 days. Stretching the plantar flexors of the dominant leg either alone without any treatment, with concurrent application of TENS, or after self-massage with therapy balls. Before and after each condition, subjects performed an isometric MVC and a force steadiness task which was quantified as the coefficient of variation for force during steady isometric contraction. After MVC, force was determined. A target line of 20% MVC was displayed on a monitor and subjects were instructed to move the cursor to the target line and maintain the contraction for 20-sec.

ROM was taken before and after each of the conditions. Stretching was performed for 3 x 30-sec with 30-sec rest between stretches. The wall calf stretch was used for all conditions. Stretching with the TENS involved the TENS using a 100hz pulse rate at a maximal tolerable intensity, but below what would evoke a muscle contraction. TENS was applied for 60-sec before stretching and left on for the duration of stretching. Self-massage was performed with two massage therapy balls on the lower calf for 60-sec prior to each calf stretch.

WHAT THEY FOUND

All 3 conditions increased ROM immediately after the intervention. There was no significant difference between stretching only and stretching + TENS for ROM. However, stretching + massage significantly increased ROM compared with stretch only (24 ± 17 % and 13 ± 9 %, respectively). Less flexible individuals experienced greater changes in ROM with stretching + massage. MVC torque significantly increased in the stretching + massage condition compared with stretching alone, while stretching + TENS did not. There was no significant difference between all 3 conditions in force steadiness before or after the intervention.

>> Practical Takeaways

This paper potentially provides a cost and time effective option for improving ROM without imposing decrements in muscular force. This has potential to influence pre-match or pre-training 'warm-up' protocols or just general flexibility/ mobility training for the athlete to perform on their own. In total, the self-massage condition only added 3-mins of time to the calf stretches. However, this could be an issue if performing multiple stretches in a session as self-massage could guite easily add upwards of 20-mins. A good way of going about this may be to perform one self-massage and stretch before and after a morning training, and to do the same with the evening training session, giving you 4 opportunities to address a specific ROM issue, if necessary.

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





James's Comments

"From this paper, adding self-massage with a lacrosse ball to stretching amplifies the effects of stretching on ankle flexibility and MVC compared to stretching alone or stretching + TENS. This seems to be in line with the current literature on foam rolling + stretching. The authors put this down to selfmassage potentially modulating neural pathways where certain spinal reflexes are diminished after differing massage techniques, allowing greater ROM while peak torque did not change.

Another theory is ROM being influenced by an increase in temperature of skin, muscle and fascia. Static stretching has been shown to produce a temporary decrease in maximal force production, however, the declines in peak torque and rate of torque development after several minutes of static stretching return to baseline values within 10-min of recovery. In contrast, stretching + massage still report flexibility gains without a decrement in muscular force,"

Fatigue & Recovery

This month's top research on fatigue and recovery.

COMPRESSION GARMENTS FOR RECOVERY: AN UPDATE ON WHAT WE KNOW

Brown F, Gissane C, Howatson G. Sport Med. 2017 (In press).

THE EFFICACY OF REPEATED COLD WATER IMMERSION ON RECOVERY

Barber S, John P, Brown F, et al. J Strength Cond Res. 2017 (In Press)

IS COLD WATER IMMERSION USEFUL WHEN ATHLETES ONLY TRAIN 3 TIMES PER WEEK?

Broatch JR, Petersen A, Bishop D. Am J Physiol Regul Integr Comp Physiol. 2017 (In Press).





Compression garments for recovery: An update on what we know

OBJECTIVE

The aim of this meta-analysis was to understand the effects of compression garments (CG) on the recovery of strength, power and endurance from exercise.

WHAT THEY DID

Twenty-three studies in healthy subjects were included for analysis. Effect sizes were calculated to measure the effect of CG on recovery. In addition, the effects of time (0-2, 2-8, 24 and >24h), pressure (<15 vs. ≥ 15 mmHg) and training status (trained vs. untrained) were also analysed after exercise.

WHAT THEY FOUND

CG demonstrate very likely small effects for enhancing recovery in general. Very likely large effects were observed for strength when measured 2-8h and >24h after exercise. Small non-likely benefits were found for the effects of CG on power recovery.

