

March 2018 | Issue #17

THE PERFORMANCE DIGEST

A review of the latest sports performance research



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Welcome to the **PERFORMANCE DIGEST**

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



OWEN WALKER

Founder and Director of
Science for Sport

LATEST NEWS

So, what's special in this month's issue?

1. **Audio Review (UPDATE)** — As a result of the positive feedback received on the first Audio Review with Francisco Tavares on Cold Water Immersion, we decided to make this a monthly feature. So, in this issue, you'll find the second audio review where I discuss Force-Velocity Profiling with James de Lacey.
2. **Injury Prevention & Rehab** — We at Science for Sport are on a constant quest to deliver the very best service you could ever imagine, because we believe the real value of what we do, is you. The reason for that, is because despite all of the best information in the World, without you and your coaching skills, this information would go wasted and never be transferred to where it's truly needed—to the athlete's. Therefore, what you ask for, we deliver. So due to a high-demand for an "Injury Prevention & Rehabilitation" section from all of the members, we felt it was only fitting that we should deliver it. As such, we'd like to welcome Dr. Stephanie Allen into the Science for Sport team as our newest "Research Reviewer" for the "Injury Prevention & Rehabilitation" section. You can check out Stephanie's bio on the next page (Page #5).

Thanks for reading, and for being a member :)
Owen Walker

Research Reviewers



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.



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.



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.



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.



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 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)



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.



Dr. Stephanie Allen

PT, DPT, OCS, CFSC

Injury Prevention & Rehab

Stephanie is a Physical Therapist who graduated from Ithaca College and is working at Boston PT & Wellness. She is passionate about strength & conditioning and how it plays into rehab, and is also a member of the Strength Faction program.



Audio REVIEW

Force-Velocity Profiling

A 1-year recap on what we know and hope to find out from future research.
with James de Lacey

WHAT WE DISCUSS

In this episode of the "Audio Review", myself (Owen) and James de Lacey discuss the current hot-topic of Force-Velocity Profiling, including what we currently know, and don't know, from the research.

In this episode, we discuss:

- What Force-Velocity Profiling is
- Who it may be useful for (e.g. what teams/athletes)
- How you can Force-Velocity Profile your athletes and what the easiest method of doing is
- The validity and reliability of those testing methods
- When you should be looking to reduce and Force-Velocity imbalance throughout the year
- What we currently don't know about Force-Velocity Profiling
- What research we hope to see in the near future

Episode length = 35 minutes



Listen Now



Key Takeaways

- Force-Velocity Profiling can be used to identify if an athlete is force- or velocity-dominant.
- We can establish an "optimal" profile for vertical Force-Velocity Profiling, but not horizontal, yet.
- The MyJump and MySprint Apps can be used to reliably generate a Force-Velocity Profile.
- We should look to reduce the imbalance when there is not an important competition right around the corner.
- When generating a vertical Force-Velocity Profile, it's easiest to use 0, 20, 40, and 60kg for a jump squat. The bar height should be placed at the acromial process of the shoulder.
- Always record in slow-motion and ensure you use a 3-second "grace period" before and after recording.
- We hope to see research on a tapering effect from Force-Velocity Profiling and the generation of an "optimal" horizontal Force-Velocity Profile.

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The Science of COACHING

How a coach can decrease injury rates and improve attendance

Coaches often complain of high injury rates and lack of attendance, so here's what appears to be a useful and instantly-actionable solution.

[Abstract]

INTRODUCTION

Managing and preventing injuries is a significant role undertaken by the coaching and support staff of any elite or performance sport team. Athlete workloads are typically the major risk factor associated with injury occurrence amongst athletes, however, in recent times it has been suggested that the leadership style of the head coach may also contribute to injuries amongst athletes (**HERE** and **HERE**).

Regardless of the context, leadership involves influencing others (in this case athletes) with the view of achieving a common goal. Different leadership styles have been linked with improvements or decreases in various outcomes including motivation, engagement, skill development, and team cohesion. It is therefore possible that the leadership style adopted by a coach could influence the stress levels and coping mechanisms of athletes, which, in turn, may contribute to the occurrence of injuries amongst their athletes. As such, this study looked to determine if a specific leadership style (transformational*) used by elite football coaches was linked to the injury rates of those players in their team.

*Transformational coaching style involves motivating and inspiring followers to go beyond their self-interest for the benefit of collective interests by providing vision, meaning, challenges, and stimulation (**HERE**).

WHAT THEY FOUND

There was a negative correlation between the use of a transformational leadership style and the incidence of injuries among elite football players. With regards to specific behaviours, the results showed

- ⇒ 33% decline in severe injuries and a 4% increase in attendance when coaches stopped or did not treat staff and athletes as individuals.
- ⇒ 23% increase in severe injuries and a 4% decline in attendance when coaches did not provide encouragement or recognition to their athletes and support staff.
- ⇒ 5% decline in player availability for training and matches due to injury when coaches did not provide clarity regarding their role to athletes and support staff.
- ⇒ No correlation between a coach being charismatic and decreasing injury incidence amongst the athletes.

WHAT THIS MEANS

Overall, the use of a transformational leadership appears to be linked with a decrease in the incidence of severe injuries, though it is not completely clear as to why this relationship exists (i.e. correlation does not mean causality). In addition to this, there was a decrease in the incidence of severe injuries, along with attendance at training, and the injury burden (absence due to injury) when the coaches used specific behaviours associated with this type of leadership style including:

- ⇒ Vision
- ⇒ Staff development
- ⇒ Supportive leadership
- ⇒ Empowerment
- ⇒ Innovative/lateral thinking
- ⇒ Leading by example

Practical Takeaways

The use of a transformational leadership style by a coach - which encourages democracy - can not only influence behavioural and social aspects of athletes, but also appears to impact the physical attributes that are also associated with playing sport (e.g. injury rates). As stated by the authors, in combination with workload monitoring to reduce the occurrence of injuries and improve attendance at training, coaches would be best served to create an environment which is characterised by support, trust, and an appreciation of all athletes and staff.



Dr. Will Vickery

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

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Strength & Conditioning

This month's top research in strength & conditioning.

LINEAR AND MULTIDIRECTIONAL SPEED: CAN WE USE PAP TO IMPROVE THEM?

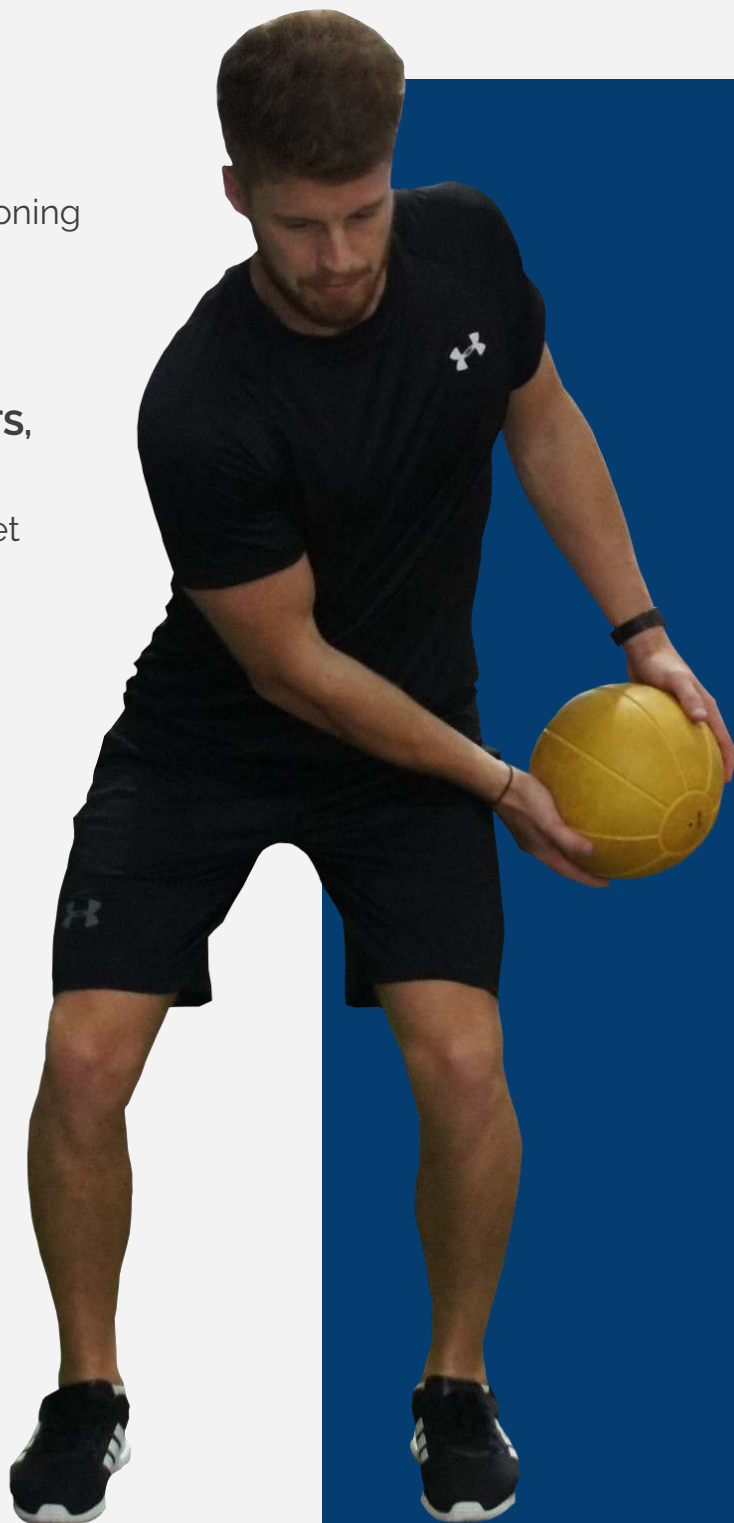
Lockie R, et al. (2018) Strength and Conditioning Journal, 40(1), 75-91.

WHICH IS BEST FOR IMPROVING JUMP PERFORMANCE: PLYOMETRICS, OLY LIFTS, OR STRENGTH TRAINING?

Berton R, Lixandrão M and Pinto e Silva C et al. (2018) Journal of Sports Sciences, 1-7.

OPTIMAL METHODS FOR MAXIMISING STRENGTH GAINS IN ATHLETES

Suchomel T, Nimphius S and Bellon C et al. (2018) Sports Medicine.



[Abstract]

Linear and multidirectional speed: Can we use PAP to improve them?

OBJECTIVE

Post-activation potentiation (PAP) is a phenomenon in which muscular performance is enhanced after prior contraction. It has been shown to increase subsequent rate of force development in the muscle. While many studies have assessed the effect of PAP on linear speed, there is a need to synthesise all of this data in order to come up with practical recommendations for the strength and conditioning coach. There is also limited knowledge of the effect of PAP on change of direction (COD) speed. Therefore, this study reviewed the current literature on the PAP response for both linear and COD speed.

WHAT THEY DID

The authors completed a narrative literature review on the effect of PAP on linear and COD speed, with a focus on the practical applications of these results. They also conducted a brief meta-analysis of the available literature regarding PAP and linear speed. Where appropriate, percentage changes and magnitude-based inferences (as shown by effect sizes) were documented. Effect sizes were calculated for those data whose mean SD (standard deviation) values were presented numerically within the manuscript.

