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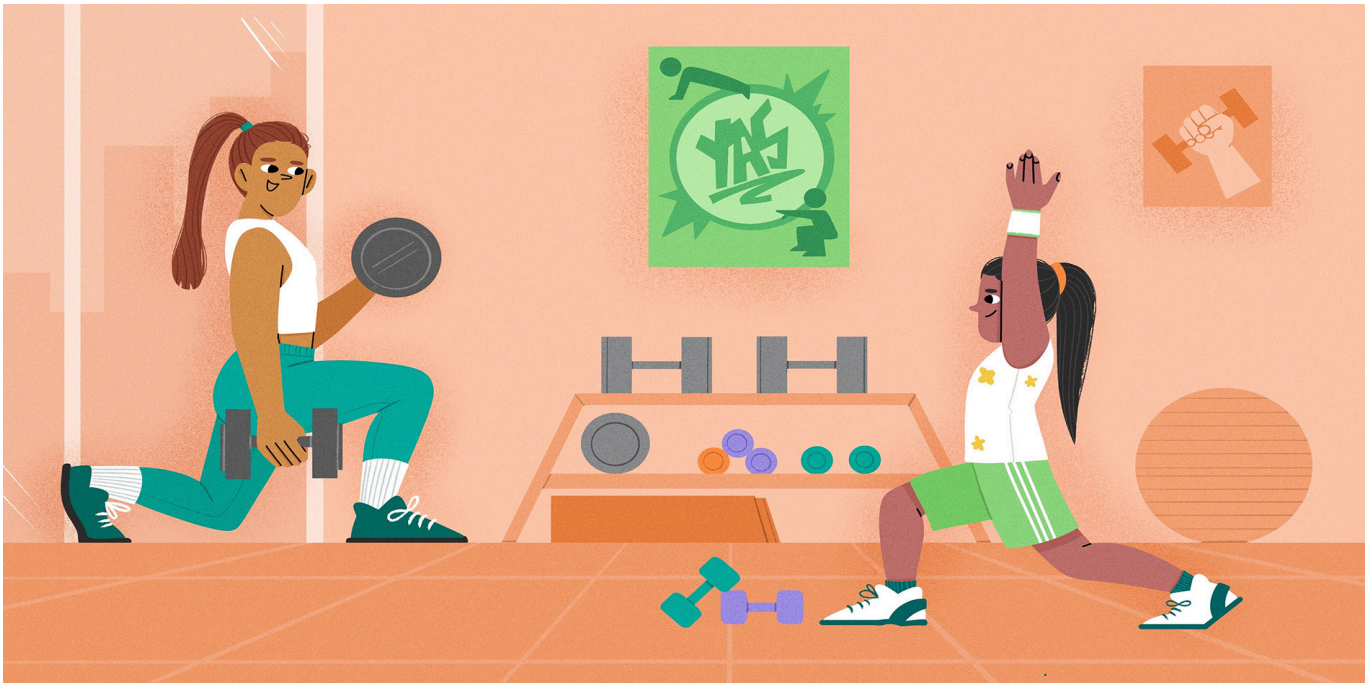

GET LIFTING—STRENGTH TRAINING FOR CHILDREN

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Strength training programs for children have become very popular. But is strength training safe and helpful in making children stronger and healthier? In this article, we discuss why and how this type of training is safe and beneficial for children. We also explain how people get stronger with strength training and how it may work differently in children and adults. Lastly, we give some tips about how children can safely start strength training with the help of a qualified coach/trainer.

YOUNG REVIEWERS:

AADIT
AGE: 9

AARUSH
AGE: 13

KALOMOIRA MARIA
AGE: 14

RESISTANCE BANDS

Large elastic bands that can be used for strength training.

STRENGTH

How much force a muscle can produce.

WHAT IS STRENGTH TRAINING?

Strength training involves doing exercises with weighted equipment, **resistance bands**, or even just the weight of your body. Strength training has been used to improve how well muscles perform. Muscle performance has three basic components: **strength**, **power**, and **endurance**. Strength is how much force a muscle can produce. Power is how quickly the muscle can produce force. Endurance is how

long the muscle can work before getting tired. Overall, good muscle performance is important for having a healthy body and mind.