CG seem to be more effective for enhancing recovery from resistance training (very likely large effects) in comparison to endurance training. In particular, wearing CGs after cycling has been demonstrated to have very likely benefits for enhancing recovery. Lastly, pressure or training status did not affect the effects of CG.

>> Practical Takeaways

The findings from this study demonstrate that when CG are implemented either during or immediately after exercise, they enhance recovery. Moreover, these results are in agreement with previous research which has investigated the effects of CG on recovery. CG demonstrated to be particularly beneficial for enhancing recovery from resistance training (predominantly strength) and from cycling.

Importantly, CG demonstrated no harmful effect on recovery from exercise, and therefore, implementation of CG is a cost-effective recovery tool that should be implemented by all athletes after intense physical activity. Unfortunately, however, the authors did not investigate the effects of the duration of CG usage.

In addition to wearing CG after exercise, and given that CG are not likely to have any harmful effect, coaches are also recommended to implement CG during non-training days (i.e. recovery days).

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





Francisco's Comments

"The magnitude of the effect sizes for CG to enhance recovery demonstrate the importance and usefulness of this recovery tool (i.e. the larger the effect size, the greater the potential for having an effect on recovery). In the 2 previous issues of the Performance Digest (September and October 17). I covered two other CG studies which also reported the positive impact of using these recovery tools to not only improve recovery, but to also enhance adaptations. It is, however, important to remember that training adaptations result from a fine tuning between stimulus and recovery. Therefore, I strongly recommend listening to the podcast I've linked to below.

Athletes should wear CG after exercise for an extended period of time (e.g. 8-48h after exercise), as long as it does not interfere with sleep quality. On the article about CG that I have reviewed in the October issue of The Performance Digest, I commented that the authors did not measure pressure. In this study, the authors did not measure pressure (at 5 mmHg) being superior to higher pressure (at 5 mmHg) being superior to higher pressure (at 5 mmHg) being superior to higher pressure (at 5 mmHg) pressure) were included for analysis, and the pressure group were too similar (4.8 – 11.8 mmHg). In my opinion, further research investigating the effects of pressure is warranted. Therefore, as I previously recommended, I would maintain my suggestion for athletes to 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."



The Efficacy of Repeated Cold Water Immersion on Recovery

OBJECTIVE

The goal of this study was to investigate the effect of repeated cold water immersion (CWI) on recovery of amateur rugby union athletes following a simulated rugby union match.

WHAT THEY DID

After a simulated rugby union match, 16 amateur athletes were exposed to 2 x 5 min of CWI at the temperature of 10°C (CWI; n = 8) or remain in a seated position for 15 min (CON; n = 8). Creatine kinase (CK), countermovement jump (CMJ), perceived muscle soreness (DOMS) and knee extensors maximal voluntary isometric contraction (MVIC) were measured pre-match, immediately post-match, 24h and 48h post-match.

WHAT THEY FOUND

Large effect sizes were observed for CMJ performance at all time points post-match and for MVIC, CK and DOMS 24h and 48h post-match favoring the CWI group. Moreover, moderate effect sizes were observed for CK and DOMS immediately postmatch, also favoring the CWI group.

>> Practical Takeaways

This study demonstrates a clear effect (i.e. large effect sizes) of CWI enhancing recovery as demonstrated by neuromuscular, perceived soreness and CK measures. These findings reinforce the benefits of CWI when the time to recovery is limited.

It is important to highlight the intermittency of the protocol implemented by the authors (e.g. 2 x 5 min). Given that superficial tissue temperatures reduce and re-warm significantly quicker than deeper tissues, intermittent exposures may be a more effective method than a constant exposure (e.g. 1 x 10-minutes) for reducing deep tissue temperatures.

This can also work well from a practical perspective, as the two immersions can be separated by as much as 10minutes before deep tissues begin to re-warm. So effectively, you could use 2 x 5 mins with anywhere from 1-10 minutes of rest out of the water. But just remember, the longer the rest, the more the tissues will re-warm.

