

Strength training for youth athletes

Takeaway points:

- An increase in absolute strength can offer immediate and significant benefit to a junior athlete who has not strength trained before
- Strength training results in an increased ability to produce force. This is relevant to all track and field athletes
- Strength training is safe and effective when kept simple and supervised properly



In my roles as both a strength coach and an Athletics Australia sprint coach I still hear parents proclaiming that “kids should not do weights”. While this belief is no doubt founded in well meaning, it is in fact based on myth. This belief, like many erroneous beliefs that circulate in the health and fitness world, stems from research done decades ago that has subsequently been shown to be either poor science or taken out of context. A review of the available literature shows that the original findings of studies done in the 1970’s and the 1980’s were misleading in that they were not studying properly designed and supervised youth resistance training programs.

More recently, the [National Strength and Conditioning Association \(NSCA\)](#) and the [Australian Strength and Conditioning Association \(ASCA\)](#) has made it very clear that resistance training for children is both safe and effective. This view is also supported by the [Australian Sports Commission](#).

The current literature on youth resistance training studies demonstrates that as long as the training program is prescribed and supervised appropriately and that it is matched to the initial capabilities of the trainer, there is a low risk of injury in children and adolescents.

Traditional arguments against youth resistance training have included the notion that it might “stunt growth” or cause “damage to growth plates”. Some even believe that getting stronger will reduce flexibility, add muscle bulk which will impair performance or even make an athlete slower on the track or sporting field.

Those who hold these beliefs unfortunately do so in ignorance of the facts. I would encourage them to review the current scientific literature, discuss their concerns with a qualified person (and note that General Practitioners are NOT usually qualified in strength training) or better still, engage in a progressive strength training program themselves so that they can understand firsthand the benefits of strength training.



The evidence is very clear

The NSCA states that ANY exercise or activity recommendation for children and adolescents has risks as well as benefits. The risk of injury while resistance training or weightlifting can be minimized by qualified supervision, appropriate program design, sensible progression, and careful selection of training equipment. The NSCA’s conclusion is that there are no justifiable safety reasons that preclude children or adolescents from participating in such a resistance training program. While there is no minimum age guidelines, the



participant must be mentally and physically ready to comply with coaching instruction and undergo the stress of a training program.

The benefits for the athlete are significant. Here is a summary of the current position of the NSCA on strength training for youth:

1. A properly designed and supervised resistance training program is relatively safe for youth.
2. A properly designed and supervised resistance training program can enhance the muscular strength and power of youth.
3. A properly designed and supervised resistance training program can improve the cardiovascular risk profile of youth as well as the osteogenic (bone health) response.
4. A properly designed and supervised resistance training program can improve motor skill performance and may contribute to enhanced sports performance of youth.
5. A properly designed and supervised resistance training program can increase a young athlete's resistance to sports-related injuries (this includes against the high incidence of ACL injuries in youth sports, particularly female)
6. A properly designed and supervised resistance training program can help improve the psychosocial well-being of youth.
7. A properly designed and supervised resistance training program can help promote and develop exercise habits during childhood and adolescence.

In my own experience, I have found that significant improvements can be made to athletic ability by just increasing absolute strength - the ability of the athlete to generate and apply force. All athletic events rely on the application of force. The more force an athlete can apply the more effective they will be. This is an immutable law of physics and it applies equally to sprinters, throwers, jumpers and distance athletes. Yes, even distance athletes!

Simple and safe

Two significant caveats need to be applied to the concept of strength training for youth. The first is that it needs to be kept simple and the second is that it needs to be made safe. If this is done, long-term increases in strength, that will have an immediate and demonstrable impact of sporting performance, can be ensured. And all of this can be achieved through the supervision of the strength training by a qualified and experienced strength coach who has specific credentials in strength training and working with children. A coach who does not have these credentials or has not had significant experience in their own strength training should not undertake this part of their athlete's development. It should be supervised by someone who does.

May the force be with you – understanding strength

Strength is not complicated. Getting stronger is not complicated. People try to make money by trying to make it complicated



because somehow we think if it is complicated than it must be better than simple. But in the final analysis, strength is very simple.

Strength is simply the production of force using your muscles. It is the ability to exert force on physical objects. For a track and field athlete that means the ground or an implement. All else being equal, the more force we can exert into the ground or into the implement then the more successful we will be.



Strength is easily measured by the amount of weight you can lift. Improvements in strength are easily measured by how much more easily you can interact with your environment – from doing simple household tasks, to getting out of a chair to throwing a Javelin another 5m.

Strength doesn't lie. It increases or it decreases depending on the work we put in (or don't) to the system that is doing the production of the strength. If we get the system to do the work it will get stronger. Simple.

The human body is that system. Therefore, we need to use the system in the most natural way possible. This is why complicated doesn't work.