POWER

How much and how fast a muscle can produce force.

ENDURANCE

How long a muscle can work before getting tired.

MYTHS OF STRENGTH TRAINING FOR CHILDREN

Many adults do strength training, but is it safe and useful for children? People used to think that strength training was not useful for children and even dangerous for them, potentially causing injuries that could affect their growth and wellbeing. For example, because many successful gymnasts (who do a lot of strength training with the weight of their bodies) are shorter, people thought that strength training could limit how tall children can grow by harming the growing parts of bones. These claims have been proven to be false by many research studies showing that strength training improves children's muscle performance, bone strength, and overall health with no harmful effects on growth and development. In fact, studies have shown that children get more injuries while playing popular sports like soccer (football) and basketball compared to performing supervised strength training [1]. Research also shows that children who do strength training and those who do not have the same height increases, demonstrating that strength training does not stunt children's growth (Figure 1) [2]. Today, many places across the world offer safe and effective strength training programs for children.

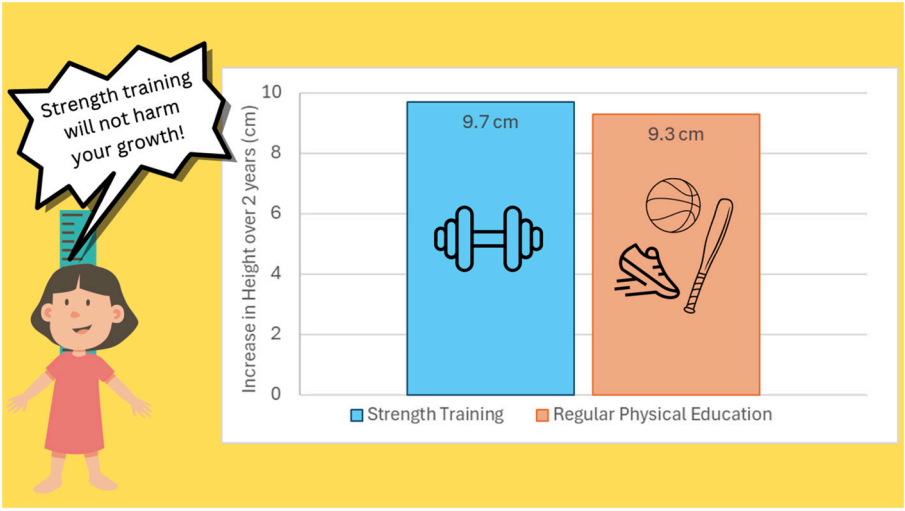

Figure 1

Over a 2-year period, one group of 4th grade boys participated in regular physical education classes, while the other group participated in strength training. Both groups grew the same amount [2].

EFFECTS OF STRENGTH TRAINING IN CHILDREN

Regular strength training can help with children's healthy growth and development. Strength training is helpful for nearly every child, including many of those with disabilities or health conditions. Experts have outlined that regular strength training in children lowers the risk of injury from other sports and increases muscle strength, endurance, sports performance, and bone strength [3, 4]. It also builds confidence

and self-esteem, which can boost mood and improve the skills used for playing with friends or for sports activities [3].

HOW DO CHILDREN GET STRONGER WITH STRENGTH TRAINING?

The strength of a muscle depends on two main things (Figure 2). The first is the size of the muscle. A larger muscle is typically stronger than a smaller one. The second is how much the muscle is activated or "turned on" when it is used. The more a muscle is activated when it is used, the stronger it can be. When adults do strength training, they get stronger by increasing the size of their muscles and by improving their ability to activate their muscles.