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



Francisco's Comments

"This was a very well conducted study. I particularly like the fact that the group of researchers matched the athletes for their body mass. As discussed in both August and October 2017's issues of the Performance Digest, core temperature changes according to different body composition measures, including body mass.

Although it was not measured, it is likely that after 48h, the effects of CWI enhancing recovery are no longer evident (See Article #1 below). Given that CWI acutely diminishes muscle protein synthesis and leads to a decrease in muscle hypertrophy (See Article #2), when the time to recovery is longer than 48h, one may avoid the usage of cold modalities. Moreover, within any typical training week, there might be training days where some accumulated fatigue may not be detrimental for the goals of the training session(s), or for the goals of a particular athlete (i.e. if the goal is to increase their muscle mass). Therefore, coaches are advised to periodise recovery modalities according to the training schedule (e.g. if the goal is hypertrophy, perhaps keep recovery modalities such as CWI to a minimum)."



Is cold water immersion useful when athletes only train 3 times per week?

OBJECTIVE

The goal of this study was to investigate the effects of cold water immersion (CWI) on molecular markers of mitochondrial biogenesis and endurance performance after a single sprint interval training (SIT) session and six weeks of SIT training.

WHAT THEY DID

Nineteen males perform a single SIT session and 16 participants from the initial sample completed six weeks of SIT (three sessions per week). Biopsies were obtained before, immediately after and 3h after the single SIT session. Those who participated in the six training weeks repeated the biopsy collection. Before and after the six training weeks, participants were tested for a graded exercise test (GXT), a 2-km cycling time trial (TT2) and 20-km cycling time trial (TT20). Subjects were divided into a CWI group (lower body CWI at 10°C for 15min) or control group for both the SIT session and the training intervention.

WHAT THEY FOUND

As expected, the mitochondrial biogenesis markers improved from pre- to post-single SIT session. The authors found no differences in any molecular marker of mitochondrial biogenesis between recovery interventions. Moreover, no differences between conditions (CWI vs. control) were observed for the different endurance performance tests.

>> Practical Takeaways

This study demonstrates that CWI provides no performance benefits when subjects only perform three training sessions a week. Lack of adaptations in performance markers are consistent with the lack of differences between CWI and control groups in the acute mitochondrial biogenesis observed.

Based on the findings from this study, CWI does not provide any beneficial effects in untrained subjects exposed to three SIT sessions per week. The fact that subjects had ~48h to recover between training sessions may explain the lack of benefits observed in those exposed to CWI.

Therefore, one of the first questions a coach should raise before implementing CWI must be: Can the athlete recovery naturally between training sessions, or does he or she need to accelerate recovery in order to perform?

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



Francisco's Comments

"Numerous studies have previously investigated the effects of CWI on recovery in endurance exercises; however, research investigating the molecular acute responses and adaptations to endurance training is scarce. Although no differences were found in mitochondrial biogenesis markers from CWI, as the authors suggest, the time points that biopsies samples were collected after exercise may have hidden some findings.

Nevertheless, the end goal of a training programme (and recovery programme) is to improve performance. In this study, no differences were observed between the groups. As discussed previously in other Performance Digest issues, the rationale to implement CWI when sessions are performed with an interval >48h is questionable. Recent research in highlytrained cyclists demonstrate that CWI may provide some benefits in endurance (See Article #1), demonstrating that the training -load and training frequency are important when deciding to incorporate or not CWI."

SPORT

Youth Development

This month's top research on youth development.

RESISTANCE TRAINING FOR CHILDREN AND ADOLESCENTS

Myers, A.M., Beam, N.W. and Fakhoury, J.D. 2017. Translational Pediatrics.

DO THE SEASONS AFFECT A CHILD'S LEVEL OF PHYSICAL ACTIVITY?

Ridgers, N.D. et al. 2017. Journal of Sports Sciences, pp.1-7.

INJURY RATES IN ENGLISH PROFESSIONAL FOOTBALL ACADEMIES: HAVE THEY INCREASED SINCE THE INTRO OF THE EPPP

Read, P.J. et al. (2017) Journal of Sports Sciences, 1-7.



