KIDS MUST STRENGTH TRAIN—A CALL TO ACTION

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As a society, people are becoming more and more inactive. Even with the recent availability of fitness information via social media and other platforms, many people continue to meet only the minimum physical activity (PA) expectations for health (5). Youth especially have seen a marked decrease in PA, which accompanies an increase in conditions like childhood obesity and diabetes (23). Likewise, a sedentary (or inactive) lifestyle is the leading cause of preventable death, and the longer this lifestyle is predominant, the associated comorbidities become more prevalent and serious (9). While health can always be improved upon, the most important time in life to capitalize on this is when the body is actively maturing and developing, both physiologically and mentally, and correct strength training is an essential component of youth physical development (23). Potential habits formed during childhood may also transfer into adulthood, manifesting as decreased disease conditions or conversely, increased sedentary behaviors if healthy habits are not formed early on (7). While many aspects of fitness can influence health, this article is intended as a reminder that children and adolescents (combined termed youth less than 18 years of age) need to be focused on building strength, or the prerequisites thereof, during these years, and that absolute strength is an incredibly profound measurement that needs to be developed as soon as possible due to the many aspects of health it positively effects (7).

DEFINITIONS

Resistance training (RT), also referred to as strength training, is the act of using resistance through available joint motion, whether that be through gravity or equipment, to elicit favorable physiological adaptations such as one's ability to exert force (7). While the ability to produce force describes the general term of strength, absolute strength can be viewed as the maximal force that can be generated by an individual. RT is one component of PA, and when performed correctly, many health benefits are the same as another more possibly well-known component: aerobic or cardiovascular training (7,21). It is important to note that for the purpose of this article, RT, or the idea of enhancing absolute strength, does not refer to the sport of powerlifting or Olympic-style weightlifting, rather the specific ability to exert force through maximal or submaximal means.

BENEFITS OF STRENGTH TRAINING FOR KIDS

In addition to some of the previously mentioned physiological benefits, RT has also been positively linked to influence cognitive and psychological aspects (15). PA, which includes RT, was shown to improve cognitive performance and development in school-age youth (6,7). RT has also been shown to increase sleep quality and duration (20). It is well known that sleep is a vital factor for brain health, emotional and mental well-being, physical recovery, and overall decreased mortality risk (4,18). This seems to engage RT and sleep in an almost positive reinforcement-like cycle in that RT helps sleep quality, and sleep assists in recovery from training, as well as decreases the risk of other comorbidities.

The cognitive aspect further translates over into a broad idea of mental strength and toughness, which is important due to the multifactorial crossover it has to other various aspects of life and contribution to society. RT has been shown to positively impact self-perception in children, which impacts self-efficacy and therefore perhaps the success of healthy lifestyle habit formation (1,15). According to the Social Cognitive Theory, those with low efficacy expect poor outcomes and are more likely to give up in the face of adversity (2). Those with higher self-efficacy are more likely to persevere and see obstacles and outcomes as something they can control. Positive cognitive feelings, such as self-perception, self-esteem, and self-efficacy, are vital to develop in adolescence and may be important for the creation of the foundation of increased PA during the earlier years (15). There is something primitive and natural about struggling through a movement and lifting a heavy object off the ground. Not only does RT show that the body is capable and resilient, but as an extension, it seems to promote mental toughness as well.

Proper RT is an important tool be taught to youth, not only for the aforementioned potential mental and psychological strength benefits, but also to turn them into physiologically stronger, more resilient, and capable adults. The ability to pick up and manipulate heavy things is important to maintaining independence and quality of life throughout the aging process. Conditions like sarcopenia and osteoporosis plague our aging population, and both can be radically slowed down and even reversed through strength training earlier in life (10).

An entire article could be written on the natural aging process and unnatural inactivity and factors they relate and lead to, but the simple truth remains that if one starts training (or exercising with purpose) younger, the baseline strength and capability has the potential to be much higher than if one began later in life. This allows for decreases in the loss of relative resiliency of tissues such as bone and muscle (i.e., osteoporosis and sarcopenia), as well as attenuating natural decreases in general capability with age. Additionally, recent research has shown that risk factors related to the development of cardiovascular disease, which is a major cause of early mortality, can develop in adolescence and can be mitigated through RT (21). This further demonstrates the need to increase PA, specifically RT, in youth to develop healthy habits of exercise and reduce risks of developing chronic diseases later on in life (7,11,19,24).