WHAT THEY FOUND

PAP and linear speed

This review suggests that linear speed can be potentiated by a strength-based conditioning activity (CA) such as a back squat (using loads of 60-90%), or a plyometric-based CA such as alternate leg bounding. It is important to note that studies have shown a large degree of individual variation in how much linear speed can be potentiated. There is also large variance in the methodology used in these studies (different exercises, reps/intensities, time-periods between CA and performance).

PAP and COD speed

There is far less research on the effect of PAP on COD speed (only 2 studies to date), however, preliminary investigations seem promising. Ultimately, more research is needed before definitive conclusions and practical applications can be more accurately provided.

» Practical Takeaways

One of the biggest takeaways for strength and conditioning coaches from this literature review is that there is a huge variance in responses between individuals using PAP. Therefore, prescribing blanket PAP methods for all athletes will not optimise results across the board. It is crucial for the strength coach to measure individual responses to different protocols and see how the athlete responds. The strength coach should experiment with different rest times between the CA and speed/COD task, different exercises (e.g. bilateral, unilateral, knee-dominant, hip-dominant, etc), and different intensities (60-95% 1RM). It is only after experimenting with this that the strength coach will know what works best for each individual.

Furthermore, while it appears that the optimal rest period (on average) between the CA and subsequent performance is around 6-7 minutes, in a practical setting, time constraints will likely not allow for you to wait this long between activities. One way to at least ensure a couple of minutes between the CA and subsequent task is to place a low-level "filler" exercise between the two. For example: heavy back squat > hip mobility drill for 2 min > depth jump. While this likely won't maximise the PAP effect, it will at least allow for better results than moving straight from one to the other, when acute fatigue may impair performance.

Finally, PAP work doesn't have to be confined to the gym. On field, doing alternate leg bounds as part of your warm-up before maximal sprinting may help enhance subsequent sprint performance. For example, the strength and conditioning coach might get the athletes warm, then do some bounds followed by dynamic stretches (to allow for time between CA and sprinting), and then proceed to maximal sprints.



Tim's Comments

"While PAP is certainly a fascinating topic, it is important to remember that things like PAP are the 1-2%'s, or the so-called "icing on the cake" in a programme. Do NOT base your strength programming around maximising PAP. Base your programming around getting athletes stronger, more robust/resilient, and more powerful. Furthermore, research has shown that stronger/more advanced athletes are the ones who see the best results from PAP anyway. Because of this, I personally would not recommend worrying about PAP unless you are working with more advanced athletes who can at least squat 1.5 x bodyweight. Before that point there are more important things to focus on.

On a different note, it is interesting to see the lack of studies on the effect of PAP on COD speed. It would be great to see research on whether a heavy lateral sled drag or lateral bound could be used to potentiate COD performance in the near future!"

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



[Abstract]

Which is best for improving jump performance: Plyometrics, Oly Lifts, or Strength training?

OBJECTIVE

Vertical or countermovement jump (CMJ) ability is a crucial aspect of physical performance in many sports. Many different types of training have been shown to improve jump performance, however, it is currently unknown which type of training causes the greatest improvements. Therefore, the purpose of this meta-analysis was to compare changes in CMJ performance from weightlifting (WL), traditional resistance training (TRT), and plyometric training (PT) to determine the most effective means of improving CMJ ability.

WHAT THEY DID

The authors searched for studies on this topic in the databases 'PubMed' and 'ISI Web of Knowledge' from 1970 to October, 2016. The inclusion criteria for study selection was: a) investigated direct comparison between WL exercises versus TRT and/or between WL exercises versus PT; b) at least six weeks of training; c) allowed the extraction of data for analysis (mean, standard deviation, and sample size); d) scored equal to, or greater than, four on PEDro scale; and e) measured CMJ height as an outcome variable.

WHAT THEY FOUND

Only 7 studies met the inclusion criteria. Four studies compared WL exercises versus TRT (total n = 78), and four studies compared WL exercises versus PT (total n = 76), with one study comparing both. All studies classified by PEDro scale had a range of 4-5 points (moderate quality).

The main 2 findings of the meta-analysis were:

1. WL exercises produced greater improvements in CMJ performance compared to TRT (7.5% vs 2.1% improvement, respectively).
2. WL exercises and PT were equally effective in improving CMJ performance (8.8% vs 8.1% improvement, respectively).

» Practical Takeaways

The main takeaway for strength and conditioning coaches from this study is that both weightlifting exercises and plyometric exercises can be used to maximise vertical jumping ability. Ultimately, the athletes' experience with WL exercises and the demands of the sport should help you determine the ideal type of training to use with your athletes.

While weightlifting exercises are certainly more difficult to learn than plyometric exercises, this does not necessarily mean we should do away with them. We should instead simply use easier to learn WL variations for those not familiar with them, such as jump shrugs and hang high pulls. These can then be progressed into hang cleans or cleans from blocks over time.

On the whole, coaches should not be married to one type of training and should probably use both to maximise CMJ performance—though combining the two has not yet been studied directly. This also does not mean we should do away with traditional resistance training either. It has a very important place in a training programme, as it is the best type of training to increase maximal strength and muscle hypertrophy. Overall, a combination of all three types of training should find their way into most strength programmes, to not only make the athlete resilient to injury, but to also hit all parts of the force-velocity curve to maximise performance!

Want to learn more?

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Tim's Comments

"I was particularly interested to review this study as there has been much debate amongst strength coaches about the 'best' type of training to maximise vertical jump ability. There are many coaches who are married to one type of training, and so I was glad to see that both Olympic weightlifting and plyometric training had the same impact on vertical jump performance. This should help stop claims that there is 'one' best way to train for power development.

Furthermore, the results of this review support the principle of specificity (i.e. it is known that strength gains are velocity specific). Because a CMJ is a fast-velocity movement, the fast velocity types of training (WL and PT) were superior to the slower velocity TRT. WL exercises were also likely superior to TRT due to joint angle-specificity too, whereby the joint angles trained in WL are more similar to those seen in a CMJ compared to in TRT."

[Abstract]

Optimal methods for maximising strength gains in athletes

OBJECTIVE

A high level of muscular strength is desirable for most athletes, as it not only helps protect against injury, but also enhances sporting performance. Therefore, understanding the training considerations to improve strength (e.g. methods, loading strategies, set configurations) and the underlying physiological factors that affect muscular strength is crucial for strength coaches.

WHAT THEY DID

The authors searched for studies and reviews on this topic published in the PubMed and Medline databases, as well as Google Scholar, up until July, 2017. They primarily focused on maximal dynamic strength rather than isometric or reactive strength. They included search terms such as 'periodization', 'muscular strength', 'hypertrophy', 'bodyweight training', 'machine resistance training', 'weightlifting', 'plyometric training', 'eccentric training', 'unilateral resistance training', 'variable resistance training', 'training to failure', 'training status', and 'rest interval'.

WHAT THEY FOUND

There were a number of important findings from the review:

- Strength development is underpinned by a combination of morphological (e.g. muscle CSA) and neural (e.g. motor unit recruitment) factors.
- Block periodisation may produce the greatest improvements in strength, as well as rate of force development (RFD) and power.
- Bilateral training, eccentric training, accentuated eccentric loading, and variable-resistance training may be the best ways to maximise strength gains.
- Bodyweight exercise, isolation exercises, plyometrics, unilateral exercise, and kettlebell training are inferior methods to improve strength, but are still relevant as they can be used to improve RFD and power, and to challenge motor demands.
- Training to failure is not necessary to maximise strength gains.
- Multiple sets may increase strength gains more so than single sets.
- While cluster sets may benefit hypertrophy and power adaptations, they may not benefit strength improvements to such a degree; however, more research is needed on this topic.
- Inter-set rest intervals ranging from 2-5 min may provide the greatest strength-power benefits.

» Practical Takeaways

There are a number of important takeaways related to the findings of this review. Firstly, while multiple sets was found to be superior to single sets for strength development, the number of sets prescribed should be based on their training status and the dose-response relationship for muscular strength development. For example, a beginner may only need 1-2 sets per exercise to maximise the strength response (so doing 3-4 sets may only increase fatigue for no further gain), whereas a more advanced athlete may need 4-5 sets to maximise strength gains.

Furthermore, while 2-5 min rest was found to be optimal for strength gains in this review, ideal rest interval length is likely to vary athlete to athlete depending on the athlete's training age, fibre type, and genetics; so auto-regulation is perhaps best practice in this scenario.

Finally, this review suggests that weaker athletes should focus on developing a strength foundation before power-type exercises and training methods (plyometrics and potentiation complexes) are emphasised. It suggests that stronger athletes, however, begin to emphasise power-type exercises and training strategies while maintaining/improving their strength levels in order to maximise physical performance.



Tim's Comments

"With over 250 references, it's great to see a comprehensive and well-written review on this massive topic. Most importantly, it's fantastic how the authors have presented the findings in a way that is so practically applicable for strength coaches.

In line with the prior review too, it is clear from this review that no single exclusive training method can achieve the range of adaptations required for both strength and power. Combining heavy and light loads (moved quickly) may produce the desired strength adaptations while also developing RFD and power characteristics that are critical to sport performance.

Finally, I am looking forward to seeing more research on accentuated eccentric loading and cluster sets in the future – two very promising methods for enhancing strength gains."

Want to learn more?

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Technology & Monitoring

This month's top research on technology and monitoring.

TIME TO COOL OFF! ARE COOLING GLOVES AND JACKETS USEFUL IN HOT/HUMID CONDITIONS?

Maroni, T. et al., European Journal of Sport Science. 2018.

HOW DOES THE VOLUME OF HIGH-SPEED RUNNING AND SPRINTING IMPACT INJURY RISK

Malone, S. et al., Journal of Science and Medicine in Sport. 2018.

MY JUMP 2 APP: A GREAT TOOL FOR MEASURING THE REACTIVE STRENGTH INDEX OR OVER-HYPE?

Bishop, C. et al. The Journal of Sports Medicine and Physical Fitness. 2018.



[Abstract]

Time to cool off! Are cooling gloves and jackets useful in hot/humid conditions?

OBJECTIVE

Exercising in heat increases core temperature, with approximately 39.4-40 degrees Celsius reported as a critical level, resulting in premature fatigue and possible heat illness. Reducing core temperature during breaks in team sports played in hot environments has been found to improve subsequent exercise performance.

Therefore, the aim of this study was to assess core temperature cooling rates with the cooling glove (one and two hands) and a cooling jacket to a no cooling condition following exercise in hot/humid conditions. The second aim was to assess the effect of cooling on the Stroop Colour Word test following exercise in the hot conditions.

WHAT THEY DID

12 non-heat acclimated male team sport athletes completed 4 testing sessions and 1 familiarisation session. Familiarisation involved body composition and a VO₂max test on a graded cycle ergometer. Each cooling intervention was randomised through the 4 testing sessions. Cooling glove (one hand), cooling glove (two hands), cooling jacket, and no cooling device. Pre-testing session procedures involved nude body mass, Stroop Colour Word test, and urine hydration measurements. The testing sessions consisted of cycling at 75% VO₂max in hot/humid conditions. Exercise was terminated when core temperature reached 39 degrees Celsius or volitional exhaustion occurred. Once completed, subjects exited the chamber and weighed nude again before repeating the Stroop test. The Stroop test involves colour names being presented in an incongruent colour and subjects needing to indicate the colour the word was, not what it says. After this, one of the cooling conditions was applied for 30mins.