RUSSEL

Resistance Training for Children and Adolescents

OBJECTIVE

Despite a large amount of research produced that focusses on resistance training in children and adolescents, few coaches, parents and/ or physical education teachers are aware of the need for regular resistance training (RT) to support health and wellbeing. This article aims to bring the reader's attention to ethical strength and conditioning practice to optimise performance and support participation.

WHAT THEY DID

This article introduces the reader to various terms used by a number of sports science roles (physiotherapist, sports coaches, S&C etc.) by breaking complex statements into simple terms. For example:

'Strength training: The use of resistance methods to increase one's ability to exert or resist force. May include free weights, body weight, machines or other resistance devices to attain this goal.'

'Core strengthening: Focusing a programme to the muscles that stabilise the trunk. Emphasises on abdominal, lower back and gluteal muscles.'

In creating these definitions, this research can be handed to parents, coaches and carers to support their understanding of the broad role of strength training in a youth sample.

WHAT THEY FOUND

The benefits of RT in youth and adolescent athletes are primarily linked to improvements in the central nervous system (CNS) through maturation and neural proliferation (See attached article). Such improvements lead to increased force potential, stretch shortening cycle function and changes in bone mineral content through loading. These benefits lead to improvements in health and wellbeing; but are not without risk.

One of the main risks associated with RT is to the epiphyseal plates. These problems are unique to developing children, as hyaline cartilage at the ends of youth long bones has not yet hardened. Further injuries include soft tissue injuries, with a majority to the trunk region. This is thought to occur as a result of programmes which over emphasise superficial muscles (six pack) and neglect the deep core and trunk.

>> Practical Takeaways

It is clear that the benefits of RT outweigh the risk associated with regular strength training. A major issue in youth RT usually stems from inadequate supervision, poor loading strategies and poor knowledge regarding youth resistance training. It is therefore important that coaches are continually seeking the help of suitably trained practitioners who are aware of the needs for youth athletes.

In previous issues, resistance training in youth has also been linked to increased wellbeing and academic success. One of the long-lasting benefits of early physical activity is the increased likelihood of long-term sports/health participation. This does not only ensure health longevity, but may also contribute to a strong social element which can often be overlooked in sports science literature.

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





Tom's Comments

"If you choose to read this paper, you will see that a majority of the terms we use and understand on a day to day basis have been given a definition (see the 'What they did' section for some examples). These help to transform some of the misconceptions associated with strength training, where typically associated resistance training concepts (squats, deadlifts or Olympic variations) are discussed in a broader sense such as 'body weight' training. Whilst this may seem an obvious notion to those with knowledge, few teachers or parents may associate bodyweight as a form of resistance or core strengthening with the lower back and gluteal muscles.

In discussing the concerns of RT, the Performance Digest reader is advised to read the last chapter, with three notable statistics being highlighted:

- ⇒ RT injury rates = 0.035 per 100 participant hours
- ⇒ Adolescent power lifters injury rates = 0.29 per 100 participant hours
- ⇒ Heavier contact sports (e.g. Rugby and American Football) injury rates - 0.800 per 100 participant hours.

These articles should be promoted to support the discipline moving forward and to dispel the many myths associated with youth RT (stunted growth, bone damage and injury)."

SPORT

Do the seasons affect a child's level of physical activity?

OBJECTIVE

The benefit of regular physical activity has been well documented, with the development of physical, social and mental health being key to growing children. However, few studies have investigated the effects of the season (Winter, Summer etc.) on physical activity.

WHAT THEY DID

Ridgers and colleagues looked to investigate activity patterns in 326 children (ages 8-11) during recess and lunchtime over varied seasons (Winter n = 246, Spring n = 211, Summer n = 161 and Autumn n = 139).

To track activity, hip-mounted accelerometers provided data every 15 seconds for 7 days in every season. Activity was classified as either light physical activity (LPA), moderate (MPA), vigorous (VPA) and moderate to vigorous physical activity (MVPA). Multilevel models of analysis are appropriate for research designs where data for participants are organised at different levels (recess, lunch, seasons etc).