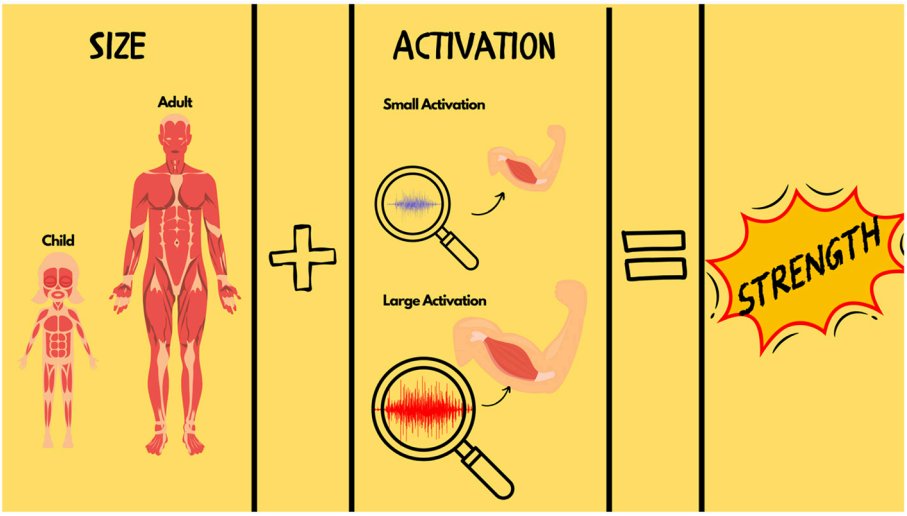

Figure 2

The strength of a muscle depends on its size and how well it can be activated. Larger muscles, and muscles with more activation are stronger than smaller muscles with lower activation.

Children also get stronger as their muscles grow! This is one reason why bigger, older siblings may be stronger than their smaller, younger siblings. However, when children do strength training, their muscles do not grow much more than they do without training. Instead, strength training improves how well children activate their muscles. This is the main reason children get stronger after strength training [5].

HOW DO I GET STARTED?

Just like other activities, if you would like to get started with strength training it is very important to first learn the correct way to do it. Early strength training should focus on doing exercises safely. It can be very helpful to learn the basics from a good, qualified coach/trainer who has experience working with children. Coaches are experts that can make sure children do movements correctly, so they do not get hurt. Coaches can also give advice on what movements to do and how to progress as you improve. With a good coach, children as young as 5–6

years old have benefitted from strength training [4]. If a child is old enough to understand and follow the instructions from their coach, they can safely begin strength training. Children living with health concerns should also confirm with a doctor that strength training is safe for them.

WHAT EXERCISES TO DO

There are many ways to do strength training. Children have been shown to get stronger with strength training using many types of equipment, or just by using their own body weight [4]. The equipment children should use depends on their strength, skill level, and what is available. When first starting strength training, it is best for children to simply use their body weight. These exercises use the least equipment, allowing children to develop skills for many other common movements. Bodyweight movements can then be made more difficult by adding resistance bands, or weights (for example, a barbell or dumbbells). Some basic exercises for the lower and upper body, and how to make these exercises more and less challenging, are shown in Figure 3. Perhaps most importantly, training should be fun! Children should try many different exercises and learn which ones they enjoy most.