More immediately, RT has been shown to decrease injury risk in young athletes (8,24). If strength is a protective factor in sports, it may also be protective against similar forces and mechanisms of injury occurring in daily life for non-athletes. There are growing

reports of sports-related injuries in youth simply because the forces required and imposed on their bodies naturally due to sporting movements (such as running, jumping, and change of direction) are much more intense than anything they have experienced (13); this can be mitigated by early strength training, which familiarizes the muscles, joints, and bones to increased stress and subsequent adaptations.

DEFINING ATHLETICISM

One mistake that has been a common thought process is the idea that sporting movements only occur if you are an athlete. Athleticism, or the development thereof, is not just needed for athletes; rather it has been defined as the ability to "repeatedly perform a range of movements with precision and confidence in a variety of environments, which require competent levels of motor skills, strength, power, speed, agility, balance, coordination, and endurance," (13). Children do not just run and jump when they are on a field or court; even with inactivity levels of youth nowadays, they still tend to run and jump outside of sport environments. Even adults should have the capability to perform these actions; not only because this is how the human body was designed to move, but to ensure basic functions and safety throughout everyday life. Regardless of sport participation or lack thereof, the same performance techniques can be used in either population, such as progressive overload and the SAID (specific adaptations to imposed demands) principle. There has been a fundamental disconnect between athlete development and general fitness. It is imperative to understand that the needs are inherently the same, though the exact methods and goals may differ based on context. Regardless of the health, fitness, or performance-related goals, it is easy to see that RT must be prioritized by youth of all activity levels and performance requirements.

WHY IS STRENGTH TRAINING FOR KIDS NOT EMPHASIZED MORE?

Motivation is difficult, but not impossible, to instill in youth, which is why the influence of parents may be a major factor in developing healthy habits including RT early in life. Adults need to lead by example and show that strength training is a normal part of life because of the benefits it entails. More than this, education for youth is paramount. Without knowledge of the benefits or expected outcomes, people lack the reason, or motivation, to start making or maintaining healthy changes (2). One session dedicated to education would go a long way to instill buy-in and long-term habits. Strict strength training may not be fun for younger ages, and once enjoyment is lost, commitment and consistency are difficult to achieve. Sit down with the kids and find out what they like to do. For example, it could be playing tag with friends, a specific sport, or even just being able to jump like their older siblings. It is not difficult to take a few minutes and show them that if they put in the consistent work, they will get stronger and closer to achieving their personal goals. According to the Long-Term Athlete Development (LTAD) model, activity and movement must be interesting, fun, and have a relatable purpose (23). Both short- and long-term goals that are personal assist with commitment and motivation (2). Buy-in will be met with extensive results that can last a lifetime.

STRENGTH TRAINING SAFELY FOR KIDS

This leads to a deeper exploration of the LTAD model. Williams outlined seven stages in this model, from the first stage being an "active start" to the last stage of "active for life" (23). Williams describes there as being no specific age that RT can begin, but rather the maturity of the child in question to be able to follow directions safely is the key factor when beginning a program (6,23). Furthermore, the LTAD model specifically outlines that RT should be emphasized at all stages of development, as before puberty RT will increase strength primarily through neuromuscular adaptations, and after through hormonal changes such as an increased circulation of testosterone, both of which will aid in overall maturation and development (14).

Once commitment is met by the child or youth, and all the prerequisites have been fulfilled (baseline cognitive, neuromuscular, and physical development), absolute strength training should become incorporated into the fitness regimen. It is important to note that the baseline development rates would vary between children, as well as the minimum experience needed for personal trainers and strength and conditioning coaches. A personal trainer or strength and conditioning coach with more experience working with youth may be more successful using these developmental models to safely incorporate strength training sooner than an inexperienced individual. RT that builds the foundation of strength can occur through bodyweight, balance, free weight, or banded exercise, among other techniques.

While all forms of PA are important and have their place in the LTAD model, loading movement patterns like the squat, hip hinge (e.g., the deadlift), overhead press, and a push and pull motion (e.g., such as the bench and row) are an efficient way to produce maximal force and adaptation through the whole body due to the systemic pattern of synergistic muscular recruitment that is required.