WHAT THEY FOUND

This study was the first to show a decrease in physical activity levels during spring and summer. Ridgers and colleagues suggests that this is due to lunchtime occurring around the hottest time of the day in Australia (24.4 to 26.6°C), where we would typically see optimal levels of moderate and vigorous physical activity around 20-22°C. These results are not consistent with other countries such as the UK, where no differences were seen in physical activity between the summer and winter. In contrast, a study undertaken in the US found that children were most active in the spring.

>> Practical Takeaways

In this study, it may be suggested that in certain areas of the world, physical activity can markedly increase/decrease in accordance to the weather. As a recommendation, it may be beneficial to periodise activities that are high or low physical activity interventions at different times of the year. For example, if children in Australia are less active during lunchtime (midday), it may be advantageous to have active clubs before and after school to combat this. In addition, activity during recess is typically higher and could be supported with more vigorous activities (small-sided games, evasion sports or gymnastics sessions). These can often be difficult to implement, as it may clash with the benefits of 'free play' that encourages problemsolving, imagination and enjoyment as shown in the video link.

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





Tom's Comments

"This study was a really interesting insight into the effects of weather on physical activity. It is always important to continually question the methodology of such studies when reliability issues (e.g. equipment and duration) come into question. For example, for a day to be considered valid, children were required to wear their accelerometer for 50% of their recess and lunchtime period. However, does this truly reflect the activity levels of the child during and after school?

Another important consideration is that this study was conducted on one school with a low socioeconomic status. Further studies should look to compare the effects of socioeconomic status on physical activity during these periods as timings, coaching quality and opportunities to explore a variety of sports are different in varied economic classes. Finally, these recommendations may not be globally applicable and should vary depending on geographical location. One interesting idea for practitioners may be found in the article link, which discusses cooling strategies before competition."



Injury rates in English professional football academies: Have they increased since the intro of the EPPP

OBJECTIVE

The English Premier League is arguably the biggest football league in the world. With the large amounts of money invested in producing new and exciting players, academies are continually looking for the best methods to nurture talent. Regulations from the Elite Player Performance Plan (EPPP) (See article link) now state that academies in the UK are required to substantially increase the volume of football training. However, high training volume (≥5 Hours) can increase the likelihood of overuse injuries. As such, Read and Colleagues (2017) have investigated the occurrence of injury to provide an updated report prior to the introduction of the EPPP.

WHAT THEY DID

In this study, the researchers investigated the recorded injuries in six professional soccer teams (2014-2015) in 608 players (age 11-18). This design is a longitudinal study, which follows over time a group of similar individuals (cohort). Injuries were calculated by dividing the number of injuries sustained by the players on the team. Injury severity was judged on four criteria:

- 1) Slight (2-3 days)
- 2) Minor (4-7 days)
- 3) Moderate (1-4 weeks)
- 4) Severe (> 4 weeks)

Further observations included contact and non-contact injuries, as well as injury timing over the season.

WHAT THEY FOUND

In total, 804 injuries were recorded between the 2014-2015 season. This equated to roughly 1.32 injuries per player/per season which resulted in 21.9 days lost to injury (mean). Of these injuries, 38.3% were to the knee and ankle, with a large proportion occurring due to non-contact injury (62.1%). These injuries were not limited to, but were mainly comprised of muscle strains and sprains. The greatest time loss per injury was in the U14s-U15s category, with the highest rate of severe injuries in the under 15's. In addition, injury incidence seemed to peak in September and January near the start and middle of the season. Based on a previously published audit, this study indicates that academy players are three times more likely to experience an injury since the formation of the EPPP.

>> Practical Takeaways

This study certainly reinforces previous concerns regarding training volume; with 'more' training creating the potential for a higher incidence of injury. This seems particularly prevalent around the age of 15, where most males will have just finished their substantial increase in height, also known as peak height velocity (PHV). PHV is accompanied by long-bone and muscle growth, which significantly alters lever length and thus contributes to fluctuating levels of coordination. This, in conjunction with an increased allocation of hours should ensure that practitioners are building their programmes around strong movement foundations.