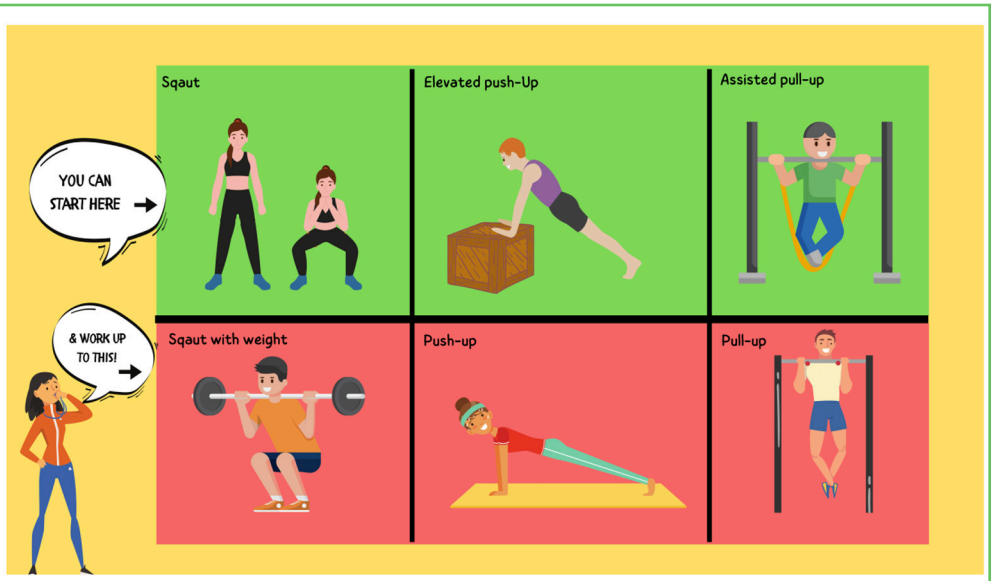

Figure 3

Figure 3

Basic exercises for the lower and upper body that can be used to begin strength training, along with ways to make these exercises more challenging as you progress.

HOW HARD AND OFTEN TO TRAIN

A good strength training program will train the entire body. One easy way to do this is to train the whole body during each training session, by doing exercises for both the lower and upper body. Training sessions can be done two or three times each week, to make sure that there is enough rest between sessions. To make sure that children

train safely, exercises should only be done with proper technique. In the early stages of training, this may mean that some children will only be able to do a movement a few times before needing a break. As children get stronger and better with the movements, they can challenge themselves by adding weight to the exercise, increasing the number of times the exercise is done, or taking shorter rests between each exercise. This will help make sure that each child continues to get stronger throughout their training program.

In conclusion, strength training is safe and effective for children. With the help of a good coach/trainer, children can improve their muscle strength and endurance, their bone strength, and their overall health by doing regular strength training. Try it and see!

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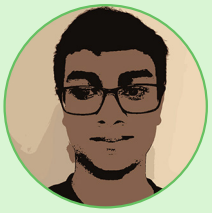
CONFLICT OF INTEREST: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

YOUNG REVIEWERS

AADIT, AGE: 9

My name is Aadit. I am 9 years old and a fourth grader. I like to study high school biology. I play the oboe, soccer, and chess online for fun. I solve rubix cubes in my spare time. I love traveling to different places around the world. Last summer I traveled to Barcelona, Madrid, Paris, and London. My favorite subject is math, in which I am accelerated in school.



AARUSH, AGE: 13

I am Aarush, and I am very interested in biology and computer science. My goal is to be a physician researcher in cardiovascular diseases. My favorite subject is math, and I am triple accelerated in it at school. I play soccer, chess, and violin as some hobbies.

KALOMOIRA MARIA, AGE: 14

Kalomoira Maria lives in Greece and attends middle school. Her interests include music (classical and pop), science (biology and physics), literature (fantasy, mystery, detective), and anime. She is an advanced pianist, distinguished in National Music Competition for young pianists. She recently attended the 3rd International Student Conference (ELEMASYN) in Prague.

AUTHORS

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Andrew McKiel is a Ph.D. student at Brock University in Ontario, Canada. His research focuses on how children get stronger from strength training. He loves sports, and especially loves to play golf and ski. Andrew is a passionate fan of the Toronto Blue Jays. *am20ff@brocku.ca

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Stacey is a Ph.D. graduate from Brock University. Her research focuses on examining differences in muscle activation between children and adults. Currently, Stacey enjoys competing in triathlons, but was a multi-sport athlete in her youth, having competed in figure skating, hockey, gymnastics, softball, and swimming.

PANAGIOTA KLENTROU

Panagiota (Nota) is a professor of sport and exercise physiology in the Department of Kinesiology at Brock University in Canada. Nota studies the implications of sports training in youth. Many of her studies examine how intense exercise and nutrition together impact the growth and health of athletes of different ages. She is a former International rhythmic gymnast.

BAREKET FALK

Bareket is a pediatric exercise physiologist, which means that she studies how the body responds to exercise and training, especially children's bodies. Much of her research focuses on how children's muscles function during exercise. She is a former athlete (volleyball, basketball) and currently enjoys recreational rowing.