WHAT THEY FOUND

Compared to the no cooling condition, moderate effect sizes were noted for a change in core temperature over the first 5mins for both the glove on one and two hands, as well as for the cooling jacket. In addition, after 10mins, the one hand glove condition and the cooling jacket condition showed moderate effect sizes compared to no cooling, as well as between the cooling jacket and glove on two hands at 25 and 30mins (i.e. faster cooling rates compared to control at 5 and 10mins and cooling jacket vs. gloves at 25 and 30mins). The non-cooling intervention displayed greater perceived thermal sensation after 10 and 20mins of cooling, but were similar for all trials at 30mins. There was no differences between interventions for post Stroop test scores.

» Practical Takeaways

This paper has potential implications for athletes involved in sports that have long breaks between quarters, halves, or timeouts during play in hot/humid environments. As most breaks between periods in team sports are roughly 10-20mins, implementing a cooling intervention may be of benefit to regulate core temperature and potentially enhance performance compared to non-cooling.

If budgets are low, a cooling jacket is a relatively cheap option due to the ability to wet and freeze the garment. In addition to this, certain factors such as acclimatising to hot environments and gender (females often sweat less than males) can modify heat tolerance. Several days in a hot environment will lead to improved heat tolerance and performance which can last several weeks. These adaptations being an increased sweat rate, increased blood plasma volume, and a decrease of salt concentrations in the sweat.



James's Comments

"Regardless of who you are, once your body reaches critical core temperature, motor output becomes reduced or completely stopped. This can be a big problem for athletes competing or training in hot/humid environments where their core temperature hangs close to the critical core temperature. While cooling interventions during or after exercise can be useful, there is plenty of research on the benefits of pre-cooling before exercise. Pre-cooling can increase the time-to-exhaustion and has been used in elite sports teams such as the Black Sticks NZ Men's Field Hockey team. The best thing is, all it takes is ingestion of an ice slurry, for example, where greater heat absorption is needed to change the ice to water in the body which essentially cools the body from the inside out."

Want to learn more?

Then check these out...



[Abstract]

How does the volume of high-speed running and sprinting impact injury risk

OBJECTIVE

A high number of training days and matches missed due to injury has been shown to be detrimental to a team's success. Studies have found that rapid increases in training and game loads increase the risk of injury in multiple team sports. The aim of this study was to determine whether high-speed running (HSR) or sprint-running (SR) distances were associated with an increased risk of lower-limb non-contact injury in elite football (soccer) players. Additionally, the authors investigated whether higher chronic training loads (average 21-day load) and aerobic fitness could off-set injury risk.

WHAT THEY DID

An observational prospective cohort design was used over 48 weeks, spanning the 2015/16 elite European soccer season. Data was collected for 37 players over one season with GPS and session RPE. An injury was defined as any injury that prevents a player from taking part in full training or match play for that day for a period greater than 24 hours. Low-severity injuries were classified as 1-3 sessions' missed, moderate-severity as unavailable for 1-2 weeks, and high-severity as missing 3 weeks or more. HSR was classified as speeds $>14.4\text{ km/h}$ (4 m/s) and SR $>19.8\text{ km/h}$ (5.5 m/s). A soccer-specific acute:chronic load comprised of 3-day acute load and a 21-day chronic load. Aerobic fitness was measured using the 30-15 intermittent fitness test (30-15IFT), with the players' final speed (30-15VIFT) being used for the analysis of aerobic fitness.

WHAT THEY FOUND

Regardless of aerobic fitness and training load, players who completed moderate HSR (701-750m) and SR (201-350m) distances were at reduced injury risk compared to low HSR and SR groupings ($<674\text{ m}$ and $<165\text{ m}$, respectively) and high HSR and SR groups (750-1025m and 350-525m, respectively). Injury risk was greater for players who experienced large weekly changes in HSR (351-455m) and SR distances (75-105m). Players who had a HSR 3:21 day ratio of >1.25 and a 3:21 day ratio SR distance >1.35 were at increased risk of injury. Higher chronic loads ($>2584\text{ AU}$) were at reduced risk of injury when they covered a 1-weekly HSR distance (701-750m) compared to the reference group ($<674\text{ m}$). Conversely, players who exerted low chronic training loads ($<2584\text{ AU}$) and covered the same 701-750m HSR were at greater risk of injury compared to the reference group. Similar trends were seen for SR distance. Players with poor aerobic fitness (30-15VIFT) had a greater risk of injury than players with better developed aerobic fitness.

» Practical Takeaways

This paper shows that when HSR and SR distances are considered independent of aerobic fitness and previous training load history, a U-shaped association exists for distance completed at speeds and subsequent injury risk (i.e. moderate loading of these distances reduces injury risk). When previous training load and aerobic fitness are considered, players with higher chronic training loads completed greater HSR and SR distances at a lower risk of injury.

Coaches should aim to expose players to periods of training that offer both high-speed running and sprint-running through the use of small-sided games or linear running. Higher chronic training loads allow for players to be exposed to increased volumes of running at reduced risk, so gradually increasing HSR and SR distances throughout a season may be a beneficial to long-term injury prevention. In doing so, increased aerobic fitness will likely be an outcome to the increased distances covered.

Want to learn more?

Then check these out...



James's Comments

"The results from this paper just adds to the already vast literature on acute:chronic training loads. As Gabbett states in a previous paper, it's how you get to the high training loads, not the high training loads themselves, that put you at greater risk of injury. Consistently exposing your athletes to higher and higher training loads, in addition to high-speed running distances, creates a protective mechanism against random spikes in high-speed distances and training loads.

Caution should be taken when applying these HSR and SR speed parameters to your athletes training monitoring. Classifying HSR at $>4\text{ m/s}$ and SR at $>5.5\text{ m/s}$ creates a large gap between the lower threshold of SR and the higher intensities of actually sprinting. For example, covering the moderate SR distance of 201-350m at maximal speeds (potentially up to $10+ \text{ m/s}$) each week may cause soft tissue and hamstring problems regardless of chronic training loads and distance. If using these parameters, it may be better to add a 3rd speed band of 90% of maximal speed so that distances can be tracked in that high-intensity range."

[Abstract]

My Jump 2 App: A great tool for measuring the reactive strength index or all hype?

OBJECTIVE

The reactive strength index (RSI) is one metric commonly analysed from the drop jump (DJ). It identifies an athlete's ability to quickly switch from an eccentric to a concentric contraction, and how much force the athlete is able to produce in the shortest possible time. RSI has also been correlated to change of direction speed, and attacking and defensive agility. Testing the drop jump is now easier than ever with the iPhone app My Jump 2. Therefore, the aim of the study was to analyse the validity and reliability of the My Jump 2 app for measuring RSI and DJ performance.

WHAT THEY DID

14 active male students with at least one year of jump training experience (including DJ) participated. Leg length was measured as per previous force-velocity-power studies to calculate force and power variables. After a standardised warm-up, subjects performed 3 DJ onto a force platform whilst simultaneously being recorded with a smartphone using the My Jump 2 app. Drop heights of 20cm and 40cm were used. Jump height, contact time, mean power, flight time, and RSI were recorded on both devices.

WHAT THEY FOUND

Near perfect levels of agreement were seen between the My Jump 2 app and force platform measures of RSI at 20cm and at 40cm (ICC = 0.95 and 0.98, respectively). Furthermore, near perfect agreement was seen in measures of jump height and contact time (ICC = 0.96 and 0.92, respectively). Mean power in both tests had a weaker agreement (ICC = 0.67). Near perfect correlations were seen in RSI measures at 20cm and 40cm ($r = 0.94$ and 0.97 , respectively) between the My Jump 2 app and force platform. Furthermore, near perfect correlations in both jump height and contact time between measuring devices ($r = 0.96$ and 0.98 , respectively). Conversely, mean power showed weaker correlations ($r = 0.66$). My Jump 2 showed good intra-session reliability when measuring RSI at 20cm and 40cm (CV = 6.71% and 10.32%, respectively).

» Practical Takeaways

The near perfect agreement seen between the My Jump 2 app and force platform for RSI, jump height, and contact time all support the validity of the app as a valid tool for measuring drop jump performance. These findings suggest that even though the take-off and landing frames are manually selected, the app can still accurately measure contact time and jump height. Mean power was the only variable which did not correlate well between the two devices. This could be due to the app's calculation of power, as the force plate measures force directly, whilst the app uses contact time, flight time, and body mass to estimate power. The slightly larger variation in RSI measurements (RSI at 40cm) could be due to the fact that RSI is multi-factorial, with the error on flight time being compounded by error on contact time. Similar findings in this study and previous research show the My Jump 2 app is able to reliably measure DJ performance in a wide range of populations from recreational to elite-level athletes.

Want to learn more?

Then check these out...



James's Comments

"I use My Jump 2 pretty extensively with my rugby guys. The DJ measurement is a quick and easy test to get accurate RSI measurements, as well as CMJ, SJ, and force-velocity profiling. Not only does the app give you RSI, but also contact time, flight time, jump height, and stiffness. The easiest way to test a team of players is to record all jumps in slow-motion and analyse the jumps later due to the time-consuming nature of manually selecting ground contacts. It is for this reason that using the DJ as a measure of "readiness" with this app isn't practical in a team setting. Furthermore, when testing the DJ, it will take a few sessions for the athletes to learn how to DJ correctly. Often, athletes newer to the DJ struggle to land with both feet at the same time which will skew your RSI and contact time results. As a result, test familiarisation is vital."

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Fatigue & Recovery

This month's top research on fatigue and recovery.

SLEEP AND PERFORMANCE: HOW TO OPTIMISE PERFORMANCE DURING PERIODS OF SLEEP DEPRIVATION

Bonnar D, et al., Sport Med. 2018.

HOW SLEEP IMPACTS STRENGTH GAINS, AND WHAT WE CAN DO ABOUT IT

Knowles OE, et al., (2018) J Sci Med Sport.

DO ICE BATHS REDUCE MUSCLE SWELLING AND RE-ESTABLISH MUSCLE FUNCTION?

Matos F, et al., J Strength Cond Res. 2018;32(3):756–63.



[Abstract]

Sleep and Performance: How to optimise performance during periods of sleep deprivation

OBJECTIVE

Adaptation from training will occur from the balance between training and recovery. Together with nutrition, sleep is recognised to be an essential component of recovery. This article aimed to review the efficacy of sleep interventions on athletic performance and recovery.

WHAT THEY DID

A systematic review was conducted with studies up to September, 2017, included for analysis. 10 studies (n = 218; participants aged between 18 -24 years old) were included for analysis. The following sleep interventions were analysed:

- Sleep extension and napping
- Sleep hygiene
- Post-exercise Recovery Strategies to Improve Nocturnal Sleep

WHAT THEY FOUND

When athletes are sleep deprived, a minimum of 1-week of increased sleep duration leads to improvements in performance measures (e.g. sprint time, tennis serving accuracy). Napping may provide some benefits for performance, with a 2-hour post-exercise nap demonstrating to be more efficient for improving an athlete's preparedness to train in comparison to a 1-hour post-exercise nap. 20-minute post-lunch napping was insufficient to improve performance and may disturb subsequent night sleep for some athletes.