For example, highly repetitive training in the absence of good technique could lead to overreaching or muscle recruitment imbalances that may lead to acute/chronic injury. To prevent this, successful initiatives have been introduced in schools (See attached video) and could support category academies moving forward. This advice should take precedence in players around the age of 15 (Post PHV), as these were at the greatest risk of severe injuries. In addition, the peak incidence of injury (September-January) suggests that injury may be the result of being under conditioned (September = early season) or a fatigue-mediated phenomenon due to accumulated games and training (January).

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





Mark's Comments

The staff at Science for Sport would like to welcome the comments from one of the co-authors of this research, Professor Mark De Ste Croix, who is a lecturer at the University of Gloucestershire and experts in paediatric sport and exercise science.

"In comparison to a published audit prior to the inception of the EPPP, this study indicates that academy soccer players are three-times more likely to experience an injury. Given that time loss and injury severity also increased during periods that typically follow rapid growth, these players should be considered an important group for training load monitoring and injury prevention strategies. Clubs need to consider carefully how they use the additional EPPP hours available and appropriate movement competency training, alongside bracing, strengthening and plyometric work (to include good landing mechanics) is needed."



Nutrition

This month's top research on nutrition.

DOES POLYPHENOL SUPPLEMENTATION EFFECT ACUTE AND CHRONIC RESPONSES TO RESISTANCE TRAINING?

Beyer, K. S. et al., (2017). Journal of Strength and Conditioning Research, 31, (11), 2945-2954.

CARBOHYDRATE BLEND VS. CARBOHYDRATE MOUTH RINSE ON ANAEROBIC PERFORMANCE

Krings, B.M. et al. (2017). International Journal of Sport Nutrition and Exercise.

POPULAR ENERGY + CAFFEINE DRINKS BEFORE EXERCISE: DO THEY HAVE ANY EFFECT?

Jeffries, O., Hill, J., Patterson, S. & Waldron, M. (2017) J Strength Con Res, Epub ahead of print.



Does polyphenol supplementation effect acute and chronic responses to resistance training?

OBJECTIVE

The first objective was to understand the effects of a 4-week polyphenol-blend (PPB) supplementation (containing green and black tea extracts) on resting hormonal concentrations and circulating indicators of systemic oxidative stress. Secondly, an acute high-volume lower-body resistance training session was performed to examine responses in the hormonal and oxidative stress changes at the end of a 4-week supplement period.

WHAT THEY DID

The study consisted of three phases and used a randomised, double-blind placebo-controlled study design. 40 untrained male participants were randomly assigned to three treatment groups (control: CON, Polyphenol Blend: PPB, and Placebo: PLA). Participants in PPB and PLA groups completed a 4-week supplement period either 2000mg.day-1 of active supplement (PPB) or PLA (Phase I), and acute high-volume exercise bout with four days follow-up blood samples post-exercise (Phase II) and a 6-week resistance training programme (full-body exercises 3 days. week1) (Phase III). The control group was only included during Phase I. Blood samples were completed during Phase I and II. Maximal lower-body strength was evaluated before and after Phase III.

WHAT THEY FOUND

Researchers found that a daily polyphenol-blend supplementation for 4 weeks increased concentrations of total antioxidant capacity when compared to placebo. In addition, six weeks of the supplementation combined with resistance training resulted in similar strength gains between groups. Consequently, polyphenol-blend supplementation may be an effective strategy to increase antioxidant capacity without hindering strength improvements in untrained male participants after 6-weeks of resistance training.

>> Practical Takeaways

Polyphenols structures can be found in groups of plant, fruit and vegetable based foods. Recently it has become popular to consume polyphenols (and/or derivatives) to aid the reduction of oxidative stress biomarkers , or more commonly known as exercise induced muscle damage, albeit the jury is still on the fence for the success of these compounds due to lacking critical research.

The study showed that supplementing with PPB can have effects on resting total antioxidant capacity and did not hinder strength gains in untrained males after a 6-week progressive resistancetraining programme. Practically, it's important to highlight that these are untrained participants training 3 days a week, which may not be representative of the athletic populations that's readers may work with. Readers should then take caution when applying these results to those athletes who not only train more than 3 days a week, but also the potential of competition. Additionally, supplement compliance of 80% was set throughout the study and may have provided some error in the results being shown. Finally, participants were said to have completed all supplement ingestion through returning their packs to the investigators, which may not be the most accurate way to access compliance rate.