Strength training is when you use natural, basic, uncomplicated human movement patterns using a resistance (weight) under the influence of gravity while standing on the ground. This is how you get stronger in a useful way. In this way we are required to produce force using our muscles in the anatomically correct sequence using the body's balance, coordination and nervous system. Just like it was designed to do. A squat for example is the most natural expression of human movement – something that every single human being learned how to do at an early age without ever being shown how.

Strength is the foundation of all other physical capabilities – power, speed, balance, agility, coordination and endurance. Without strength, all these other physical capabilities are less effective because they all require the production of force. This is why athletes take steroids. There are no "technique steroids", there are no "endurance steroids", there are no "speed steroids" - steroids allow you to train to get stronger than you can without them. Even athletes dumb enough to take steroids have worked out that strength is the golden egg – so much so they risk their very careers to get it.



Consider this. A middle distance runner who can do a bodyweight squat can generate a certain amount of force for every stride they take. In a longer race, every stride is a repetitive sub-maximal effort that represents a certain percentage of the athlete's absolute strength capability.

What if we work with this athlete and double his strength by learning how to squat with a bar and getting stronger. Then, every stride they run at the same speed represents a smaller percentage of the athlete's previous maximum effort so now he can either go a lot further at the same speed before fatigue, or go faster (by running harder and producing more force) for the



same distance. His performance has improved by a significant margin by learning to squat. He is stronger.

What about the kid learning to use blocks. The coach stands back and observes that she is “running on the spot”, or “stepping out of the blocks not running or pushing”. This is fairly easy to observe. So what follows is a complicated series of stride drills and starting mechanics drills designed to fix this. These take a lot of time and are hard to do correctly and invariably, unless the athlete has reached a mature level of training, they will return to their natural patterns under the stress of a race. Is it maybe worth considering that the kid running on the spot is actually unable to generate the force

required to drive powerfully forward? That they lack strength. Lack of strength has nowhere to hide in the first 10m of any sprint race. Its absence can be mitigated once in full flight by various other physiological factors but not when the application of force into the ground to overcome inertia is the number one priority and is on full display. The drills might work. Getting stronger will always work.

How we get stronger

The beauty is in the simplicity. For many years a lot of people have got stronger by following a simple plan. Apply stress to the body (strength training), allow the body to recover (rest and eat appropriately between sessions) and allow it to adapt (the body does what it needs to do to return to homeostasis – it gets stronger). Then you do it again this time applying just a little bit more stress. And then you do it again and again and again.

You can do this pretty much forever and it is a fundamental biological concept that is free of charge to every human being. Developing other bio motor abilities like speed and endurance is no different (although their development is more fruitful in the presence of greater levels of strength).

This is an important consideration when designing strength program for younger athletes. The acquisition of strength should be part of the athlete’s long term development and therefore it should not be rushed. The progression of resistance should be incremental, for example, the squat might be progressed by as little as 1-2.5kg per week. Apply the stress and let nature take its course.

Keep it simple

A youth strength training program does not need complicated periodisation; a simple, linear progression program with conservative incremental increases will provide the foundation of a youth strength training program for many years to come. Normal volume/intensity rules can be applied during peak competition season but for a few years, long-term, linear progression is all the athlete will need. This also has the added benefit of demonstrating to the athlete that progress and improvements can be made, in any endeavour in life, by consistently applying themselves to a long-term plan that has a goal at the end of it. Not only important as a life skill, but it will also perhaps mean that the athlete is not so likely to “program hop” in the attempt to try the latest and greatest, fast-gain promise internet program by the guru of the month.

The exception to this of course is for a more advanced athlete – the structuring of their strength training would have to be planned in consideration of the periodisation of their overall training program. The longer the time spent strength training – the harder it becomes to maintain the

strength progression so more complex programming is required but that is another story for another day.

When it comes to building strength – keeping it simple, slow and steady has always worked and will always work. A program can be built around just a handful of exercises. Squatting, dead lifting, overhead pressing and bench pressing is all the variety and complexity that pretty much any youth athlete will need for many years. These exercises use the most amount of muscle mass over the most effective range of motion to build strength while requiring balance, coordination and core strength to perform them. They are performed using the body as an integrated system of muscles, bones, ligaments and tendons thus strengthening the body as a system. This is an important consideration in any youth training program.

What about power and plyometrics? What about “functional training”? What about “corrective exercise”? What about “sports specificity”?

This is where things can stop being simple if we allow it. Many well-meaning track and field coaches (and coaches from other sports) will have their athletes engage in plyometric training which are ballistic, body weight movements relying a rapid stretch shortening cycle of muscles, tendons and ligaments. This is done as conventional wisdom would have them believe that this will make the athlete more powerful and therefore better at athletics or their chosen sport.