Although acute sleep hygiene strategies (e.g. dimly lit room, cool room temperature, restricted access to technology prior to bedtime) may lead to increases in sleep duration, it seems to have no impact on performance and recovery. When implemented for longer periods (e.g. 1 month), sleep hygiene strategies may aid recovery and performance. Moreover, the follow-up results of one study demonstrated that athletes exposed to sleep hygiene strategies for longer periods of time did increase sleep quality. Furthermore, acute hygiene strategies in combination to bright-light therapy seem to have a beneficial impact (perceived fatigue and sleep quality) on reducing the negative effects of jet-lag.

Post-exercise strategies to improve nocturnal sleep (e.g. dry air whole-body cryostimulation or red-light irradiation) demonstrated to have a beneficial effect on subjective and objective sleep patterns, and minor improvements in performance measures.

» Practical Takeaways

The main finding of this study was that sleep extension was the most effective way to improve performance measures. Moreover, the remaining strategies (napping, sleep hygiene, and post-exercise recovery strategies) provided mixed results.

After periods when sleep may be compromised (e.g. due to flight-related changes in sleep patterns or during busy training schedules), the training schedule should be changed slightly to allow athletes more time to sleep and rest. For example, they could be given:

- Napping periods during the training day
- Delayed start of the training days

Although it can be difficult to implement sleep hygiene strategies (e.g. removing electronic devices whilst in bed) in team-sport settings because of the social aspect, appropriate education surrounding this topic should be provided.

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



Francisco's Comments

"As mentioned by the authors, causes for sleep deprivation among athletes are different from the general population, therefore findings from general population studies may have limited application within the athletic population.

With this in mind, research investigating the effect of sleep interventions to improve performance is limited, making it difficult to point to clear conclusions."

[Abstract]

How sleep impacts strength gains, and what we can do about it

OBJECTIVE

Sleep deprivation and sleep restriction both increase fatigue and decrease readiness to training. At present, there is limited knowledge surrounding the effects of inadequate sleep on strength-performance. Therefore, the aim of this systematic review is to understand the effect of sleep deprivation and sleep restriction on resistance training performance, and to explore the effects of inadequate sleep on hormonal responses and markers of anabolism.

WHAT THEY DID

The authors performed a systematic review which included studies based on three combined concepts: 1) inadequate sleep, 2) resistance exercise, and 3) performance and physiological outcomes.

WHAT THEY FOUND

With regards to acute sleep deprivation (e.g. one night with no sleep), there seems to be no significant detrimental effect on muscle strength. Moreover, there also seems to be no alterations on the cortisol-testosterone profiles following acute sleep deprivation. However, studies investigating chronic sleep deprivation (i.e. 30-64 hours of no sleep) found mixed results. For example, two studies observed a reduction in strength, and one study reported no differences in strength in comparison to a control group.

» Practical Takeaways

Acute sleep deprivation (e.g. one night with no sleep) appears to have no detrimental effect on strength; though there is limited research on this topic. On the other hand, extended sleep deprivation does seem to have a harmful effect on strength, with consecutive nights with reduced sleep affecting multi-joint strength.

Napping before resistance training sessions and changes in training schedule (e.g. late starts) can be effective strategies for minimising the impact of sleep deprivation on performance during periods of inadequate sleep. Lastly, group training and the consumption of caffeine can increase resistance training performance; however, care must be taken with caffeine intake if athletes are training late in the day (i.e. mid-afternoon onwards) as caffeine can negatively impact sleep.

Want to learn more?

Then check these out...



Francisco's Comments

"The authors of this study highlight a particular scenario in which athletes are likely to be subject to sleep deprivation – the birth of a new child. I can relate to this scenario as a lot of my athletes have had to deal with sleep restriction/deprivation as a result of newly-born babies. Some other scenarios that may lead to inadequate sleep include: important competitions, especially for novice players, school and work-related stress, jet-lag, higher than usual training load. Practitioners must be able to identify these type of scenarios (e.g. inadequate sleep) and implement counteractive strategies such as:

- Adjust resistance-training loads
- Adjust the training schedule (e.g. late starts or inclusion of napping opportunities)
- Implement competition within training sessions (e.g. competition in some exercises)
- Pre-training nutritional strategies (e.g. caffeine intake)
- Training in groups

Although research is limited regarding the hormonal responses to sleep deprivation, it seems that chronic sleep restriction may lead to an inappropriate hormonal environment for adaptations to resistance training. Further research is needed to better understand the effects of inappropriate sleep on anabolic responses. Moreover, it would be interesting to explore the effects of inadequate sleep on muscle activation."

[Abstract]

Do ice baths reduce muscle swelling and re-establish muscle function?

OBJECTIVE

Cold water immersion (CWI) is widely implemented in the athletic field aiming to reduce secondary effects from exercise such as pain, discomfort, oedema, and muscular dysfunction. Resistance training (RT) is known to elicit these secondary effects, therefore CWI can enhance recovery from RT. Therefore, the aim of this study was to measure the effects of CWI on muscle thickness (MT) of the elbow flexors after a resistance training (RT) protocol.

WHAT THEY DID

11 men were exposed to an elbow flexor RT protocol on one arm. The other arm was used as a control. On week one, after the RT protocol, the trained arm of the 11 men was exposed to passive recovery (PAS). Two weeks after, the subjects performed the same RT protocol, instead, this time, the trained arm was exposed to CWI (20 minutes at 5-10°C). MT of the elbow flexors was obtained before and immediately afterwards, and 24, 48 and 72 hours after exercise.

WHAT THEY FOUND

MT increased in the arm exposed to RT in both conditions (PAS and CWI). MT was significantly higher in exercised arm in the PAS when compared to the CWI condition. In conclusion, these findings demonstrate that CWI implemented after a RT protocol can reduce muscle swelling.

» Practical Takeaways

In this study – which I was a part of – we demonstrated that 20 minutes of CWI implemented after a RT can have an effect on reducing skin temperature (~14°C). This reduction in temperature is associated with a reduction in MT (i.e. reduction in muscle swelling after exercise).

When the time to recovery is limited, CWI should be implemented to enhance recovery from muscle damage and re-establish muscle function. However, due to the role that inflammation induced from training has on muscle hypertrophy, practitioners should reconsider using CWI when time to recovery is long (e.g. 48-72 hours) or performance is not a main outcome (e.g. light technical-tactical field session). In other words, if athletes have sufficient time to recover, then CWI may not be necessary.

Want to learn more?

Then check these out...



Francisco's Comments

"From a research perspective, a potential limitation of this study was the fact that there was little hydrostatic-induced pressure due to the equipment the arm was immersed in. Additionally, there was a high variation on water temperature (~5°C) due to the fact that we did not use a water circulator.

This study demonstrated the beneficial effects of CWI for reducing MT (i.e. oedema/swelling) from RT. With a reduction in muscle swelling, we would expect a re-establishment of muscle function (e.g. enhance sub-maximal muscle function and prevent decreases in muscle maximal isometric strength [see the linked articles below]).

The findings from this study reinforce the message I conveyed in previous issues of the Performance Digest. That being, when recovery time is limited, and performance is a main outcome (e.g. competition or speed session), CWI can be used to enhance recovery (i.e. re-establishment of muscle function). However, if the time to recovery is long, or the goal of the subsequent training days do not depend on the maximal muscle performance output, the implementation of CWI should be reconsidered.

The following factors should be considered when implementing CWI:

- Goals of the athlete (long-term)
- Goals of the subsequent training session
- Phase of the season (goals of the phase)
- Density of the weekly schedule (i.e. when will the following training session occur?)

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Youth Development

This month's top research on youth development.

SKIPPING IS USEFUL FOR INCREASING BONE DENSITY IN YOUNGSTERS?

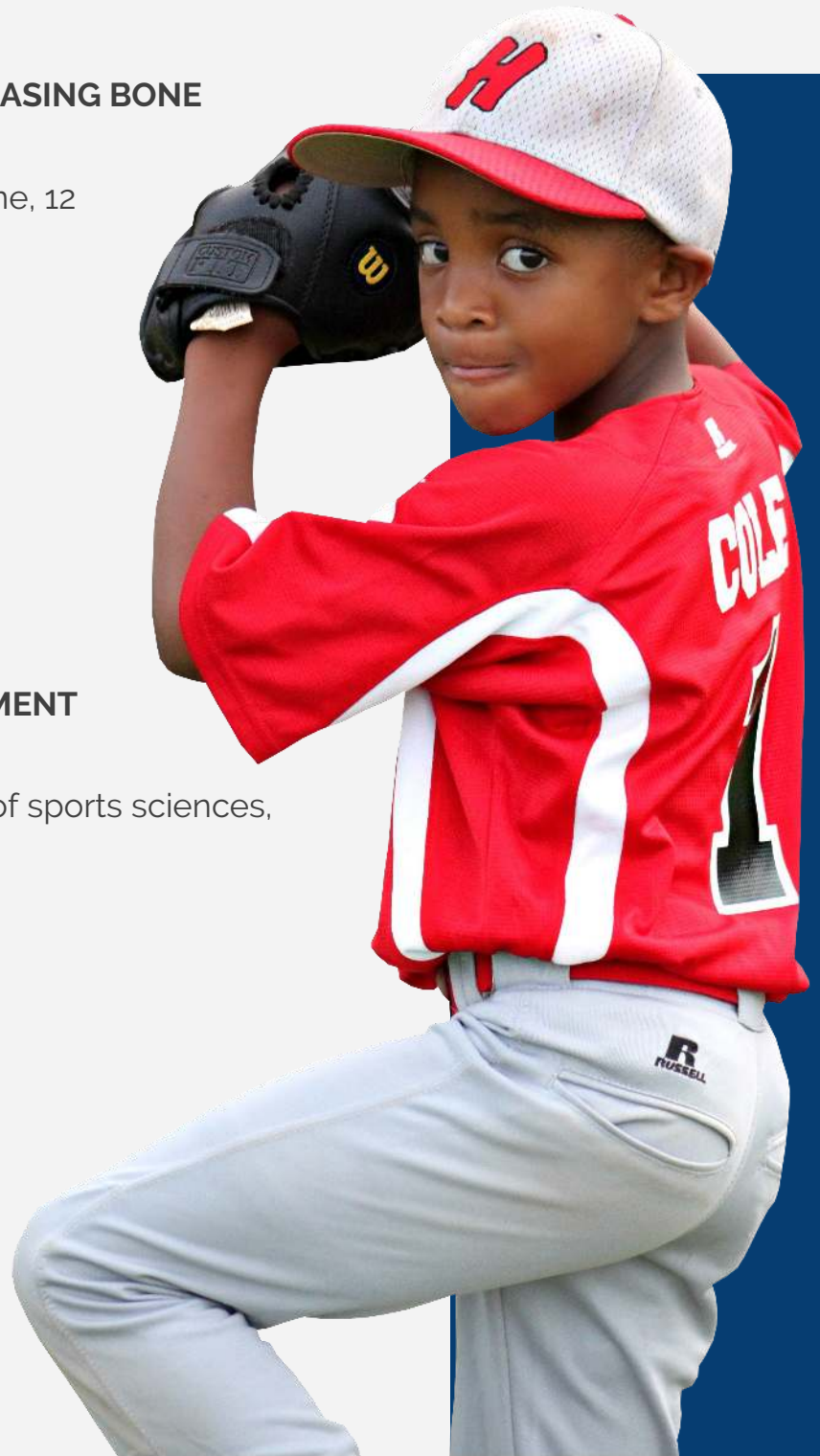
Ha, A.S. and Ng, J.Y., 2017. PloS one, 12 (12).