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



James's Comments

"Although the authors do show favorable effects of PPB for recovery, these data should be taken with caution. The manuscript fails to provide any details of the actual nutrient intakes that participants consumed for the two days leading into each trial and were, in fact, asked to 'remember as accurately as possible' and then mimic this. Additionally, a three-day food log was completed for the six weeks of training, but again, with no insights into the breakdown of what was actually eaten and further food diaries have many known limitations. The study only assessed adaptations to lower-body strength instead of whole body strength changes.

Finally, I would like readers to understand that the study was funded by a grant from Kemin Foods L. C. who are the manufacturer and distributors of the active supplement PPB and where one of the authors to the manuscript is a R & D scientist. This goes to show that you cannot just read a study abstract and accept the findings as accurate or trustworthy; deeper analysis is crucial.."

Carbohydrate blend vs. carbohydrate mouth rinse on anaerobic performance

OBJECTIVE

The aim of this study was to examine the effects of two carbohydrate administration techniques (carbohydrate ingestion (CHOI) and carbohydrate mouth rinse (CHOR) during acute bouts of repeated maximal cycling sprints on power output, heart rate and ratings of perceived exertion.

WHAT THEY DID

Fourteen healthy active males with intermediate resistance training experience volunteered to participate in the study. Following a five-minute warm-up on a cycle ergometer, participants immediately began a series of five maximal 15-second sprints against 0.075kg • kg-1 body mass interspersed with four minutes of active recovery.

WHAT THEY FOUND

The main finding from this investigation suggests that CHOI of a 10% solution was more likely to provide a beneficial performance effect compared to PLAI and PLAR and CHOR. To elaborate, CHOI showed significant greater mean power output, total work and significant attenuated fatigue index compared to CHOR. With no mechanistic data from the study to conclude why there are ergogenic effects during this protocol, the authors suggested gastric emptying rates and CHO availability of substrate used in the muscle may have partially explained performance enhancement. The results of this study also reported that there were no significant improvements with CHOR during short-duration anaerobic exercise. This is in disagreement to previous studies that found improvement in performance during moderate to high-intensity exercise (~60% to 75% VO2max) of at least 1-hour duration (De Ataide e Silva et al., 2014 - **HERE**).

>> Practical Takeaways

It has been previously believed that to optimise anaerobic performance, CHOR may be a popular method of administration as it may minimise gastrointestinal distress compared to CHOI and activate brain regions related to the sensation of reward and pleasure; especially during exercise lasting less than 1-hour. Although this type of protocol may not be practical to on-field athletic demands, the results of the study can still be applied to athletes or recreational exercisers who are required to perform repeated bouts of maximal intensity exercise.

For example, it is quite common to see physios or other members of performance teams running onto the field during periods of stoppage to pass fluids to athletes. Therefore, a mixture of water and carbohydrate solutions should be included in the water racks so that athletes who may not only want something more palatable than water in differing environmental conditions, but they then also have the option to ingest the fluids or simply rinse and spit out.

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



James's Comments

"Despite the fact the participants in this study were advised to maintain dietary habits before each experimental trial, the authors did not monitor participants' food intake via food diaries or 24-hrs recall, for example. Therefore, there's a possibility that participants muscle glycogen stores differed between each experimental trial. Additionally, the study's experimental protocol is not externally validated to match the demands of typical team and/ or field sports. Readers should also note that only one familiarisation session was conducted, and as such, results from the healthy males may have been influenced from a learning effect alone, especially considering the large standard deviations are displayed."



Popular energy + caffeine drinks before exercise: Do they have any effect?

OBJECTIVE

Researchers sought to determine the effect (compared to a placebo) of co-ingesting caffeine and taurine, in respective doses that would match those typically seen in popular commercial energy drinks, on performance in repeat-sprint cycling.