However, a basic understanding of plyometrics highlights the fact that they are designed to express an athlete’s STRENGTH AT SPEED or POWER. Unfortunately, if the athlete is not strong then there is no point doing plyometric exercises – they have no meaningful strength to express – and in addition, their risk of injury is higher due to this lack of strength. The athlete would be better served by first increasing their strength and then engaging in plyometrics to express that strength as power. This is not to say that plyometrics will not help athletes improve their performance, it is however, to say that they would be more effective in the presence of greater levels of strength. The time is better spent getting the athlete stronger.

Functional training and corrective exercises are often included in an athlete’s program as these are sold as being things that will improve athletic prowess, make them more balanced and iron out the bugs that have developed in the athlete’s physical system or to “bridge the gap between the weight room and the track”. Like technical drills, these things take a lot of time to do and they can be complicated. Is a squat not the most functional exercise in existence? Is it not also the most useful corrective exercise in existence? A loaded squat moves every lower body joint through its full range of motion and makes it get stronger. If you fall over, then you take some sort of action (corrective) to ensure that you don’t fall over again. But you do this by squatting again, a bit differently, not by putting the bar away and doing an isolation exercise to make something “fire” properly.

The well-equipped coach might get their junior athlete to pull a loaded sled as it is deemed to be very “sports specific”. Like plyometrics, resisted running is ineffective in the absence of general strength levels. When weak, strength training has a significant impact and it doesn’t matter how the athlete gets stronger – there is no need to worry about horizontal v vertical forces vectors and like. Just the increase in strength will provide for greater force production which will provide for greater speed or throwing distance. When the athlete reaches elite levels and is mature in terms of training

history then the strength training may need to be more specific. This is when resisted running and horizontal force vectors might become more relevant.

Is the ultimate in effective simplicity just to get the junior athlete stronger through sensible strength training using whole body free weight exercises and then just let them go and practise their sport? Just let them run, jump, throw. The new strength can now be expressed as an increase in performance of the sport. Isn't that the very definition of sport specificity?

Keep it safe

The other advantage of course of keeping it simple is that it is easier to keep it safe. Basic whole body exercises using natural human movement patterns are inherently safe and will remain so until we apply an inappropriate load that makes them unsafe. Squats, dead lifts and pressing movements such the overhead press and bench press will strengthen the most amount of muscle mass over the most effective range of motion and these exercises can be mastered over many years.

Machine based strength training is not effective as the athlete will move in movement patterns determined by the machine and they will not be required to balance or coordinate their movements under the influence of gravity.

All exercises should start with body weight only loads until technique is perfected (and this applies equally to adults) and the application of progressively heavier resistance can be applied in appropriate increments. Depending on the age and stage of physical maturity of the trainee, the initial adaptations to a strength program may be neurological or hypertrophy related or a mixture of both.

A good strength trainer will be able to write a linear progression program that utilises the stress-recover-adaptation cycle. They will be able to perform squatting, pressing and dead lifting exercises themselves with a high degree of technical proficiency and know the teaching progressions for each.

They will be equipped with fractional plates that can be added to a bar to ensure that progression is slow, steady and constant. This can only be done with a barbell – it cannot be done for any period of time with dumbbells or resistance bands. The good strength trainer will have a range of different weighted Olympic bars that these fractional plates can be added to. A standard 20kg Olympic bar is not appropriate for most beginning youth strength trainers.

Note that this sort of equipment is not usually found in your national gym chain so that is not where the junior athlete should be doing the strength training.

A good strength trainer will understand the guidelines that are published by organisations such as the Australian Strength and Condition Association that set out repetition and intensity ranges for the different age groups and they will be experienced enough to modify these as appropriate for every trainee so that a program can be structured with respect to the individual youth athlete's levels of maturation, technical proficiency, motor skill competency and existing strength levels.

They will have a thorough understanding of the principles of force production, human anatomy and programming and be able to pass on their knowledge so that the junior athlete can learn from them.

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References and recommended further reading:

Strength Training in Children and Adolescents - Raising the Bar for Young Athletes?

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3445252/>

Youth resistance training: updated position statement paper from the National Strength and Conditioning Association

<http://www.ncbi.nlm.nih.gov/pubmed/19620931>

The Australian Strength and Conditioning Association Position Stand - Resistance Training for Children and Youth

<https://www.strengthandconditioning.org/resistance-training-for-child-and-youth>

Australian Sports Commission –Weight Training for Athletes

http://www.ausport.gov.au/participating/coaches/tools/coaching_children/Weight_training

Weight training - Pre-adolescent strength training - Just do it! (Australian Institute of Sport)

http://www.ausport.gov.au/_data/assets/pdf_file/0009/145971/Article_weight_training_preadole_scent_strength_training_Narelle_Sibte.pdf