WHAT THE KIDS HAVE TO SAY ABOUT EARLY SPORT SPECIALISATION

Padaki, A.S. et al., (2017) Sports health, 9(6), pp.532-536.

A PRACTICAL METHOD FOR ASSESSING GYM-BASED MOVEMENT QUALITY IN YOUNG ATHLETES

Duncan, M.J. et al., 2018. Journal of sports sciences, pp.1-6.



[Abstract]

Skipping is useful for increasing bone density in youngsters?

OBJECTIVE

Of the numerous adaptations that occur during puberty, bone growth is a key protagonist that accompanies both age and height. Of equal importance, is the formation of new bone; where bone mineral accrual (BMA) is high during childhood and adolescence. As bone strength is thought to be a preventative measure of injury and osteoporosis, it is imperative that coaches look for methods that develop bone resilience in a fun and developmental manner (i.e. rope skipping).

WHAT THEY DID

This study recruited 176 Hong Kong girls (age 12.23 years $\pm$ 1.80) from local schools. Initially, measures such as height, weight, pubertal stage, bone mineral density (BMD), and cardiovascular fitness were taken. BMD measurements were taken on the forearm and calcanei (foot). The participants were split into two groups. The experimental group consisted of 66 girls who were regularly involved in rope-skipping activities. The control group consisted of 110 athletes which lasted for two years. Of these 176, 143 of them attended the re-testing day after two years. A two-Level ANOVA was used to assess both time and time against the variable (control vs experimental).

WHAT THEY FOUND

After two years, the experimental group (those regularly involved in rope skipping) were reported to be more physically active than the control group, despite showing a decrease in physical activity from pre to post. For both BMD and cardiovascular (CV) fitness, no statistically different results were found between the control and experimental group. This suggests that rope skipping was not an effective method of developing CV fitness. However, those who took part in rope skipping (experimental group) demonstrated higher levels of BMD in the calcanei. It is important to note that BMD was also higher in this group before the two-year intervention. In conclusion, this study suggests that girls' bone health and CV fitness is related to physical growth. Furthermore, rope skipping can contribute to lower-body bone health and could be a fun way to encourage regular physical activity.

» Practical Takeaways

This study supports the notion that rope skipping can, in fact, be beneficial at improving BMA, but only in the lower limbs. In a well-trained cohort, the need to progress training through a structured and methodical plan may be required to create further bone growth and development. This could be achieved by altering the intensity (jump height/force), volume (amount of jumps per day/week), technique (2:2 legs, 2:1 leg etc.), or speed of jump (ground contact time).

Unfortunately, the practical takeaways section is limited by the same limitations of this study. Whilst this research did have a two-year follow up period, it failed to quantify the volume or duration of jump-based tasks. Furthermore, the children of this study were asked to report on their own levels of physical activity, which may be flawed due to their lack of awareness as to what constitutes as "physical activity".

Skipping is a fantastic representation of a child's ability to coordinate, utilise the stretch shortening cycle, and demonstrate their motor skill competence. I would personally monitor through volume (number of jumps), visual fatigue (inability to maintain good jumping/landing mechanics), and tedium, combatted through adequate challenge and progressions.

Lastly, coaches who work with young athletes who participate in non-load bearing sports (e.g. swimming and cycling) may wish to add skipping to their training regime to ensure they are developing their BMD for health purposes, particularly the female athletes.



Tom's Comments

"I really see the value of studies like these, where commonly used activities such as rope skipping are put through their statistical paces. As someone who works in a number of schools, rope skipping - usually accompanied with a song - is still a really popular activity, particularly in young girls. This study reinforces the notion of Wolff's law, where a bone will adapt by increasing BMD, and thus size, that goes hand-in-hand with repetitive stress.

This is not only an "adult-friendly" initiative to suggest to a young child, but can also develop coordination, RSI, and plyometric ability in young children. In addition, rope skipping has many variations (see attached video) that can help to avoid tedium and ensure progression. Unfortunately, this study offers few recommendations with regards to the frequency, volume, and intensity required to create adaptation."

Want to learn more?

Then check these out...



[Abstract]

What the kids have to say early sport specialisation

OBJECTIVE

Sport can be an incredibly fulfilling experience, physically, psychologically, and emotionally. In a society run by technological advancement, many still find comfort in participating in sport at all levels. Unfortunately, many children remain either inactive, or are "pushed" into participation. Voluminous and repetitive participation in sport can result in overuse injuries, burnout, and even dampened enjoyment. This study introduces the reader to a novel instrument to assess the driving factors behind participation, with an aim to reduce the negative connotations that accompany early sports specialisation.

WHAT THEY DID

This study collected survey data from 235 athletes between the ages of 7-18 years old. The children were afforded a parent/coach-free opportunity to express their opinions in a survey. This survey was designed by an interdisciplinary team, consisting of orthopaedic surgeons, physical therapists, athletic trainers, and training academy staff. The survey consisted of two sections, and the data was analysed based on a 5-point Likert-type scale, as seen below.

Section 1 - Participants demographic data such as age, sex, injury history, and self-reported competence

Section 2 - 15 questions discussing factors influencing participation

Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6
50% Negative			50% Positive		

WHAT THEY FOUND

On average, players began to specialise in one sport at 8.1 ± 3.6 years, with 74% of these reportedly suffering a sports-related injury. To define the higher-tier of specialisation, players were asked questions regarding their participation. It was found that of the 74% of those who were classed as highly-specialised, spent 9 or more months of the year in one sport. Furthermore, players with an injury history were more likely to participate all-year round. These players were often told by a coach not to participate in other sports, though this study failed to dig deeper and reveal why this was their (the coach's) opinion. Half of the children reported that sport was interfering with their academic success, but felt external pressures to participate (e.g. they had wishes to attend college); this was more common with older players.

» Practical Takeaways

Despite our ever-growing knowledge of the need to provide rounded sporting experiences, youth sports specialisation is actually increasing. This study also found that specialisation was linked to injury, burnout, and dissatisfaction. As a result of this, it is important that children do not spend over 9 months focussing solely one sport to combat these issues. When designing sessions, it is important that children are both passengers and drivers on their learning journey. The attached podcast discusses Bernstein's theory of 'repetition without repetition', which may prove valuable for children who are highly-plastic and can benefit from high-levels of variety in the learning journey.

In the instance of an injury, the authors of this research article suggest that coaches, players, and parents must understand the internal and external pressures that may have led to this injury. This should not be a blunt conversation, but a considered approach that dissects all of the psychosocial factors that may have contributed to the injury. Whilst it is important that we should value aspiration and drive to succeed, we must remind those in charge of any child that their developmental interests are at heart and excessive pressure may impact their chances of succeeding. As the reader, you may wish to use statistics to support a conversation. For example, in this research article, 97% of sports professionals accredited their success to early multi-sport development. This may help to defuse any tension and potentially educate the parent who may easily think that more practice will benefit their child to succeed in that sport.

Want to learn more?

Then check these out...



Tom's Comments

"Based on the numerous research articles published regarding early vs. late specialisation, it would seem fairly obvious that children should not specialise in only one sport. Providing a child with access to multiple-sports will support a child in developing multiple solutions to the unpredictable, and sometimes chaotic, nature of sport. For example, a child who develops the ability to rotate and dissociate between the upper- and lower-body in a sport such as tennis, may be able to transfer these skills to other sports. This could be further demonstrated by a player who has to rotate to catch the ball in Rugby, or time a run in football by looking over a shoulder.

To move forward as a discipline, it is important that coaches are continually empowering one another through education and challenging long-held notions regarding youth development. I strongly believe that when a child has fun and can develop their own solutions to coach-created problems (i.e. an obstacle or technical issue), they begin to learn from the journey and develop ownership and confidence, which can therefore develop them into a better person and athlete. Many of the benefits of sports participation have been discussed in the attached article link, but the development of the person should be emphasised alongside technical prowess in the early years. This will ensure that children enjoy sport and are therefore more likely to participate for many years to come."

[Abstract]

A practical method for assessing gym-based movement quality in young athletes

OBJECTIVE

Engagement in weight-bearing activity in children has received a lot of attention in the last decade. Countless publications have suggested that weight training is safe and effective, and it is therefore on the radar of the world health organisation (WHO) to increase the amount of strength-related activities that children partake in. Whilst many of the risks associated with low-levels of strength can be reversed through an appropriate and supervised strength regime, it can be difficult to apply training that meets the needs of a varied group of athletes. The aim of this study was to assess the construct validity of the Resistance Training Skills Battery for Children (RTSBc) to support practitioners in their allocation of strength-related activities.

WHAT THEY DID

This study used a sample of 27 children (21 boys and 6 girls) aged 7-10 (Mean 8.3 ± 1.8 years). All participants attended two testing days, consisting of: (1) anthropometric measurements, (2) RTSBc, (3) muscular fitness (10m sprint, standing long jump, seated medicine ball throw), (4) tests of gross motor skill development and (5), knee extensor isokinetic dynamometry. Most of the above have been previously mentioned, but the RTSBc has only been introduced in this edition of the Performance Digest. The RTSBc consists of:

Bodyweight squat
Push-up
Step-up
Suspended Row
Standing overhead press
Front support with chest touch

The criterion used has been attached in the article link.

WHAT THEY FOUND

Children who were found to have high scores on the RTSBc tests were also more competent in gross motor skills (e.g. kicking and running) and 10m sprint times. However, seated medicine ball throws, standing long jump (SLJ), and peak isometric kinetic force did not correlate with RTSBc scores. After statistical analysis, the RTSBc proved a valid instrument for assessing competence. Maturation measured through age at peak height velocity (APHV) was found to be a covariate (a predictive factor) of increased performance, which is hardly surprising.

» Practical Takeaways

It is important that as coaches, we continually review and assess the methods we use to understand our athletes competence. A majority of the coaches who work with youth athletes are very passionate about introducing strength-based training to children at a younger age. As a result of this, we must convince parents, teachers, and children that the need to be "strong" isn't just for aesthetic, injury prevention, or health-related reasons, but to also ensure optimal performance characteristics. By using research such as this, we can strengthen our position in both clubs and schools, which will hopefully lead to a cultural shift in people's attitudes towards strength training for children. In the attached podcast, the "why" and the "how" of youth resistance training have been discussed and could be sent to those who are still unsure about the role of strength and conditioning for youngsters.

In conclusion, this study demonstrates that the RTSBc can be used to assess the resistance training movement skills of young athletes. This means that coaches could use this test to assess resistance training skill when working with new athletes, for example.

Want to learn more?

Then check these out...



Tom's Comments

"This study reinforces the notion that high levels of strength are not only linked to improved motor-skill function, but can be used as a predictor of other bio-motor qualities; such as improved running speed, change of direction speed, and throwing skills. The link between maturation and performance, particularly in age-similar peers, has been extensively researched. Strength improvements in children during PHV are thought to occur as a result of increased muscle size and function, and thus, the ability to produce force. As an athlete can potentially produce more force during this time, this force can be used in multiple directions, helping to generate both mass and velocity in commonly performed tasks. For example, when kicking a football, an increase in muscle size would be of benefit to create sufficient mass to accelerate the ball. However, this isn't a universally applicable notion, as excessive muscle may limit speed, especially in the absence of good coaching/technique."

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Nutrition

This month's top research on nutrition.