WHAT THEY DID

This was a randomised, double-blind, cross-over, repeated measures study with 11 physically active male university students. Subjects ingested either a caffeine/taurine (80mg/1g) gelatine capsule (CAFTAU) or a placebo capsule (PLA) 60mins before exercise. They then completed 10 x 6s sprints on a cycle ergometer with rest periods of 24s between each sprint. Researchers measured performance as peak power but also took measurements of Blood Lactate Concentration, RPE (rating of perceived exertion) and Heart Rate at baseline, after sprint #5 and after sprint #10.

WHAT THEY FOUND

Results showed no significant difference in peak power generated between CAFTAU and PLA conditions. During the CAFTAU condition participants had a higher rate of fatigue during sprints 6-10 compared to PLA. 8/11 participants demonstrated reduced ability to maintain power during sprint #10 in CAFTAU condition vs PLA. There was no significant difference in RPE or heart rate across the exercise duration between CAFTAU and PLA. Baseline heart rate was significantly higher in CAFTAU condition. Blood lactate concentration was not different at baseline but was significantly higher when measured at sprints #5 and #10 in the CAFTAU condition compared to PLA.

>> Practical Takeaways

Contrary to the various advertisements and promises of performance boosting capabilities, energy drinks may, in fact, be deleterious to performance. This research demonstrates how both performance measures and physiological variables are either unaffected or worsened by doses of caffeine and taurine representative of energy drinks often used by athletes both before and during performance.

This research only investigated high-intensity/short duration performance, but this could be seen as representative of the sort of work required in most team sports when quick bursts of movement are interspersed with less intense periods – albeit this was performed during cycling rather than running. However, caffeine and taurine should not be disregarded as ergogenic aids as the existing research on their performance enhancement is lucid and abundant. That being said, athletes or coaches looking to elicit any benefit from the supplements should consider using higher doses than those found in commercial energy drinks.

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





James's Comments

"This research is limited by its small sample of 'physically active' university students, but after reading around the existing literature on this topic, it concurs with results of many other studies. Further research into the effect of energy-drink doses on other exercise modalities, for example, longer duration aerobic exercise, is warranted to determine if these doses could have positive effects for any type of sport.

Coaches and athletes taking this research on board would be able to save money by buying supplements in their isolated form and ingesting doses that will actually aid performance, rather than purchasing them in energy drink form and not gaining any beneficial effects. Finally, typical endurance cycling events are preceded by a longer period of time spent in the saddle with peak periods of hill climbs or chases that would warrant intake of ergogenic supplementation, although this study didn't include any cycling of this endurance nature before the sprinting period."



HOW IMPORTANT IS MUSCULAR STRENGTH TO ATHLETIC PERFORMANCE?





WHAT THIS MEANS

"This review of the current literature supports the notion that greater muscular strength underpins various physical and performance attributes and can be instrumental in improving an individual athletic performance"

Study: Suchomel TJ, Nimphius S, Stone MH. The Importance of Muscular Strength in Athletic Performance. Sport Med. 2016;46(10):1419–49.

DOES BEETROOT JUICE IMPROVE INTERMITTENT EXERCISE PERFORMANCE?





WHAT THIS MEANS

"Loading beetroot juice for 6-days prior to intermittent exercise can reduce heart rate and improve performance in trained athletes. This study provides evidence that nitrate loading may be a viable protocol for intermittent sports such as football, rugby and basketball"

Study: Nyakayiru J, Jonvik K, Trommelen J, Pinckaers P, Senden J, van Loon L, et al. Beetroot Juice Supplementation Improves High-Intensity Intermittent Type Exercise Performance in Trained Soccer Players. Nutrients. 2017.

NUTRITIONAL SUPPORT FOR THE INJURED ATHLETE

WHAT THIS MEANS

"Maintaining positive energy balance, consuming higher protein intakes and some specific supplementation is recommended. Consuming primarily whole or minimally processed foods and a well-balanced diet will help to meet micronutrient needs and will likely improve recovery outcomes in injured athletes."

Study: Tipton KD. Nutritional Support for Exercise-Induced Injuries. Sport Med. 2015;45(S1):93–104.

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