While previously thought to be unsafe, RT in youth is well accepted in the literature to be a safe addition for PA (6,7,8,14,15,16,17). Additionally, Faigenbaum and Myer stated that one-repetition maximum (1RM) testing is also safe and effective in adolescents (6 – 12 years of age) with machines and free weights alike (8). Likewise, when performed correctly, training programs based around the repetition maximum are also safe. As safety is one of the biggest concerns in youth participating in strength training, one major area of scrutiny is the possibility of damage to growth plates. Faigenbaum and Myer also presented research indicating that injury to the growth cartilage typically came due to improper lifting techniques, chosen intensity, or lack of adequate, qualified supervision (8). Furthermore, Faigenbaum and Myer also stated that no study that has been conducted with expert guidance has shown to end in growth plate injury (8). This concept can be associated with a decrease in risk of any related injury that participants would normally be at risk of when participating in a qualified, well-programmed, supervised exercise session (8). In saying this, teachability, and instruction of qualified professionals are important when it comes to training youth. This means that even when the main goal is to increase absolute strength, certain

criteria, such as correct technique while performing the previously stated movement patterns, must be met before progressively overloading that pattern to specifically target absolute strength.

Utilizing Piaget's classical theory of motor development, a framework was introduced to conceptualize the stages of cognitive and physical development that eventually would define how to go about strength training with youth (11). From early childhood through adolescence, children mature cognitively, mentally, and physically at different rates. As such, to efficiently train absolute strength, cognitive development must be enough to understand and obey directions as well as communicate concerns in a safe manner. Physically, neuromuscular coordination and recruitment, as well as a baseline of strength must also be in place to ensure that body tissues such as bone, tendon, and ligaments, not just muscle, are capable and ready for heavier loads.

It still stands to reason to initially construct a baseline of strength to give beginning balance, control, and power a foundation to build off of (3). Additionally, a properly periodized program that allows for adequate recovery is of great importance, especially if the use of higher intensities in RT to promote absolute strength are implemented or intended to be.

WHAT ARE THE BEST WAYS TO BUILD OVERALL STRENGTH IN CHILDREN?

The same ways to build overall strength in adults are the ways to do so in kids. It is true that children are not just tiny adults. However, in the absence of any comorbidities, medical conditions, or abnormal physical developments, the same principles of training can and should be applied (6). Medical clearance to further ensure safety would also be prudent in this regard (6). As previously stated, bodyweight and band exercises, as well as balance and coordination, are important for motor development, but absolute strength can benefit all categories of muscular performance. Once the fundamental movements patterns previously stated can be performed with bodyweight alone, typical barbell lifts are an effective way to build absolute strength and associated adaptations due to their biomechanical efficiency. Do not start by loading up a bar, but begin slow with kettlebells or dumbbells and use progressive overload. Then, once technique is optimized, load the bar and do not be afraid to do so under relatively high intensities for that particular child.

Programs that are based around these barbell lifts, accessory exercises, and activities to incorporate the functional transfer to life such as running, jumping, or sport-specific work can benefit youth immensely. These baseline movements are all shown to be the most improved with heavier loads (60 – 80% 1RM), the higher of which corresponds closer to absolute strength training (23).

To start, lighter loads, such as 50% of 1RM or estimated 1RM for 10 – 12 repetitions, are enough to elicit strength gains in untrained individuals (9). To continue to target absolute strength, heavier loads will eventually need to be lifted. As progressive overload is utilized correctly, loads of up to 85% 1RM for 5 – 6 repetitions can be used to develop absolute strength. When using higher loads and intensities, rest in between sets is imperative to allow the body to recover and restore intramuscular energy stores (9). Longer rest periods are beneficial in strength training youth of up to four minutes in between sets (12). However, even longer rest periods can be allowed, if they are needed, to facilitate confidence and readiness to correctly complete the next lift. At that point, the overall session length will often determine how long can be taken in between sets. It is important to note again that these higher loads are completely dependent upon the training age (how long the individual has been exercising with this purpose) of the participant, which is why it is imperative to begin training as soon as possible. This will allow for greater strength optimization and development at a younger age. Typically, these higher loads and intensities are only used for the main core lifts (previously mentioned fundamental movement patterns). Lighter intensities for accessory work (e.g., balance, coordination, etc.) can be used to complement the base of strength as well as offer a strategy to reduce overtraining.

STRONGER KIDS, STRONGER ADULTS

Absolute strength is the foundation for all performance capabilities, and therefore can be argued to be of higher priority than other fitness attributes (14). The best time to develop habits to maximize the results associated with RT are during one's youth, due to the chronic time frame needed to optimize benefits. Through qualified professionals, there is an opportunity to completely reshape health into the next generation. Strong kids grow up to be strong adults, not only physiologically, but mentally as well.

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