CAFFEINE IN ALTERNATE FORMS (E.G. GUMS, ENERGY DRINKS, AND GELS): DO THEY ACTUALLY WORK?

Wickham, K.A. and Spriet, L.L., 2018.
Sports Medicine, 48(1), pp. 79-91.

BEETROOT JUICE: CAN IT IMPROVE PERFORMANCE IN ATHLETES OF ALL LEVELS?

Jonvik, K.L., et al. (2018). European
Journal of Sport Science, 7, 1-10

DOES DEHYDRATION AFFECT MENTAL PERFORMANCE IN ELITE-LEVEL ATHLETES?

Irwin, C., et al. (2018). Journal of Sports Sciences, 36 (3), pp. 247-255.



[Abstract]

Caffeine in alternate forms (e.g. gums, energy drinks, and gels): Do they actually work?

OBJECTIVE

Although caffeine is known to be a powerful ergogenic (i.e. performance enhancing) stimulant, caffeine supplementation in alternative forms (e.g. gels, gums, and sprays) is a growing market with many companies claiming that it will "boost energy" or "improve performance". Many of these claims, however, are in contrast to the evidence shown or based on non-existing literature. As a result, this study sought to review an array of existing literature on alternate methods of caffeine delivery to determine:

1. If they affect the rate of entry of caffeine into the blood
2. If they stimulate direct connections between caffeine sensors in the oral/nasal cavities and the brain
3. If they are ergogenic in training and competition environments

WHAT THEY DID

Researchers collated existing research that investigates the efficacy and mechanisms of the following caffeine delivery methods:

- Bars and Gels
- Chewing Gum
- Mouth Rinse
- Energy Drinks
- Nasal and Oral Aerosol Sprays

They scrutinised the results of the research to determine whether or not each particular method of caffeine administration is viable and ergogenic. It is important to note that this review article was published in a supplement supported by the Gatorade Sports Science Institute with Dr. Spriet selecting peer-reviewing each paper.

WHAT THEY FOUND

Bars and Gels: 100mg doses of caffeine can improve cognitive function, time-to-exhaustion, and time-trial performance.

Chewing Gum: Maximal caffeine concentration in the blood is reached quicker with gum compared to capsules, and gum can be used to effectively maintain caffeine concentrations during an event at doses of 50mg, 100mg, and 200mg. Caffeine gum improved endurance cycling performance, and there is limited evidence that repeated sprint cycling and power production are also improved.

Mouth Rinse: Not shown to improve cognitive performance but can improve short, high-intensity, repeated sprints in normal and depleted glycogen states. No ergogenic effects on aerobic exercise performance.

Energy Drinks: Generally inconclusive, as most research investigates the effect of caffeine in conjunction with high doses of carbohydrate and taurine with minimal evidence on the effect of single ingredients on their own.

Sprays: Little support for any ergogenic effects as caffeine doses administered this way is likely insufficient for any benefit to be gained.

» Practical Takeaways

The physical and cognitive performance boosting capabilities of caffeine are hardly unknown to those in the sporting environment. The conclusions of this review, however, make for some interesting implications for how athletes and coaches may decide to implement caffeine into their training and competition regimes. The most conclusive of administration methods presented in this review is caffeinated chewing gum.

Chewing gum is easy to carry in large quantities, doesn't involve the swallowing of large capsules and tablets, and perhaps most notably, doesn't enter the gut. This is worth noting as bars and gels can sometimes cause gastrointestinal problems if ingested before/during exercise, as blood is diverted towards exercising muscles and away from the digestive tract. This means that the contents of the stomach do not get digested properly, and as such, can cause feelings of discomfort and irritation in exercisers. Gum could be easily incorporated during exercise to maintain caffeine concentrations and prevent a drop-off in energy levels. The other methods examined in this review shouldn't be discounted as viable options, but in terms of speed, ease, and comfort, caffeinated chewing gum seems to be the way to go.

Want to learn more?

Then check these out...



James's Comments

"This is a good review published in a very reputable academic journal – Sports Medicine. The authors mention how there is a paucity of research on alternate caffeine administration methods in women. Ingestion methods like aerosol and mouth rinses have only started to emerge recently, so hopefully further research is incipient and will engender information about their effectiveness across males and females. The encompassing nature of this review is certainly an asset, as different methods will be suited to different athletes and the authors elucidate the benefits of each method sufficiently enough for readers to draw their own conclusions. Athletes should remember that supplements should be batch tested and certification documented."

[Abstract]

Beetroot juice: Can it improve performance in athletes of all levels?

OBJECTIVE

Nutritional aids to improve exercise performance have become popular in athletes, irrespective of competition/sporting level. A very popular supplement as an ergogenic aid in recent years is dietary nitrate, often administered as a drink (e.g. beetroot juice [BR]). This has led to many athletes (both elite and recreational) to consume BR prior to competition in an effort to improve performance. However, there is an ongoing debate that the differences in the efficacy of dietary nitrate to improve performance may be related to training status; where highly-trained athletes maybe less responsive to the ergogenic properties of nitrate compared to recreational athletes. These effects have only been described in endurance athletes, and therefore, the effects on sprint disciplines remains unknown. Resultantly, this study assessed and compared plasma nitrate and nitrite concentrations and repeated-sprint performance following beetroot juice supplementation between recreational, competitive, and elite sprint athletes.

WHAT THEY DID

In a randomised double-blinded crossover study design, recreational cyclists (n = 20), national talent speed-skaters (n = 22), and Olympic-level track cyclists (n = 10) conducted two 6-day supplementation periods; 140 ml per day of nitrate-rich (BR ~800mg) and nitrate-depleted (Placebo (PLA) ~ 0.5 mg) beetroot juice, both provided by a popular available brand (Beet it). Following the familiarisation session, participants started a 6-day supplementation period during which 140ml of either BR or PLA was ingested each day. On the 6th supplementation day of each period, an experimental test consisting of 30-seconds consecutive Wingate tests was performed at the same day of the week and time of day for each individual (± 1 h). The supplementation periods were interspaced by a one week wash-out.

WHAT THEY FOUND

The study showed that six days of nitrate-rich beetroot juice supplementation significantly increased plasma nitrate and nitrate concentrations, with no differences between sporting levels. Although beetroot juice did not affect peak power and mean power during the Wingate tests, time to peak power improved by ~2.8% following BR versus PLA. This improvement was not different between Wingate tests 1, 2, and 3. Furthermore, the effects of beetroot juice and placebo did not differ for any other Wingate parameters (peak power or mean power) or perceived rate of exertion or heart rate.

» Practical Takeaways

An improvement in time-to-reach peak power was observed. Based on these findings, it remains questionable whether such a finding has a benefit to many high-intensity and sprint disciplines. However, a faster acceleration can be of great relevance to various sports. For example, in BMX and track cycling, the ability to reach peak power is important because it allows the athlete to be more efficient from the beginning of the race in comparison to the other competitors during the race. Riders are often searching to improve the capacity to accelerate improvement during high-intensity and sprint performance. Sprint disciplines, such as short-distance running and speed skating, are other examples where faster acceleration is important. The study involves a relatively large number of participants (n = 52), and therefore, it is possible that the current findings may be a good representative and true indication that beetroot juice has no effects on mean power or peak power during repeated Wingate tests.

Although the study used a gold-standard methodology for determining plasma nitrate and nitrite concentrations, in addition to using a much greater sample size when compared with previous work, it is important to consider several factors to these findings. For example, the authors did not control for normal consumption of beetroot from salads or juices, and as such, this may be a slight limitation to the study. If athletes are already consuming a large amount of dietary nitrates (see attached infographic), then the addition of a nitrate supplement may have little, to no, effect. In the study, no restrictions were set for the intake of nitrate-rich foods (see attached infographic) during the intervention period. Furthermore, day-to-day variations are also important to consider, as athletes in current study were tested during different time periods.

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James's Comments

"In contrasts to previous work, one of the main findings was that there were similar effects of beetroot juice for recreational, competitive, and elite athletes. This shows that time to peak power was independent of athletes training status. Such outcome is unlikely, and perhaps this may have depended on genetic or training effects on muscle fiber type composition. Since elite athletes of sprint disciplines are likely to have higher proportions of type II muscle fibers compared to elite endurance athletes, it is still possible that the sprinters in the study have a greater response to nitrate supplementation, and that even elite athletes performing high-intensity and/or sprint disciplines could experience positive effects of beetroot juice supplementation.

Credit to the authors, however, who have managed to perform this work on Olympic-level cyclists; of whom, five athletes won medals at the European Championship in 2015. It would be great for more research in elite athletes of high-intensity or sprint disciplines to establish ergogenic potential for specific sports and environmental conditions."

[Abstract]

Does dehydration affect mental performance in elite-level athletes?

OBJECTIVE

During prolonged aerobic exercise, it is likely that athletes lose water and electrolytes as a consequence of thermoregulatory sweating. In some situations, especially when exercise is prolonged, high-intensity, and/or in a hot environment, sweat losses cause dehydration. Such an effect has often been negatively associated with impaired cognitive function, with typical impairment when fluid loss exceeds 2% body mass. Despite many studies having investigated dehydration and cognitive function usually by incorporating multiple trials with different interventions or treatments (e.g. different levels of fluid loss, changes in climatic conditions, and varied sports) to determine dose-response effects or the impact of concurrent stressors with reaction time tasks, there is no study examining the ability to replicate the effects of exercise-induced fluid loss on cognitive performance when all other factors are standardised; which is essential in order to consider trial-to-trial variability and day-to-day normal perturbations. Hence, this study investigated the effects of aerobic exercise and the associated fluid losses and rehydration on cognitive function in well-trained male endurance tri-athletes.

WHAT THEY DID

Participants were tested on five separate occasions. Initial visit consisted of a VO₂max test for the determination of peak power output for subsequent experimental trials. 10 well-trained triathlon runners and/or cyclists (VO₂max: 62.95 ± 7.20 ml · kg⁻¹ · min⁻¹) completed in total four experimental trials in a randomised, repeated, counterbalanced study design. In each trial, participants completed a continuous steady-state cycling exercise at ~65% peak sustainable power output (60min) before consuming beverages and food to ad libitum Water (Trial 1), Water (Trial 2), Powerade (Trial 3), and Sustagen Sport (Trial 4). Cognitive performance was assessed using a four-choice reaction time task, body mass, fluid consumption volumes, urine samples, and subjective feelings questionnaire before and immediately after exercise, and then every hour (for 4 hours) during recovery. As the aim was to induce dehydration equivalent to 1.8% body mass loss, body mass was measured to determine fluid loss following 60 minutes of exercise. If required, exercise continued in 10 min intervals until the desired loss was achieved. On average, participants lost -2.5 ± 0.6% body mass.

WHAT THEY FOUND

Whilst other studies have reported negative impacts of dehydration on cognitive function, the results show that well-trained athletes involved in acute aerobic exercise may not suffer from cognitive impairment in the immediate post-exercise recovery period; despite substantial fluid losses associated with endurance exercise. Irrespective of fluid loss, it appears that exercise induces positive effects on cognitive performance.

» Practical Takeaways

It is well-reported that dehydration negatively affects cognitive function, and that athletes are often advised to consume adequate fluid immediately after exercise to replace the fluid losses. However, this study suggests that aggressive post-exercise fluid consumption may not be warranted for an optimal cognitive function. Many sports employ breaks before, during, and after competitions. In team-sports, half-time allows rehydration to take place, whilst between weigh-in and competition in weight-making sports, periods of 24-hours can be utilised to counter-act fluid losses. Therefore, to prevent any adverse effects to cognitive function, authors suggest it may be more appropriate to adhere to the American College of Sports Medicine fluid recovery guidelines, and when possible, consume fluids over an extended period of time. Such a strategy does not appear to negatively impact cognitive function and will also maximise opportunities for fluid retention. In summary, elite athletes often get this right already by entering training or competition hydrated and then rehydrating at the cessation of exercise in line with thirst receptors and how they feel.



James's Comments

"Here, a well-controlled and standardised study was completed, strengthening the repeated observations such as equivalent levels of fluid loss were achieved and cognitive tasks were administered at the same time of the day. However, only a single cognitive task was measured in the study, therefore, the same effects may not have been observed in other cognitive tasks such as executive function or decision-making, information processing, and memory tasks. For example, tennis is a sport where attention, executive functions, and spatial memory skills are extremely important, and therefore, future research should measure several other cognitive components across a number of cognitive domains to clarify these effects. It still remains clear, however, that athletes should begin training and competition performance in a euhydrated state to mitigate any potential negative effects of dehydration."

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Injury Prevention & Rehab

This month's top research on injury prevention and rehabilitation.

HAMSTRING INJURIES: DOES THE CENTRAL TENDON ACTUALLY IMPACT THE RETURN-TO-PLAY TIME AND RE-INJURY?

van der Made AD, et al. (2018) Br J Sports Med. 52(2):83-88.

ACHILLES TENDINOPATHY: OPTIMISING THE RETURN-TO-SPORT PROCESS

Habets B, et al., (2018) Sports Med. 48 (3):705-723.

ACL RECONSTRUCTION: RECOMMENDATIONS FOR AN UPDATED RETURN-TO-SPORT APPROACH

Hewett TE, Di Stasi SL, Myer GD. Am J Sports Med. 2013 Jan;41(1):216-24.



[Abstract]

Hamstring injuries: Does the central tendon actually impact the return-to-play time and re-injury?

OBJECTIVE

Involvement of the intramuscular or "central" tendon has been reported in previous research to be predictive of delayed return to play (RTP) in acute hamstring (HS) injuries. This intramuscular/central tendon refers to the part of the tendon to which muscle fibers directly attach. The aim of this study was to determine whether intramuscular tendon involvement is truly associated with delayed RTP and/or to increased rates of re-injury.

WHAT THEY DID

Participants were 70 athletes who were already enrolled in a double-blind randomised controlled trial investigating the effects of platelet-rich plasma (PRP) in hamstring injuries. They had MRI confirmed grade I or II HS injury, and had successfully completed the prescribed rehab programme. MRIs were scored in three domains: 1) tendon disruption as a percentage of cross-sectional area (CSA) (<50%, 50-99% and 100%), 2) longitudinal or length of tendon disruption, and 3) presence of waviness (discontinuity within the tissue). RTP was defined as number of days from injury to completion of the rehab programme, and re-injury was defined as acute onset of posterior thigh pain during game or training in the same leg within one year of RTP.

WHAT THEY FOUND

Of the 70 participants, 29 injuries involved the central tendon (17 partial thickness, and 12 full thickness). Average time to RTP was 24.5 days (22.2 days for those without central tendon disruption, and 27.7 days for those with disruption). Length of tendon disruption had no significant correlation to RTP, and only full thickness injuries with central tendon disruption were associated with a longer time to RTP. All injuries that exhibited waviness on MRI had either 50-99% or 100% disruption of tendon cross sectional area. Re-injury rates were as follows: 6 injures within 2 months, 8 within 6 months, and 11 within 12 months.

» Practical Takeaways

Injuries that exhibited waviness and central tendon dysfunction took just over a week longer to RTP than those without central tendon dysfunction. Considering this, and given the significant overlap in days of RTP between the groups, we cannot confidently say that central tendon involvement alone is predictive of the RTP time.

This information can help strength coaches and physiotherapists educate their athletes/patients and assure them that these positive imaging findings do not necessarily warrant surgery. Research has shown that the structural damage found on imaging does not always correspond to symptom severity. More importantly, they can be reassured that although certain severities may require more conservative training, there is not a great deal of difference in number of days to RTP between the different injuries. This can be a huge confidence booster for athletes/patients, and can be instrumental in maintaining their motivation and focus during rehab and training.

Want to learn more?

Then check these out...



Steph's Comments

"This is helpful information, as I think it is sometimes difficult for coaches and physiotherapists to state this type of assertion without being seen as "ignoring" the imaging results. If we are armed with evidence that imaging is not strongly correlated to RTP, then we can get into the plan of care and training programme that will best serve the individual in their path to optimal function more quickly. This being said, I also believe this is another great example of a time where the strength coach and physiotherapist relationship is vital. We need to be able to weave together the clinical knowledge of how to respect healing and head injury precautions with the optimal progressive loading via strength training and conditioning; and this type of information can help us do so.

There was also some areas of limitation, including the fact that subjects were mostly professional football players and the number of varying degrees of injury was limited. Therefore, future studies should explore a more clinically relevant population, in addition to larger sample sizes. Additionally, it would be beneficial to explore more objective, criteria-based, and sport-specific rehab protocols in order to establish some standardisation of care with a difficult to manage diagnosis such as hamstring strain, and to decrease re-injury rates after RTP."

[Abstract]

Achilles tendinopathy: Optimising the return-to-sport process

OBJECTIVE

The dearth of clearly defined criteria, and even a definition of return to sport (RTS), for Achilles tendinopathy (AT) makes it difficult to efficiently and optimally guide athletes through the transition. There was a two-part purpose to this study: 1) to establish a definition of RTS, where it is viewed as the ultimate goal after mid-portion AT, and 2) to search the literature and find clear criteria for decision making in the process of RTS.

WHAT THEY DID

A systematic literature search was performed by two researchers using selected databases, with date ranges from 1998 through to July, 2017, and various search terms similar to "Achilles tendinopathy," and "return to sport." Data was compiled and a content analysis approach was used to dissect the data. This approach had 3 steps: Step one was open coding, where the researchers read through the included studies separately and compiled temporary "labels" that related to either a definition of, or criteria for RTS. Step two was axial coding, where each researcher looked at the labels and investigated possible connections between them. Consensus meetings between the researchers were held after steps one and two. Step three was selective coding, in which both researchers collaborated and developed comprehensive content categories that served as relative terms to define RTS and to describe criteria used for RTS.

WHAT THEY FOUND

Of the 35 studies included, 32 (91%) gave a definition of RTS, and 19 (54%) discussed criteria for RTS. From the content analysis approach, the following content categories were formed for definitions of RTS: reaching pre-injury activity/sports level, absence of pain, and recovery. Subsequently, the following eight categories were created for criteria for RTS: level of pain, level of functional recovery, recovery of muscular strength, recovery of range of motion, level of endurance of the involved limb, medical advice, psychosocial factors, and anatomical/physiological properties of the musculotendinous complex. Despite narrowing down study themes, they found considerable variations and lack of reported time to RTS amongst the studies.

» Practical Takeaways

Although there were clear "common threads" in what type of outcomes were reported upon, there was little consistency in just how they were reported, which makes comparison, and ultimately a conclusion of the best methods for RTS, very difficult. For example, the studies that mentioned resumption of strength equal to the uninvolved side, did not report exactly how they measured this or even which muscle groups should be focused on. What the authors did confidently conclude, however, was that RTS may be defined according to pre-injury level of play, absence of pain, and recovery. Criteria for RTS, unfortunately, was significantly more variable and inconclusive. That being said, this variability in study design and reporting also reiterates the importance of programme individualisation for each athlete/patient.

Despite this review's variability, there are 3 main points that are beneficial to remember. One is that resolution of symptoms (especially within 10 days) does not mean that the individual is ready for RTS, as there is likely still tendon healing that needs to occur. The second is that we can confidently define RTS based on pre-injury level of play, having no pain, and recovery time. Lastly, when looking into other findings, the authors showed that it has been demonstrated that completely ceasing sports activities during rehabilitation may not be necessary. Considering these points, the coach and clinician can, at the very least, educate the athlete/patient on what the end-point is, the importance of respecting healing even after pain resolves, and that they will likely be able to participate on some level even before a full return.

Want to learn more?

Then check these out...



Steph's Comments

"The qualitative nature of this review makes it unique, and effectively highlights the areas that require deeper experimentation and investigation when it comes to such a diagnosis of AT as it is part of a large spectrum. Although it is clear that we need more objective research to fill in the blanks in regards to a structured criteria-based RTS protocol, it is also of benefit to have a way of measuring the "end-point" or when the athlete has successfully returned to sport; which I feel this review provides. The "end-point" referred to in this study, again, is primarily the safe return to pre-injury level of sports, absence of pain, and overall recovery time.

I really believe that the most important takeaway was the assertion that it is not always necessary to completely stop playing your sport during the rehab process, particularly if using a pain monitoring system (e.g. the athlete is not allowed to continue playing if pain reaches above a 2/10 on the VAS scale). Though it has not been shown that it significantly improves or decreases time to RTS, it does not do harm, and may actually be more instrumental in maintaining athlete motivation and avoiding negative psychosocial factors from coming into play."

[Abstract]

ACL Reconstruction: Recommendations for an updated return-to-sport approach

OBJECTIVE

Anterior cruciate ligament reconstruction (ACLR) remains the standard of care for ACL-deficient athletes planning to return to sport. Outcomes are, however, mixed and poorer than previously reported. Less than half of athletes who undergo ACLR will return to sport within 1 year, and 1 in 4 will experience a re-injury. This article presents the recent evidence and provides recommendations for an updated approach to return to sport (RTS) focusing on rectifying neuromuscular control deficits.

WHAT THEY DID

The authors surveyed the latest evidence, particularly in the areas of reduced function and neuromuscular control, risk factors for secondary injury, and methods to identify post-ACLR neuromuscular impairments. They also performed a prospective cohort study that examined neuromuscular and biomechanical factors related to risk of re-injury. The combined findings from both the literature review and cohort study were reviewed and utilised to develop an updated late phase post-operative rehab protocol that aims to decrease re-injury risk.

WHAT THEY FOUND

From the literature review:

- Normal quadriceps strength does not ensure normal neuromuscular control
- Increasing evidence of altered neuromuscular control in the unaffected limb
- The uninvolved hip shows compensations that are predictive of secondary ACL injury
- Risk factors for secondary injury included:
 - * female sex (88% of reported contralateral ACL injury), uninvolved hip rotation force produced during landing, frontal plane (side to side) knee motion during landing, sagittal plane (front to back) knee force/strength asymmetries at initial contact, deficits in postural stability of the surgical/affected limb, ratio of hamstrings-to-quadriceps torque production (weak quadriceps strength compared to hamstring strength), asymmetries in single-limb hop testing.

From cohort study: 4 measures of neuromuscular asymmetry were found to be predictive of re-injury risk

- Hip rotation control deficits
- Excessive frontal plane knee mechanics
- Knee flexor (hamstring) deficits
- Postural control deficits

» Practical Takeaways

It is well established that we need to utilise a combination of a timeline-based and a functional testing based RTS protocol, and that symmetrical lower-extremity (LE) quadriceps strength is important. Despite these facts, and the evidence that supports them, the injury and re-injury rates continue to be high. The ever-increasing support for neuromuscular control training as a critical component of the return to sport rehabilitation is perhaps where we need to divert our focus in an effort to remedy this.

As this review highlights, adequate quadriceps strength is essential, but it does not guarantee adequate trunk and LE neuromuscular control. In addition, decreased joint motion and reduced force production in BOTH the involved joint and the uninvolved hip joint have been observed. For physical therapists and strength coaches involved in an athlete's rehabilitation, this means we should place an emphasis on restoring a good hamstring-to-quadriceps strength ratio (85%) and co-activation of these muscle groups, address asymmetries in the areas mentioned above, and on training to improve those asymmetries through jump and land mechanics, plyometrics, single-leg strengthening and balance work. A solid foundation of strength and control in these areas, followed by sports-specific drills and activities with progressive overload, better sets the athlete up for success and may reduce their risk of re-injury.

Want to learn more?

Then check these out...



Steph's Comments

"This article, amongst many others, supports the concept that return to sport following ACLR is multifactorial. Admittedly, from my own clinical experience, it is very difficult to return an athlete/patient back to high-level sport without any setbacks or re-strategising at certain points in the plan of care. Knowing that these specific areas of neuromuscular dysfunction and asymmetry can be fairly accurate in predicting re-injury risk is helpful in creating a more objective and effective protocol, with the ultimate goal of reduced re-injury risk and improved long-term outcomes.

Although the authors performed a thorough literature review, they did not describe how they did so in nearly as much detail as they described the cohort study and their resulting proposed protocol. As in most cases, further higher quality research with greater emphasis on long-term outcomes is needed. However, I feel this is a great starting point and allows for a more objective, systematic approach to return to sport. It also serves as a strong foundation upon which to educate our patients regarding post-op potential and prognosis and to increase their confidence in the process. In the end, isn't improved patient care experiences and outcomes the main goal?"

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Infographics

A round-up of our monthly research infographics.

DOES ANKLE MOBILITY AND SEGEMENT RATIOS INFLUENCE TRUNK ANGLE IN THE SQUAT?

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

DO STRONGER AND FASTER ATHLETES HAVE A REDUCED RISK OF INJURY?

Malone S. et al., (2017). Journal of Science and Medicine in Sport.



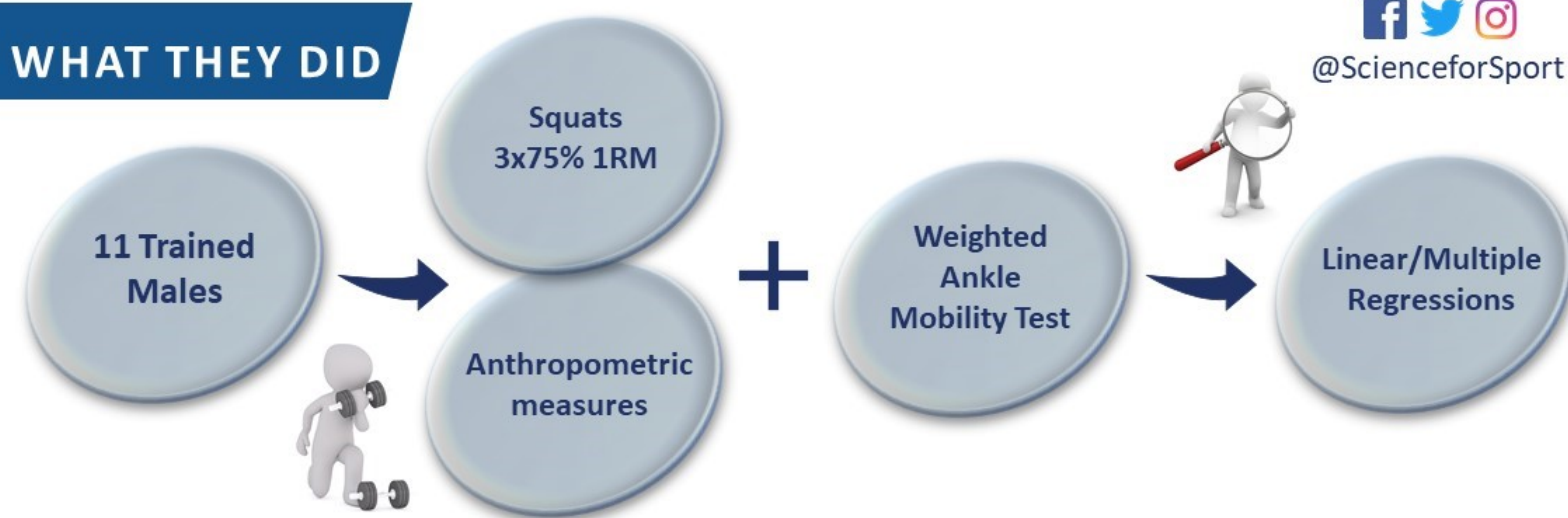
Do ankle flexibility and segment ratios influence trunk angle in the squat?

SCIENCE for
SPORT

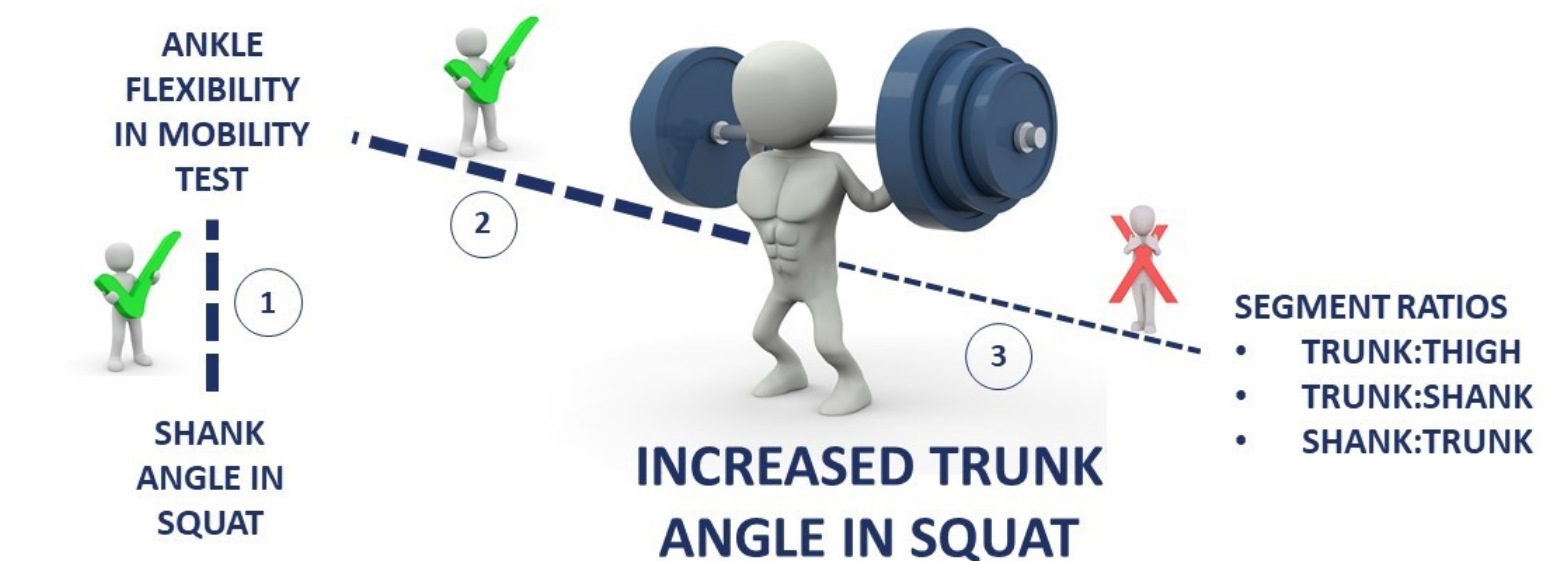


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WHAT THEY DID



RELATIONSHIPS THEY FOUND



WHAT THIS MEANS

“Knowing the relationship between segment ratios, ankle mobility, and trunk lean, the coach should be able to determine whether limited movement in the back squat is primarily caused by the subject’s ankle mobility or morphology.”



Study: Fuglsang, E.I., Telling, A.S. and Sørensen, H., 2017. Effect of Ankle Mobility and Segment Ratios on Trunk Lean in the Barbell Back Squat. *The Journal of Strength & Conditioning Research*, 31(11), pp.3024-3033.

Do stronger and faster athletes have a reduced risk of injury?

SCIENCE
for
SPORT



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WHAT THEY FOUND

STRENGTH

1



3RM trap bar deadlift

Stronger athletes had reduced risk of injury compared to weaker athletes

REPEATED SPRINT ABILITY (RSA)

2



Time in 6x35m shuttle

Athletes with a faster RSA had a lower injury risk than those with a slower RSA

SPEED

3



5, 10, 20m times

Faster athletes in 5, 10, 20m had lower injury risk than slower athletes

WHAT THIS MEANS

“These findings demonstrate that well-developed lower-body strength, RSA and speed are associated with better tolerance to higher workloads and reduced risk of injury in team-sport athletes.”

Malone, S., Hughes, B., Doran, D.A., Collins, K. and Gabbett, T.J., 2018. Can the workload–injury relationship be moderated by improved strength, speed and repeated-sprint qualities?. *Journal of Science and Medicine in Sport*.

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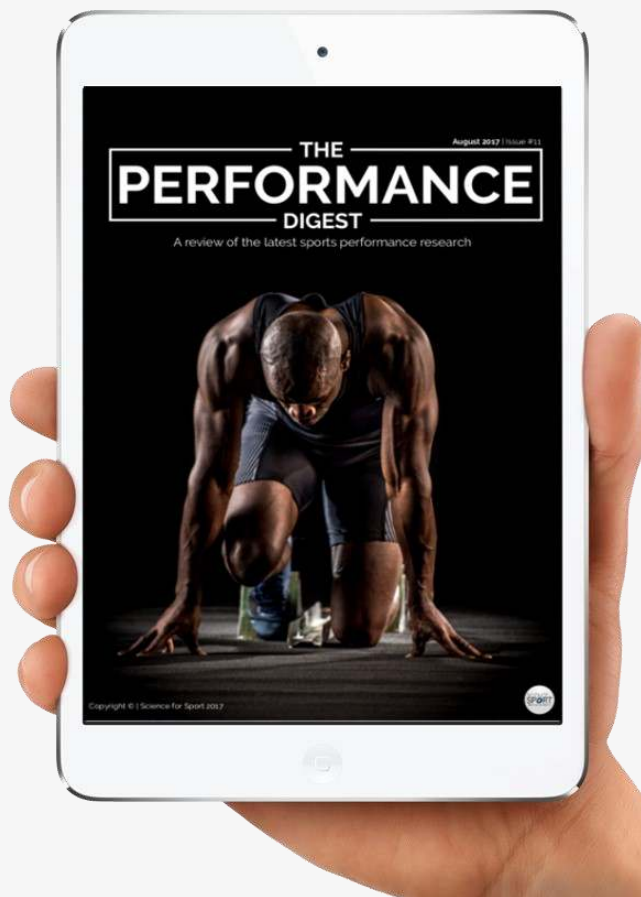
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Next issue will be published on 31st March 2018.

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Warm Regards
Science for Sport



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